THE NEW SURREY HOSPITAL

AND

BC CANCER CENTRE PROJECT

Schedule 1 – Statement of Requirements

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Appendices

PART 1. INTERPRETATION

1.1 Definitions and Interpretation

1.1.1 In this Schedule, in addition to the definitions set out in the Agreement and any other Schedules:

1.1.1.1 “Acoustic and Vibration Consultant” means a Professional Engineer with demonstrated experience in providing recommendations and analysis for acoustic and vibration performance of buildings;

1.1.1.2 “Active DAS” is where single mode fibre connects the DAS head end in the MER to expansion units situated in the Facility’s TRs to distribute the required frequencies and bands. From the expansion units, signals are distributed to active cellular access points located throughout the Facility over hybrid cabling that has both fiber and copper conductors for DC power distribution;

1.1.1.3 “Airborne Isolation Room” means a room designed, constructed and ventilated to limit the spread of airborne microorganisms from an infected occupant, having negative pressure ventilation to the surrounding areas conforming to CSA Z8000 Canadian Healthcare Facilities and CSA Z317.2 Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Healthcare Facilities with an adjoining AIR Anteroom at the entrance that is separated by doors from both the outside and the main space in the AIR;

1.1.1.4 “AIR Anteroom” means a space at the entrance to an AIR that provides for storage and removal of PPE and provides an airlock between the adjacent space and the Patient;

1.1.1.5 “Antenna Headend Equipment Room” has the meaning set out in Section 7.8 Communications (Division 27);

1.1.1.6 "Anti-Barricade" means a room designed such that the occupant cannot cordon themselves within the space or that if an occupant collapses against the door Staff can open the door from outside the space;

1.1.1.7 “Architectural Concrete” means all concrete exposed to view, excluding the Facility underground parking area, roadworks, curb and gutter, mechanical, electrical and Communications Rooms; refer to Section 6.3.2;

1.1.1.8 “Architectural Hardware Consultant (AHC)” means an individual certified with the Door Hardware Institute (DHI), trained to recognize builders’ hardware requirements for door openings in all types of buildings for function and compliance requirements;

1.1.1.9 “Asset” means an item, thing or entity that has potential or actual value to an organization;

1.1.1.10 “Asset Management” means the data, systems and operational processes that enable the Authority to deliver high-quality healthcare at the Facility over its life span;

1.1.1.11 “Automatic Fault Detection Diagnostics and Reporting” has the meaning set out in Section 7.6.3.33.

1.1.1.12 “Back-of-House” means the rooms, spaces and circulation systems, including corridors, elevators and stairs that are not designed for use by the public;

1.1.1.13 “Basis of Design” unless noted otherwise, has the meaning defined in Section 5.6.5.2;

1.1.1.14 “BC Building Code” or “BCBC” means the most recent version of the British Columbia Building Code;

1.1.1.15 “Borrowed Light” has the meaning set out in Sections 5.7.1.5(3) and 5.7.1.5(4) of this Schedule;

1.1.1.16 “Building Envelope Consultant” means an individual whose credentials as a building envelope professional are recognized by the AIBC or the APEGBC to review and certify building envelope Design and Construction;

1.1.1.17 “Building Gross Area" or "Building Gross Square Metres” (BGSM) means the sum of all floor areas within a building measured to the outside face of exterior walls for all stories or areas having floor surfaces;

1.1.1.18 “Building Gross Square Metres” means the sum of all floor areas measured to the outside face of exterior walls for all stories or areas having floor surfaces within the Facility. The BGSM includes Component Gross Square Metres (CGSM), corridor circulation, building structure, service space (such as mechanical, electrical and communications) and the exterior walls;

1.1.1.19 “Building Information Modelling (BIM)” means the use of a shared digital representation of a built Asset to facilitate Design, construction and operation processes to form a reliable basis for decisions;

1.1.1.20 “Building System(s)” means the architectural, structural (and seismic), mechanical, electrical, communications and other systems in or servicing the Facility;

1.1.1.21 “CATV Outlet” has the meaning set out in Division 27, Section 7.8.23;

1.1.1.22 “Campus Perimeter Pathway System” has the meaning set out in in Appendix 1G [Campus Perimeter Pathway System Technical Specifications] of this Schedule“;

1.1.1.23 “Ceiling Height” means the minimum clear height between the finish floor and the finish ceiling where there are no obstructions or protrusions within or below the specified height;

1.1.1.24 “Child Care Centre” has the meaning set out in Appendix 1S [Child Care Centre Requirements];

1.1.1.25 “City” means the City of Surrey, British Columbia;

1.1.1.26 “Commission, Commissioned or Commissioning” means testing, calibrating and balancing the Equipment or system in accordance with the requirements set out in this Agreement, all applicable standards and Good Industry Practice, including to ensure that relevant systems, Equipment, and assemblies have been installed, are operating in accordance with the manufacturer’s requirements and specifications, and fit for the Authority’s intended use;

1.1.1.27 “Commissioning Authority (CxA)” means the individual hired by the Authority to oversee, review and approve the Commissioning process developed and implemented by the Design-Builder;

1.1.1.28 “Commissioning Plan” means the master planning tool relating to Commissioning, setting out scope, standards, roles and responsibilities, process, methodology, and all other aspects of the Commissioning process that will be applied to the project. Minimum requirements for the Commissioning Plan are set out in Section 5.6.6.

1.1.1.29 “Commissioning Provider (CxP)” means the individual hired by the Design-Builder designated to plan, organize, lead, and review the Commissioning process activities. The CxP facilitates communication between the Authority and the Design-Builder to ensure that Commissioning scope and schedule are in accordance with the Project Agreement;

1.1.1.30 “Commissioning Report” means a record of the completion of all Commissioning activities for the Project, including all associated documentation, as defined in ASHRAE Guideline 0.

1.1.1.31 “Communications Pathway System” has the meaning set out in Section 7.8.8 of this Schedule;

1.1.1.32 “Communications Room” has the meaning set out in Section 7.8.9 of this Schedule;

1.1.1.33 “Component, Sub-Component or Functional Component” means a cohesive grouping of activities or spaces related by service or physical arrangement and are as described in Appendix 1A [Clinical Specifications and Functional Space Requirements]. A planning Component may or may not be a department or platform since the term ”Department” or “Platform” means an administrative organization rather than a functional organization of space and activities;

1.1.1.34 “Component Gross Square Metres” means the sum of a Component or department floor area within the Facility. The CGSM includes the NSM of all rooms/areas within the Component plus the space occupied by interdepartmental circulation as well as the walls and partitions within that area;

1.1.1.35 “Contained Use Area” means a supervised area containing one or more rooms in which occupant movement is restricted to a single room by security measures not under the control of occupant;

1.1.1.36 “Convenient Access” means access between rooms, spaces, areas or Components that are located at a minimal distance from each other and linked by horizontal circulation or, as determined in agreement with the Authority on a case-by-case basis, linked by vertical circulation, such that the location of these items is optimized for efficiency of flow and the path between them minimizes corners, jogs or obstructions such as columns that create interference;

1.1.1.37 “Core Network Equipment” means equipment classified as a backbone device that is central to the network’s successful operation. Core Network Equipment is used to connect to servers, Internet service providers and to aggregate all switches that are used to connect end-use equipment and other devices. This equipment is typically located in the MER;

1.1.1.38 “CPTED” means Crime Prevention through Environmental Design. CPTED is a multi-disciplinary approach to deterring undesirable and criminal activity and behaviour through environmental design;

1.1.1.39 “CSA” means Canadian Standards Association or CSA Group, a standards development organization accredited by the Standards Council of Canada that develops standards in multiple areas including climate change, business management and safety and performance, including those for electrical and electronic equipment, industrial equipment, boilers and pressure vessels, compressed gas handling appliances, environmental protection, and construction materials;

1.1.1.40 “Data Drop” means connection point in a network consisting of a complete Category 6A Permanent Link connection between a RJ45 jack in a TO and a patch panel in a Communications Room (typically a MER or TR);

1.1.1.41 “dBA” means the unit of sound pressure level in the typical case where sound is measured using the A-weighting feature of a sound level meter. The A-weighting replicates the frequency sensitivity of the human ear to sound at moderate intensities;

1.1.1.42 “Design Life” means the period of time during which an item is expected by its designers to work within its specified parameters; in other words, the anticipated life expectancy of the item;

1.1.1.43 “Design Objectives” has the meaning set out in Section 3.1 of this Schedule;

1.1.1.44 “Direct Access” means access between rooms, spaces, areas or Components that are horizontally contiguous and linked internally such that the path between them involves no movement through other circulation systems or spaces or, as determined in agreement with the Authority on a case-by-case basis, are vertically contiguous by means of a dedicated elevator or internal stairs;

1.1.1.45 “Direct Natural Light” has the meaning set out in Section 5.7.1.5(2) of this Schedule;

1.1.1.46 "Effective Date" means the date of the Design-Build Agreement;

1.1.1.47 “Electrical Room” means a service room dedicated only to housing electrical power distribution equipment and associated ancillary systems and includes rooms in the Energy Centre containing electrical equipment, BER, UPS room(s), FERs, and SERs;

1.1.1.48 “Emergency Operations Centre” has the meaning set out in Section 5.2.5 of this Schedule;

1.1.1.49 “Emergency Power System” means a power system that is supplied from an emergency supply connected to feed the essential systems as set out in CSA Z32 Clause 6;

1.1.1.50 “Energy Centre” has the meaning set out in Section 5.4.1.1 of this Schedule;

1.1.1.51 “Enhanced Room Data Sheet” has the meaning set out in Sections 2.5.4 and 2.5.9 of this Schedule;

1.1.1.52 “Entrance Facility Room” has the meaning set out in Section 7.8.9.3 of this Schedule;

1.1.1.53 “Ethernet” is an array of networking technologies and systems used in LANs, where computers are connected within a primary physical space. Systems using Ethernet communication divide data streams into packets, which are known as frames. Frames include source and destination address information, as well as mechanisms used to detect errors in transmitted data and retransmission requests;

1.1.1.54 “Evidence-Based Design” or “EBD” has the meaning set out in Section 3.2.1 of this Schedule;

1.1.1.55 “Extra-low Voltage” has the meaning set out in the CEC;

1.1.1.56 “Facility Management” means the organizational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the healthcare business;

1.1.1.57 “FMO” means Facilities Maintenance and Operations or Plant Services Staff at the Facility;

1.1.1.58 “Front-of-House” means the rooms, spaces and circulation systems, including corridors, elevators and stairs that are designed for use by public;

1.1.1.59 “Functional Space Requirements” means the list of required spaces to be included in the Design of the Facility. The Functional Space Requirements document is located in the Appendix 1A [Clinical Specifications and Functional Space Requirements];

1.1.1.60 “Functional Testing” means a full range of tests under actual load, conducted to verify that specific systems, subsystems, Components, and interfaces between systems conform to a given criteria. Functional Testing is witnessed and documented by the Commissioning Authority;

1.1.1.61 “Future Expansion” has the meaning set out in Section 4.2 Master Site Plan;

1.1.1.62 “Geotechnical Consultant” means a Professional Engineer who is a qualified geotechnical engineer;

1.1.1.63 “Good Industry Practice” means the application of standards, practices, methods and procedures to a good commercial standard, conforming to law and exercising that degree of skill and care, diligence, prudence and foresight which would reasonably and ordinarily be expected from a qualified, skilled and experienced person engaged in a similar type of undertaking in the same or similar circumstances;

1.1.1.64 “Hard Codec” means hardware Coder/Decoder for encoding and decoding a digital data stream or signal;

1.1.1.65 “Hybrid-Fibre-Coax DAS” is where single mode fibre connects the DAS head end in the MER to radio repeaters situated in the Facility’s Communications Rooms to distribute the required frequencies and bands. From the radio repeaters, RF energy is distributed to passive antennas located throughout the Facility over horizontal coax cabling;

1.1.1.66 “IM/IT Equipment” has the meaning set out in Appendix 1J [Equipment List IM/IT];

1.1.1.67 “Infection Control Practitioner” means an individual retained by the Design-Builder and approved by the Authority, who has received training in infection prevention and control and whose primary responsibility is infection control and prevention in a healthcare setting;

1.1.1.68 “Information Model” means a digital representation of the physical and functional configuration, characteristics or attributes of the Facility, which incorporates both geometric and non-geometric (Asset attributes including Asset metadata and associated documents) information using object-oriented BIM technology;

1.1.1.69 “Information Technology” means the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data;

1.1.1.70 “Internal Circulation” means movement between rooms, spaces, areas or Components internally by means of horizontal connections such as doors or openings without passage through other circulation systems;

1.1.1.71 “Lean Health Care” has the meaning set out in Section 3.3.1 of this Schedule;

1.1.1.72 “Life Cycle” means the stages involved in management of an Asset;

1.1.1.73 “Life Cycle Cost” means Total Cost of Ownership;

1.1.1.74 “Life Safety System” means any equipment or infrastructure that either provides, monitors or supports life safety or is designed to protect and evacuate the Facility in emergencies, including Patient vital signs, fire alarm, medical gases and nurse call systems;

1.1.1.75 "Ligature Resistant" means elimination of all points where a cord, rope, bed sheet or similar cordlike material can be looped or tied to an item in order to create a point of ligature;

1.1.1.76 “Line of Sight” has the meaning set out in Section 5.7.15 of this Schedule;

1.1.1.77 “Lockdown” means a circumstance whereby the Authority can electronically control access to certain areas in response to a declared emergency, riot, outbreak, pandemic, labour disruption, or other major disaster;

1.1.1.78 “Main Equipment Room” has the meaning set out in Section 7.8.9.4 of this Schedule;

1.1.1.79 “Major Electrical Equipment” means the physically large or fundamental components of an electrical system including generators, high voltage equipment, power transformers, 600V and 208V CDPs and high voltage and draw out breakers. Major Electrical Equipment also includes physically smaller components that have an essential role in an overall system function or reliability, or Facility department operation. Components include head end electronic equipment such as main fire alarm panels, main security system panels or switches and nurse call switches.

1.1.1.80 “Major Mechanical Equipment” means the physically large or fundamental components of a central system including boilers, chillers, cooling towers, heat exchangers, water heaters and associated storage tanks. Major Mechanical Equipment also includes physically smaller components that have an essential role in the overall system function or reliability, or Facility department operation. Components include PRVs and backflow preventers.

1.1.1.81 “Master Site Plan” has the meaning set out in Section 4.2 of this Schedule;

1.1.1.82 “Medical Device Reprocessing" or "MDR” means the department that reprocesses reusable medical devices and provides supplies of sterile instruments, linen packs, dressings and other sterile items used in Patient care;

1.1.1.83 “Millwork” means architectural woodwork for casework, cabinet units, closet shelves, sills, counters, paneling, trim and partitions;

1.1.1.84 “Move In” has the meaning set out in Section 2.8 of this Schedule;

1.1.1.85 “Multimedia Room” has the meaning set out in Section 7.8.15.1 of this Schedule;

1.1.1.86 “Net Area" or "Net Square Metres" or "NSM” means the horizontal area of space assignable to a specific function. The Net Area of rooms is measured to the inside face of wall surfaces;

1.1.1.87 “Network Ready Date” has the meaning set out in Section 2.9.2.1 of this Schedule;

1.1.1.88 “Off-Site” refers to works or areas related to the project that fall within public rights-of-way outside of the defined property lines of the subject property;

1.1.1.89 “On-Site” refers to works or areas within the defined property lines of the subject property;

1.1.1.90 “Opening Day Layout” means the layout of all rooms and areas that will be equipped and put into service as of the Substantial Completion. Refer to Appendix 1H [Equipment and Furniture] for the quantity of rooms that will be equipped at Substantial Completion;

1.1.1.91 "Outbreak Control Zone" means a collection of rooms and spaces that, in the event of an infectious disease outbreak, can be isolated as a self-contained zone and negatively pressurized by the HVAC system relative to the surrounding areas to mitigate the spread of airborne infections;

1.1.1.92 “Owner’s Project Requirements” has the meaning set out in LEED V4 Energy and Atmosphere prerequisite Fundamental Commissioning and Verification.

1.1.1.93 “PAR” means Periodic Automatic Replenishment. This is one method of inventory replenishment used by logistic operations within a hospital;

1.1.1.94 “Patient” means an inpatient or outpatient who is waiting for or undergoing medical investigation, care or treatment at the Facility;

1.1.1.95 “Patient Care Area” has the meaning set out in CSA Z8000 and Z32;

1.1.1.96 “Permanent Link” is the length of UTP cabling (Category 6 and 6A) from the patch panel in a Communications Room to a TO. For horizontal distances, Permanent Link length will be measured at right angles to the building. Risers or vertical distances will also be used to add to the Permanent Link length of the cable;

1.1.1.97 “Person- and Family-Centred Care” means a standard of care that emphasizes the individual needs of each Patient and treats them with respect and dignity, enabling them to participate integrally in their own care process within an environment that recognizes and respects the essential role of the Patient’s family or supporters;

1.1.1.98 “Persons with Disabilities” has the meaning set out in the BCBC;

1.1.1.99 “Public Circulation” means movement between rooms, spaces, areas or Components by means of horizontal and/or vertical circulation corridors, stairs or elevators that are for use by public, including Patients, families, visitors and Staff;

1.1.1.100 “Qualified Environmental Professional” is defined pursuant to the Riparian Areas Protection Regulation, as amended from time to time. As of the version posted on June 8, 2021, a Qualified Environmental Professional is defined, in part, as an individual from the approved list; registered under the Professional Governance

Act; in good standing with their regulatory body; and acting within their expertise, scope of practice, and code of ethics;

1.1.1.101 "Quality Daylight" means that the daylight in a space within 4.5 m of the exterior perimeter wall will have at least 75% coverage with natural light levels between 300 and 3000 lux as set out under the Daylight credit for LEED BD+C: Healthcare v4, Option 3: Measurement;

1.1.1.102 "Raceway" means any channel designed for holding wires, cables, or busbars. The term includes conduit (rigid and flexible, metal and non-metallic);

1.1.1.103 “Radiation Protection Adviser” has the meaning set out in Section 6.13.2.1(2)(f);

1.1.1.104 “Rain Screen” has the meaning set out in Section 5.7.2.2 of this Schedule;

1.1.1.105 “Recurring Rooms” means spaces or rooms that are of the same type and function, have reasonably similar NSM requirements and are repeated or listed as multiple units in the Appendix 1A [Clinical Specifications and Functional Space Requirements];

1.1.1.106 “Secure Outdoor Space” has the meaning set out in Section 5.7.3 of this Schedule;

1.1.1.107 “Seismically Isolated Building Structure” has the meaning set out in Section 3.1.1.10 of this Schedule;

1.1.1.108 “Service Circulation” means movement between rooms, spaces, areas or Components by means of horizontal and/or vertical circulation corridors, stairs or elevators that are for use by Staff, Patients and services, including Equipment, supplies, materials, carts, pallets, etc., and not for use by public;

1.1.1.109 "Shelled Space" means space that is constructed to meet the Authority’s future needs and is enclosed within the building envelope of the Facility. Shelled Space includes all radiation shielding (where noted), electrical, communications, plumbing, heating, ventilation and air conditioning services that support the future needs. Shelled Space includes emergency lighting, insulation and GB (such as in retail areas) that is taped but otherwise unfinished;

1.1.1.110 “Soft Codec” means any VC application such as Skype for Business, Microsoft Teams, Cisco Webex, Go To Meeting, Google Meet or other similar software that the Authority uses at the time of Procurement that provides video chat and voice call sessions between computers, tablets, mobile devices. This term will also apply to any VC application residing on BYOD equipment;

1.1.1.111 “STC” has the meaning set out in Appendix 1D [Acoustic, Vibration, and Noise Control Measures];

1.1.1.112 “Staff” means a person or group of persons carrying out work within the Facility including physicians, volunteers, couriers, vendors, even if not directly employed by the Authority;

1.1.1.113 “Statement of Requirements” means the provisions of Schedule 1 – Statement of Requirements;

1.1.1.114 “Structural Engineer-of-Record” means a Professional Engineer registered in British Columbia who is a designated structural engineer having “Struct Eng” standing with EGBC;

1.1.1.115 “Structured Cabling” is defined as building or campus telecommunications cabling infrastructure that consists of a number of smaller standardized elements (hence structured) called subsystems;

1.1.1.116 “Tamper Resistant” means a non-electrical component resistant to being operated, accessed, compromised or removed without the use of proper, specialized tools, or an electrical receptacle designed, constructed, and marked as Tamper Resistant in accordance with CSA C22.2 No. 42;

1.1.1.117 “Telecommunications Outlet” means the connecting device in the work area consisting of jacks, faceplate, or other transition device on which a minimum of two Category 6A Data Drops terminate. A TO is housed in a metallic or non-metallic box located within a floor, wall or ceiling;

1.1.1.118 “Telecommunications Service Provider” means an organization that will provide a wide range of Telecommunication services to individuals or other organizations;

1.1.1.119 “Telecommunications Room” has the meaning set out in Section 7.8.9.5 of this Schedule;

1.1.1.120 “Telemetry” means the wireless component of the Patient physiological monitoring system, which is comprised of wireless access points, horizontal Structured Cabling, and access point enclosures;

1.1.1.121 “Total Cost of Ownership” means financial analysis that result in a complete Life Cycle value of a building, Building System or component. This value includes each phase of ownership from planning, Design and Construction though operations, maintenance, capital or component renewal, over the life of the respective component and decommissioning or disposal;

1.1.1.122 “Ultra HD” means cameras and display screens with an aspect ratio of 16:9 or wider capable of capturing or presenting video at a minimum resolution of 3840 by 2160 pixels, also known as 4K UHD;

1.1.1.123 “Unassigned Space” has the meaning set out in Section 2.2.2 of this Schedule;

1.1.1.124 “Un-Equipped” means a room or space that is finished and Commissioned except for having Equipment installed.

1.1.1.125 “Universal Design” has the meaning set out in Section 3.10.1 of this Schedule;

1.1.1.126 “Unusable Area” has the meaning set out in Section 2.2.5 of this Schedule;

1.1.1.127 “Utility” or “Utilities” means:

1.1.1.127(1) Electrical Power;

1.1.1.127(2) Steam and Chilled Water;

1.1.1.127(3) Water Main;

1.1.1.127(4) Sanitary Sewer;

1.1.1.127(5) Storm Sewer;

1.1.1.127(6) Gas, Oil and Any Other Fossil-Based Fuel;

1.1.1.127(7) Medical Gas Compounds; and

1.1.1.127(8) Telephone and Data Cabling.

1.1.1.128 "Vandal Resistant" means designed to withstand abuse and tampering without damage and includes features to resist prying, impact and shattering;

1.1.1.129 "Void Space" has the meaning set out in Section 2.2.2 of this Schedule;

1.1.1.130 "Wayfinding" refers to the spatial problem-solving process people undertake as they travel through an environment seeking a destination. Signage, landmarks and other Assets help individuals with the navigation process.

1.1.2 Statement of Requirements

1.1.2.1 This Schedule is written as an output specification and defines what the Design-Builder will achieve in the Design and Construction. Except as expressly stated otherwise, the Design-Builder will carry out the Design and Construction as required and contemplated by each provision of this Schedule and its Appendices whether or not the provision is written as an obligation of the Design-Builder or is stated in the imperative form.

1.1.2.2 Where "cost effective", "appropriate", "sufficient", "minimize" and related or similar terms are used, they are to be construed and interpreted in terms of whether they are cost effective, appropriate, sufficient, minimizing, etc. from the perspective of a prudent government organization responsible for operating an acute care hospital and cancer centre building, who balances capital costs against maintenance, operations, clinical efficiency environmental sustainability, energy efficiency and other non-capital costs over the life of the Facility.

1.1.2.3 Unless expressly stated otherwise, each reference to a standard or code in this document will be deemed to mean the latest version of that standard or code as of the Effective Date.

1.1.2.4 The Design-Builder will provide a complete and fully functional Facility fit for its intended use and purpose as specified in this Agreement.

1.2 Acronym List

1.2.1 3D – Three-dimensional

1.2.2 AACs – Advanced Application Controllers

1.2.3 AAMA – American Architectural Manufacturers Association

1.2.4 AAMI – Association for The Advancement of Medical Instrumentation

1.2.5 AAS – Aluminum Association Standards

1.2.6 ABHR – Alcohol-Based Hand Rub

1.2.7 ACS - Access Control System

1.2.8 ACU - Anesthetic Care Unit

1.2.9 ADC – Automated Dispensing Cabinets

1.2.10 ADL – Activities of Daily Living

1.2.11 AEC – Acoustic Echo Cancellation

1.2.12 AES – Audio Engineering Society

1.2.13 AFDDR – Automatic Fault Detection Diagnostics and Reporting

1.2.14 AFF – Above Finished Floor Level

1.2.15 AFUE – Annual Fuel Utilization Efficiency

1.2.16 AGSS – Anaesthetic Gas Scavenging System

1.2.17 AGV – Automated Guided Vehicle

1.2.18 AHER – Antenna Headend Equipment Room

1.2.19 AHJ – Authority Having Jurisdiction

1.2.20 AHRI – Air Conditioning, Heating, & Refrigeration Institute

1.2.21 AHU – Air Handling Unit

1.2.22 AIBC – Architectural Institute of British Columbia

1.2.23 AIR – Airborne Isolation Room

1.2.24 ANSI – American National Standards Institute

1.2.25 API - Application Programming Interface

1.2.26 ARGB – Abuse-Resistant Gypsum Board

1.2.27 ASC – Application Specific Controllers

1.2.28 ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers

1.2.29 ASME – American Society of Mechanical Engineers

1.2.30 ASPE – American Society of Plumbing Engineers

1.2.31 ASTC – Apparent Sound Transmission Class

1.2.32 ASTM – American Society for Testing and Materials

1.2.33 ATS – Automatic Transfer Switch

1.2.34 AV – Audio Visual

1.2.35 AVB – Audio Video Bridging

1.2.36 AVIXA - The Audiovisual and Integrated Experience Association

1.2.37 AWCC – Association of Wall and Ceiling Contractors

1.2.38 AWMAC – Architectural Woodwork Manufacturers Association of Canada

1.2.39 AWWA – American Water Works Association

1.2.40 BACnet – Building Automation and Control Network

1.2.41 BCAS – British Columbia Ambulance Service

1.2.42 BCBC – BC Building Code

1.2.43 BCEHS – BC Emergency and Health Services

1.2.44 BCH – BC Hydro

1.2.45 BCICA – British Columbia Insulation Contractors Association

1.2.46 BCSLA – British Columbia Society of Landscape Architects

1.2.47 BECx – Building Enclosure Commissioning

1.2.48 BECxA – Building Enclosure Commissioning Authority

1.2.49 BECxP – Building Enclosure Commissioning Provider

1.2.50 BER – Building Electrical Room

1.2.51 BES – Building Enclosure Specialist

1.2.52 BGSM – Building Gross Square Metres

1.2.53 BICSI – Building Industry Consulting Service International

1.2.54 BIM – Building Information Modelling

1.2.55 BIOS – Basic Input/Output System

1.2.56 BMS – Building Management System

1.2.57 BOMA – Building Owner and Managers Association

1.2.58 BPE – Borated Polyethylene

1.2.59 BTL – BACnet Testing Laboratories

1.2.60 BYOD – Bring Your Own Device

1.2.61 CACF – Central Alarm and Control Facility

1.2.62 CAP – Crimes Against Persons

1.2.63 CATV – Cable Television

1.2.64 CC – Cancer Centre

1.2.65 CCI – Critical Care Indicator

1.2.66 CCPM – Canadian College of Physicists in Medicine

1.2.67 CDL – Continuous Disinfection Lighting

1.2.68 CDP – Centralized Distribution Panelboard

1.2.69 CEC – Canadian Electrical Code

1.2.70 CFC – Chlorofluorocarbon

1.2.71 CFD – Computational Fluid Dynamics

1.2.72 CFR – United States Code of Federal Regulations

1.2.73 cGMP – Current Good Manufacturing Practices

1.2.74 CGSB - Canadian General Standards Board

1.2.75 CGSM – Component Gross Square Metres

1.2.76 CH – Core Hospital

1.2.77 CIC – Certified Irrigation Contractor – Commercial

1.2.78 CL – Containment Level

1.2.79 CLIA – Certified Irrigation Designer and Certified Landscape Irrigation Auditor

1.2.80 CMCA – Canadian Masonry Contractors Association

1.2.81 CMMS – Computerized Maintenance Management System

1.2.82 CNSC – Canadian Nuclear Safety Commission

1.2.83 CO2 – Carbon Dioxide

1.2.84 COB – Chip On Board

1.2.85 CPPS – Campus Perimeter Pathway System

1.2.86 CPTED – Crime Prevention Through Environmental Design

1.2.87 CRAC – Computer Room Air Conditioning

1.2.88 CRI – Colour Rendering Index

1.2.89 CRN – Canadian Registration Number

1.2.90 CSA – Canadian Standards Association

1.2.91 CSC – Canadian Securities Course

1.2.92 CSI – Canadian Securities Institute

1.2.93 CSSBI – Canadian Sheet Steel Building Institute

1.2.94 CT - Computed Tomography

1.2.95 Cx – Commissioning

1.2.96 DAS – Distributed Antenna System

1.2.97 DCOF – Dynamic Coefficient of Friction

1.2.98 DDC – Direct Digital Controls

1.2.99 DHI – Door and Hardware Institute

1.2.100 DiiA – Digital Illumination Interface Alliance

1.2.101 DoE – United States Department of Energy

1.2.102 DISS – Diameter Index Safety System

1.2.103 DSP – Digital Signal Processor

1.2.104 DVLED – Direct View LED

1.2.105 DVMS – Digital Video Management System

1.2.106 EBD – Evidence-Based Design

1.2.107 EC – Energy Centre

1.2.108 ECG – Electrocardiography

1.2.109 EEG – Electroencephalogram

1.2.110 EES – Energy and Environmental Sustainability

1.2.111 EF – Entrance Facility

1.2.112 EGBC - Engineers and Geoscientists British Columbia

1.2.113 EMF – Electromagnetic Field

1.2.114 EMI – Electromagnetic Interference

1.2.115 EMR – Electronic Medical Record

1.2.116 EMS – Elevator Management System

1.2.117 EMT – Electrical Metallic Tubing

1.2.118 EOC - Emergency Operations Centre

1.2.119 EPA – United States Environmental Protection Agency

1.2.120 ePDU – Electronic Power Distribution Unit

1.2.121 EPMS – Energy and Power Management System

1.2.122 ePTZ – Electronic Pan Tilt Zoom

1.2.123 EQM – Equal Percentage Modified

1.2.124 ERDS – Enhanced Room Data Sheet

1.2.125 ESS – Electronic Safety and Security

1.2.126 EV – Electric Vehicle

1.2.127 EVAC – Emergency Voice Communications

1.2.128 EVSE – Electric Vehicle Supply Equipment

1.2.129 FCC – Federal Communications Commission

1.2.130 FCxP – Fire Commissioning Agent

1.2.131 FEMA – Federal Emergency Management Agency

1.2.132 FER – Floor Electrical Room

1.2.133 FFEO – Firefighters' Emergency Operation

1.2.134 FGI – Facility Guidelines Institute

1.2.135 FM – Facilities Management

1.2.136 FM - Factory Mutual (standards)

1.2.137 FMO – Facilities Maintenance and Operations

1.2.138 FoM – Faculty of Medicine

1.2.139 FOV - Field of View

1.2.140 FPS - Frames Per Second

1.2.141 FUS – Fire Underwriters Survey

1.2.142 GFCI – Ground Fault Circuit Interrupter

1.2.143 GHG – Greenhouse Gases

1.2.144 GPR – Ground Potential Rise

1.2.145 GPS – Global Positioning Satellite

1.2.146 GUI - Graphical User Interface

1.2.147 GB – Gypsum Board

1.2.148 GVS&DD – Greater Vancouver Sewerage and Drainage District Development

1.2.149 HAU – High Acuity Unit

1.2.150 HCFC – Hydrochlorofluorocarbons

1.2.151 HD – High Definition

1.2.152 HDR – Halogenated Drug Recovery

1.2.153 HDR – High Dose Radiation

1.2.154 HEPA – High Efficiency Particulate Air

1.2.155 HMI – Human Machine Interface

1.2.156 HIGH-Z – High Impedance

1.2.157 HOA – Hand/Off/Auto

1.2.158 HP – Horsepower

1.2.159 HVAC – Heating, Ventilating and Air-Conditioning

1.2.160 HVATS – High Voltage Automatic Transfer Switch

1.2.161 Hz – Hertz

1.2.162 IACET – International Accreditors for Continuing Education and Training

1.2.163 IAHSS - International Association for Healthcare Security and Safety

1.2.164 IBMP - Integrated Building Management Platform

1.2.165 ICS – Intercom Control System

1.2.166 ID – Indicative Design

1.2.167 ID – Identity

1.2.168 IDS – Intrusion Detection System

1.2.169 IDIBC – Interior Designers Institute of British Columbia

1.2.170 IEEE – Institute of Electrical and Electronic Engineers

1.2.171 IFC – Issued for Construction

1.2.172 IIABC – Irrigation Industry Association of British Columbia

1.2.173 IGMAC – Insulating Glass Manufacturers Association of Canada

1.2.174 ILSS – Integrated Life Safety Systems

1.2.175 I/O – Input / Output

1.2.176 IP – Internet Protocol

1.2.177 IPCC – Intergovernmental Panel on Climate Change

1.2.178 IPLV – Integrated Part Load Value

1.2.179 IPS – Integrated Protection Services

1.2.180 IPU – Inpatient Unit

1.2.181 IPVS – IP Video Surveillance

1.2.182 IRGB – Impact-Resistant Gypsum Board

1.2.183 IM/IT – Information Management Information Technology

1.2.184 ISMP - Integrated Stormwater Management Plan

1.2.185 ISO – International Organization for Standardization

1.2.186 ISOT – Integrated Systems Operational Testing

1.2.187 IT – Information Technology

1.2.188 IV – Intravenous

1.2.189 JOHSC – Joint Occupational Health and Safety Committee

1.2.190 kPa – Kilopascal

1.2.191 KPU – Kwantlen Polytechnic University

1.2.192 KPI – Key Performance Indicator

1.2.193 KVM – Keyboard, Video and Mouse

1.2.194 kW – Kilowatt

1.2.195 kWh – Kilowatt-hour

1.2.196 LAN – Local Area Network

1.2.197 LCD – Liquid Crystal Display

1.2.198 LED – Light Emitting Diode

1.2.199 LEED – LEED® Leadership In Energy and Environmental Design

1.2.200 LMFM - Lower Mainland Facilities Management

1.2.201 LOW-Z – Low Impedance

1.2.202 LRV - Light Reflectance Values

1.2.203 mA – Milliamp

1.2.204 MaP – Maximum Performance

1.2.205 M&V – Measurement and Verification

1.2.206 MBCx – Monitoring-Based Commissioning

1.2.207 MCC – Motor Control Centre

1.2.208 MCP – Motor Circuit Protector

1.2.209 MDP – Main Distribution Panelboard

1.2.210 MDR – Medical Device Reprocessing

1.2.211 MEO – Medical Emergency Operation

1.2.212 MER – Main Equipment Room

1.2.213 MI – Medical Imaging

1.2.214 MMCD – Master Municipal Construction Documents

1.2.215 MMRGB – Moisture and Mould-Resistant Gypsum Board

1.2.216 MMU – Mobile Medical Unit

1.2.217 MPI – Master Painters Institute

1.2.218 MPR – Multi-Purpose Room

1.2.219 MRI – Magnetic Resonance Imaging

1.2.220 MSI – Master Systems Integration

1.2.221 MS/TP LAN – Master Slave Token Passive Local Area Network

1.2.222 NAPRA – National Association of Pharmacy Regulatory Authorities

1.2.223 NBIC – National Board Inspection Code

1.2.224 NC – Noise Criteria

1.2.225 NCRP – National Council on Radiation Protection and Measurement

1.2.226 NDI – Network Device Interface

1.2.227 NDI | HX – Network Device Interface High Efficiency

1.2.228 NECB – National Energy Code of Canada for Buildings

1.2.229 NEMA – National Electrical Manufacturers Association

1.2.230 NFC – Near-field Communication

1.2.231 NFCA – National Floor Covering Association

1.2.232 NFPA – National Fire Protection Association

1.2.233 NIBS – National Institute of Building Sciences

1.2.234 NIC – Noise Insulation Class

1.2.235 NIST – National Institute of Standards and Technology

1.2.236 NOx – Nitrogen Oxides

1.2.237 NRC – National Research Council

1.2.238 NRC – Noise Reduction Coefficient (acoustic parameter)

1.2.239 NSF – NSF International (formerly National Sanitation Foundation)

1.2.240 NSHBCCC (NSHCC) – New Surrey Hospital and BC Cancer Centre

1.2.241 NSM – Net Square Metres

1.2.242 NTP – Network Time Protocol

1.2.243 NWMA – National Woodwork Manufacturers Association

1.2.244 OA – Outdoor Air

1.2.245 OCP – Official Community Plan

1.2.246 OCPP – Open Charge Point Protocol

1.2.247 OEM – Original Equipment Manufacturer

1.2.248 OHS – Occupational Health and Safety

1.2.249 O&M – Operations and Maintenance

1.2.250 OR – Operating Room

1.2.251 OSDP – Open Supervised Device Protocol

1.2.252 OSHPD – Office of Statewide Health Planning and Development

1.2.253 OS&Y – Open Stem and Yoke

1.2.254 PA – Public Address

1.2.255 PACS – Picture Archiving and Communication System

1.2.256 PAR – Periodic Automatic Replacement

1.2.257 PBX – Private Branch Exchange

1.2.258 PC – Personal Computer

1.2.259 PCB – Polychlorinated Biphenyls

1.2.260 PCR – Polymerase Chain Reaction

1.2.261 PHSA – Provincial Health Services Authority

1.2.262 PICNet – Provincial Infection Control Network of British Columbia

1.2.263 PICV – Pressure Independent Control Valves

1.2.264 PID – Proportional Integral Derivative

1.2.265 PoE – Power over Ethernet

1.2.266 POI – Point of Interest / Point of Interconnect

1.2.267 PPE – Personal Protective Equipment

1.2.268 PRV – Pressure Reducing Valve

1.2.269 PSIG – Pounds Per Square Inch Gauge

1.2.270 PTS - Pneumatic Tube System

1.2.271 PTZ – Pan Tilt Zoom

1.2.272 QR Code - Quick Response Code

1.2.273 RAM – Random Access Memory

1.2.274 RCABC – Roofing Contractors Association of British Columbia

1.2.275 RCDD – Registered Communications Distribution Designer

1.2.276 RDS – Room Data Sheet

1.2.277 REST – Representational State Transfer

1.2.278 RF – Radio Frequency

1.2.279 RFID – Radio Frequency Identification

1.2.280 RO – Reverse Osmosis

1.2.281 RSO – Radiation Safety Officer

1.2.282 RoHS – Restriction of Hazardous Substances

1.2.283 RT60 – Reverberation Time

1.2.284 RTLS – Real-Time Location System

1.2.285 SA – Smart Actuators

1.2.286 SaaS – Software as a Service

1.2.287 SACT – Suspended Acoustic Ceiling Tile

1.2.288 SAF – Software Assessment Form

1.2.289 SAP – Solution Assessment Process

1.2.290 SDI – Serial Device Interface

1.2.291 SDK – Software Developer Kit

1.2.292 SDVOE – Software Defined Video Over Ethernet

1.2.293 SEFA – Science Equipment and Furniture Association

1.2.294 SER – Sub Electrical Room

1.2.295 SIP – Session Initiated Protocol

1.2.296 SLD - Single Line Diagram

1.2.297 SMACNA – Sheet Metal and Air Conditioning National Contractors Association

1.2.298 SMS - Short Message Service

1.2.299 SNR – Signal to Noise Ratio

1.2.300 SOR – Schedule 1 - Statement of Requirements

1.2.301 SPD – Surge Protective Device

1.2.302 SPDT – Single-Pole Double-Throw

1.2.303 SQL – Structured Query Language

1.2.304 SRT - Secure Reliable Transport

1.2.305 SRW - Statutory Right of Way

1.2.306 SS – Smart Sensors

1.2.307 SS – Stainless Steel

1.2.308 SSACT – Suspended Security Acoustic Ceiling Tile

1.2.309 STC – Sound Transmission Class

1.2.310 STCC – Composite Sound Transmission Class

1.2.311 TAA – Trade Agreements Act

1.2.312 TAB – Testing, Adjusting and Balancing

1.2.313 TCP – Transmission Control Protocol

1.2.314 THD – Total Harmonic Distortion

1.2.315 TIA – Telecommunications Industry Association

1.2.316 TO - Telecommunications Outlet

1.2.317 TR – Telecommunications Room

1.2.318 TRS – Tip Ring Sleeve

1.2.319 TSS – Total Suspended Solid

1.2.320 TTMAC – Terrazzo and Tile Manufacturers Association of Canada

1.2.321 UI – User Interface

1.2.322 UL – Underwriters' Laboratories

1.2.323 ULC – Underwriters' Laboratories of Canada

1.2.324 UNO – Unless Noted Otherwise

1.2.325 UPS – Uninterruptible Power Supply

1.2.326 USB - Universal Serial Bus

1.2.327 USP - United States Pharmacopeia

1.2.328 VA – Volt-Ampere

1.2.329 VAR – Value-Added Reseller

1.2.330 VAV – Variable Air Volume

1.2.331 VC – Videoconference

1.2.332 Vdc – Volts of Direct Current

1.2.333 VESA – Video Electronics Standards Association

1.2.334 VFD – Variable Frequency Drive

1.2.335 VH – Virtual Health

1.2.336 VLAN – Virtual Local Area Network

1.2.337 VNC - Virtual Network Computing

1.2.338 VOC – Volatile Organic Compounds

1.2.339 VoIP – Voice Over Internet Protocol

1.2.340 WAN – Wide Area Network

1.2.341 WAP – Wireless Access Point

1.2.342 WSBC – WorkSafe BC

PART 2. GENERAL

2.1 Project Overview

2.1.1 The Design-Builder is responsible for the Design and Construction of the Project which will include the following:

2.1.1.1 The Facility;

2.1.1.2 All surface parking, underground parking, lay-by parking, On-Site and Off-Site Utilities, including all Off-Site utilities required by the City of Surrey;

2.1.1.3 All roadways, sidewalks, pathways, bicycle lanes, and interconnections to City street network including along James Hill Drive and 180th Street, and at surrounding intersections of Highway 10 and James Hill Drive at 180th and 184th Streets as shown in Appendix 1E [Civil Infrastructure Plans], including all Off-Site works and services required by the City of Surrey;

2.1.1.4 All work required by City of Surrey as part of the Servicing Agreement, including as set out in Section 65.2 of the Design-Build Agreement;

2.1.1.5 All Utility stub outs and knock-out panels for connections to Future Expansion; including phases east and southeast of the Facility;

2.1.1.6 All exterior areas including the Secure Outdoor Spaces, plaza, and wellness walkway;

2.1.1.7 All the Functional Components, rooms and spaces described in Appendix 1A [Clinical Specifications and Functional Space Requirements];

2.1.1.8 Child Care Centre; and

2.1.1.9 Energy Centre.

2.1.2 The Design and Construction of the Facility (excluding the Child Care Centre) will comply with the requirements of CSA Class A-2 HCF (Healthcare Facility), unless noted otherwise.

2.2 Clinical Specifications and Schedules of Accommodation

2.2.1 The Design-Builder will perform the Design and Construction of the Facility:

2.2.1.1 So that the Facility and all areas and spaces within accommodate all the activities, functions, design features and adjacencies described in the Appendix 1A [Clinical Specifications and Functional Space Requirements];

2.2.1.2 So that any proposals to exceed the allowable area variations described in Section 2.2.1.5, will be first demonstrated to the Authority's satisfaction and approval, that affected rooms retain their functionality. If, in the Authority's opinion, the room does not meet the required functionality, the full NSM will be provided;

2.2.1.3 So that the proportions and aspect ratio of all rooms and spaces support the required activities, clearances and functions. Additionally, the following requirements apply:

2.2.1.3(1) Columns and similar architectural elements will not protrude more than 300 mm into, or otherwise be located in Operating Rooms, Operating Room – Isolation or Operating Room – HDR, Procedure Room – Endoscopic and Procedure Room – General.

2.2.1.3(2) Square shaped rooms are desirable for Operating Rooms, Operating Room – Isolation and Operating Room – HDR and the following minimum requirements are applicable:

2.2.1.3(2)(a) Operating Rooms and Operating Room – Isolation will be approximately (within 100 mm) 7.5 m x 8.0 m unless otherwise approved by the Authority; and

2.2.1.3(2)(b) Operating Room – HDR will have no dimension less than 7.2 m (excluding maze entry) unless otherwise approved by the Authority.

2.2.1.3(3) The minimum width of the Sterile Supply Core will not be less than 5.5 m to allow for two (2) 1.5 m wide carts and circulation space between them.

2.2.1.4 In accordance with the requirements of Appendix 1A [Clinical Specifications and Functional Space Requirements], subject to any adjustments or refinements made in consultation with the Authority; and

2.2.1.5 So that Void Space and Unassigned Space is minimized.

2.2.2 Unassigned Space and Void Space

2.2.2.1 Unassigned Space means areas that are not otherwise defined as Void Space or required under this Agreement for Building Systems, Utilities or spaces otherwise set out in Appendix 1A [Clinical Specifications and Functional Space Requirements].

2.2.2.2 The Design-Builder will finish, configure and arrange (where possible) the Unassigned Space such that it is useable by the Authority for their benefit or purpose, complete with elements such as architectural openings (doors/windows, etc.), finishes, electrical, communications, plumbing, heating, ventilation and air conditioning services in accordance with the standards and requirements set out in the Agreement.

2.2.2.3 The Authority acting reasonably will determine the use of Unassigned Space based on the location in the Design which may include incorporating or adding the Unassigned Space into the adjoining room/space, or as additional storage, office, administrative or other such non-clinical support space.

2.2.2.4 The Design-Builder in collaboration with the Authority, through the Review Procedure will assign new room names and numbers to any Unassigned Spaces, in accordance with the conventions used in Appendix 1A [Clinical Specifications and Functional Space Requirements], as they are incorporated into the Design and Construction.

2.2.2.5 Void Space means area less than 3.0 NSM that is not required for Building Systems, Utilities or otherwise useable by the Authority such as space, which as a result of the Design, is inaccessible or encapsulated between walls and/or structure.

2.2.2.6 The Design-Builder is responsible to finish all Void Space in accordance with the requirement set out in the Agreement such as acoustics, building envelope and Life Safety Systems.

2.2.2.7 The Design-Builder will minimize Void Space and Unassigned Spaces, wherever possible. Where Void Space does occur, the Design-Builder in collaboration with the Authority through the Review Procedure, will endeavour to convert Void Space into useable Unassigned Area for the Authority's benefit.

2.2.3 Area Variations

2.2.3.1 Without limiting the requirements as set out in Section 2.2.1, the Design-Builder will adhere to the area variations described herein.

2.2.3.2 Unless noted otherwise, the NSM area for each room or space will not be more than 2% smaller or larger than the required area listed in Appendix 1A [Clinical Specifications and Functional Space Requirements].

2.2.3.3 The following rooms and spaces will not be more than 2% larger but may be up to 5% smaller than the required NSM area listed in Appendix 1A [Clinical Specifications and Functional Space Requirements].

Change Room	**Meeting Room**	**Patient Room**	**Workroom**
C7.10	A4.02	B1.01	D2.09
F2.04	B4.06	B1.02	D2.17
F3.02	C8.01	B1.04	G3.01
F4.02	D7.01	B2.01	G3.02
F5.02	E7.07	B2.03	H1.02
F6.02	F8.08	B2.05	H1.03
K3.02	G3.08	B3.01	I3.02
K4.03	H1.05	B3.03	J5.05
L1.08	K1.12	**Procedure Room**	K1.08
M2.08	K2.02	D3.02	K1.09
R3.08	L3.06	D3.03	K2.01
Y1.11	N3.04	F4.10	K3.11
Control Desk	P4.02	**Trauma Room**	K4.11
D2.01	R4.06	C3.03	L1.03
D3.01	S2.02	**Ultrasound Procedure Room**	M1.04
Office	U2.06	L2.19	M2.03
T1.04	U5.02	**Waiting Area**	N3.01
T2.05	U6.02	C3.06.01	R4.03
Operating Room	U6.04	C4.02.01	U2.02

D2.04	V1.05	C5.01	U3.02
D2.05	V1.07	**Washroom/Shower**	U5.01
D2.06	W4.12	C8.05	U5.06
		D7.13	U5.07
		Y1.10	W4.09
			X4.03

2.2.3.4 The following rooms and spaces will not be more than 2% larger but may be up to 10% smaller than the required NSM area listed in Appendix 1A [Clinical Specifications and Functional Space Requirements].

Alcove	**Orthovoltage/Superficial**	**Office**	**Washroom**
A3.12	L1.06	L3.08	I1.04
B1.13	**Reading Room**	M1.05	I2.20
B2.12	M2.07	M2.06	I3.03
B3.11	F2.15	N1.04	J5.03
C3.26	F3.10	N2.03	K1.06
C4.22	F3.11	N3.05	K1.13
D6.14	F4.18	N3.06	K3.05
G1.09	F5.15	P2.06	K4.06
I2.17	F6.07	P4.01	L1.11
L2.20	**Sacred Space**	Q3.01	L1.12
M1.07	T4.04	Q3.02	L2.16
N3.07	**Treatment Bunker Interior**	R4.01	L2.17
T4.05	L1.04	R4.02	L3.07
V1.02	**Ultrasound Procedure Room**	S2.03	M1.03
Business Work Area	F2.12	T1.06	M1.20
A1.02	F3.07	T1.07	M2.04
C1.09	**Waiting Area**	T1.09	M2.13
D1.02	A1.03	U2.01	M2.17
E7.04	C1.04	U3.01	M2.26
E8.02	C7.01	U4.01	M2.34
F1.02	D1.03	U4.03	N1.07
F8.07	E8.03	U5.04	N3.10
G3.07	F1.04	U5.05	P4.03
H1.09	F2.01	U6.05	R4.07
J5.07	F2.07	U6.06	S2.04
L3.05	F3.01	W1.10	T1.03
N3.02	F4.01	W2.01	T2.02
S2.01	F5.01	W2.05	T2.07
U1.05	F6.01	W3.02	T4.06
U2.03	G1.01	W4.11	U1.03
U6.03	I1.02	W4.24	U3.03
Y4.03	K3.01	W5.02	U5.10
Consult Room	K4.01	W5.03	U7.02
B3.10	L1.01	X4.01	V1.04
D1.05	L1.09	X4.02	W1.07
F2.08	M2.01	Y3.04	X4.04
F3.05	T1.02.08	Y3.05	Y2.02

G1.07	T2.01.02	Y4.01	Y4.04
I1.03	U1.02	**Washroom**	Y5.03
I2.10	**Group Room**	A1.04	
J3.03	G1.10	A3.11	
K3.06	V1.01	A4.07	
L1.10	**Imaging Room**	B1.20	
L2.07	F2.09	B1.21	
M2.05	**Look Good Feel Good Room**	B2.13	
C4.01	T2.04	B2.22	
G1.06	**Office**	B3.12	
Data Image Centre	A3.16	B3.22	
F1.06	A4.06	B4.02	
Decision Room	B2.25	C1.05	
C2.02	B3.25	C2.14	
Diagnostic Mammography Room	B4.07	C3.17	
F2.11	B4.08	C3.33	
Exam Room	C8.02	C4.04	
A2.03	C8.03	C4.25	
G1.03	D2.18	C5.08	
I2.06	D2.19	D1.04	
L2.02	D7.03	D2.26	
M2.25	D7.04	D3.12	
Gathering Area	E2.04	D3.14	
T4.02	E5.05	D6.11	
Lounge	E7.01	D6.20	
B2.28	F2.03	D7.02	
B4.01	F7.07	E7.05	
B4.09	F8.01	E8.04	
C8.06	F8.02	F1.05	
D7.15	F8.03	F2.05	
E7.06	F8.04	F3.06	
F8.10	G3.03	F4.04	
P4.04	G3.04	F4.17	
R4.05	H1.01	F5.04	
T1.08	I3.01	F6.05	
U7.01	J5.04	F8.09	
W4.13	K1.07	G1.12	
Y1.16	L3.01	G1.13	
Y5.01	L3.02	H1.10	

2.2.4 The NSM area for all rooms required per Appendix 1A [Clinical Specifications and Functional Space Requirements] will exclude Unusable Area.

2.2.5 Unusable Area means horizontal area that does not contribute to the function of the room or space as described in Appendix 1A [Clinical Specifications and Functional Space Requirements] and includes:

2.2.5.1 Void Space;

2.2.5.2 Non-functional corridor circulation space required for access;

2.2.5.3 Non-functional areas created by acute or obtuse wall angles;

2.2.5.4 Non-functional L-shaped rooms; and

2.2.5.5 All other space where the functionality is encumbered by structure, columns, shafts or projections.

2.2.6 Provide access to all rooms and spaces in Appendix 1A [Clinical Specifications and Functional Space Requirements] from Internal Circulation within their respective Component or Sub-Component unless noted otherwise or approved by the Authority.

2.2.7 Do not utilize the NSM of a room or space to access another room or space.

2.2.8 Access to a Component or Sub-Component will not be through a separate Functional Component or Sub-Component.

2.2.9 All spaces within a Component or Sub-Component will be grouped unless approved by the Authority. Dividing a Component or Sub-Component either across one floor or on different floors is not acceptable unless noted otherwise in Appendix 1A [Clinical Specifications and Functional Space Requirements] or approved by the Authority.

2.2.10 The term Patient Room in this Schedule is used to describe all rooms with the term "Patient Room" appearing in the "Space" description column of the Schedule of Accommodations in Appendix 1A [Clinical Specifications and Functional Space Requirements]. Unless noted otherwise, when a clause describes the requirements of a "Patient Room", they will apply to all rooms with "Patient Room" appearing in the title; for example, Patient Room - Private or Patient Room - Private - HAU.

2.3 Additional Rooms and Spaces

2.3.1 Notwithstanding anything in Appendix 1A [Clinical Specifications and Functional Space Requirements], the Design and Construction of the Facility will include all rooms and spaces as required to comply with the terms of the Agreement.

2.3.2 The following appendices are intended to represent the minimum requirements for the Facility. They contain additional civil, architectural, mechanical, electrical and communications to be provided as part of the Project:

2.3.2.1 Appendix 1A [Clinical Specifications and Functional Space Requirements]

2.3.2.2 Appendix 1B [Minimum Room Requirements]

2.3.2.3 Appendix 1C [Wood First Appropriate Use Matrix]

2.3.2.4 Appendix 1D [Acoustic, Vibration, and Noise Control Measures]

2.3.2.5 Appendix 1E [Civil Infrastructure Plans]

2.3.2.6 Appendix 1F [Work Area Diagrams]

2.3.2.7 Appendix 1G [Campus Perimeter Pathway System Technical Specifications]

2.3.2.8 Appendix 1H [Equipment and Furniture]

2.3.2.9 Appendix 1I [Food Services Equipment List]

2.3.2.10 Appendix 1J [Equipment List IM/IT]

2.3.2.11 Appendix 1K [Multimedia Room Matrix]

2.3.2.12 Appendix 1L [Commissioning Roles and Responsibilities]

2.3.2.13 Appendix 1M [PHSA Communications Infrastructure Standards and Specifications]

2.3.2.14 Appendix 1N [Electrical and Communications Matrix]

2.3.2.15 Appendix 1O [Security Operation Matrix]

2.3.2.16 Appendix 1P [Metering Matrix]

2.3.2.17 Appendix 1Q [Acceptable Manufacturers List]

2.3.2.18 Appendix 1R [Wayfinding Standards and Requirements]

2.3.2.19 Appendix 1S [Child Care Centre Requirements]

2.3.2.20 Appendix 1T [UBC FoM Design Guidelines and Functional Requirements]

2.3.2.21 Appendix 1U [BIM Requirements]

2.3.2.22 Appendix 1V [Asset Management Requirements]

2.3.2.23 Appendix 1W [Systems Responsibility Matrix]

2.3.2.24 Appendix 1X [Warranty Requirements]

2.3.2.25 Appendix 1Y [Spare Parts and Extra Stock Materials]

2.3.2.26 Appendix 1Z [Electrical Factory Acceptance Testing (FAT) Requirements]

2.3.3 In addition to the requirements listed within the Appendices above, the Design-Builder will provide all appropriate services and connections to ensure full functionality of all Equipment listed in Appendix 1H [Equipment and Furniture], Appendix 1I [Food Services Equipment List] and Appendix 1J [Equipment List IM/IT]. Notwithstanding anything in the Appendices above, the Design and Construction of the Facility will include all requirements described in this Schedule.

2.4 Standards and Guidelines

2.4.1 Design-Builder will undertake the Design and Construction:

2.4.1.1 in accordance with the BCBC, BC Fire Code and BC Plumbing Code, and all applicable laws and City of Surrey bylaws, policies and guidelines, including:

2.4.1.1(1) Surrey Zoning Bylaw, 1993, No. 12000, Amendment Bylaw, No. 20418;

2.4.1.1(2) City of Surrey Official Community Plan, Development Permit Guidelines: Form and Character, DP1.1 Common Guidelines;

2.4.1.1(3) Ecosystem Development Plan;

2.4.1.1(4) Surrey Public Safety Radio Building Amplification System Bylaw, No. 19108;

2.4.1.1(5) Surrey Plumbing Bylaw, No. 6569;

2.4.1.1(6) Surrey Noise Control Bylaw, No. 7044;

2.4.1.1(7) Surrey Subdivision and Development Bylaw, No. 8830;

2.4.1.1(8) Surrey Contaminated Soils Deposition Bylaw, No. 11039;

2.4.1.1(9) Surrey Zoning Bylaw, No. 12000;

2.4.1.1(10) Surrey Tree Protection Bylaw, No. 16100;

2.4.1.1(11) Surrey Erosion and Sediment Control Bylaw, No. 16138;

2.4.1.1(12) Surrey Waterworks Regulation and Charges Bylaw, No. 16337;

2.4.1.1(13) Surrey Soil Conservation and Protection Bylaw, No. 16389;

2.4.1.1(14) Surrey Stormwater Drainage Regulation and Charges Bylaw, No. 16610;

2.4.1.1(15) Surrey Sanitary Sewer Regulation and Charges Bylaw, No. 16611;

2.4.1.1(16) Surrey District Energy System Bylaw, No. 17667;

2.4.1.1(17) Surrey Building Bylaw, No. 17850;

2.4.1.1(18) Surrey Waterworks Cross Connection Control Bylaw, No. 17988;

2.4.1.1(19) Surrey Demolition Waste and Recyclable Materials Bylaw, No. 19453;

2.4.1.1(20) Master Municipal Construction Documents (MMCD) Platinum Edition and Supplementary Updates;

2.4.1.1(21) City of Surrey - Cloverdale McLellan Integrated Stormwater Management Plan (ISMP);

2.4.1.1(22) City of Surrey Cloverdale Town Centre Plan;

2.4.1.1(23) City of Surrey Engineering Publications and Engineering Bulletins, including:

2.4.1.1(23)(a) the Design Criteria Manual,

2.4.1.1(23)(b) the Supplementary Master Municipal Construction Documents,

2.4.1.1(23)(c) the Water Meter and Service Connection Design Criteria Manual & Supplementary Specifications, and

2.4.1.1(23)(d) the Construction Drawing and Digital Infrastructure Standards Specification;

2.4.1.1(23)(e) the latest revision of the Land Development Engineering Review letter provided by the City of Surrey under file 7821-0149-00 as first issued July 7, 2021 to IBI Group; and

2.4.1.1(23)(f) the latest revision of the Sensitive Ecosystem Development Variance Permit issued by the City of Surrey including the associated Report prepared by Keystone Environmental.

2.4.1.1(24) Proximal Work Requirements Metro Vancouver Water and Liquid Waste System Facilities.

2.4.1.2 having regard for the concerns, needs and interests of

2.4.1.2(1) all Persons who will be Facility Users;

2.4.1.2(2) all governmental authorities;

2.4.1.2(3) the community; and

2.4.1.2(4) the City.

2.4.1.3 in accordance with Good Industry Practice;

2.4.1.4 such that every product is installed in accordance with the manufacturer's installation instructions; and

2.4.1.5 to the same standard that an experienced, prudent and knowledgeable long-term Owner of a high-quality health care Facility in North America operated publicly would employ.

2.4.2 If more than one standard is applicable, the highest such standard will apply.

2.4.3 If the Design-Builder wishes to refer to a code or standard from a jurisdiction outside of Canada, then the Design-Builder will demonstrate to the Authority's satisfaction that such code or standard meets or exceeds the requirements of this Schedule.

2.4.4 The most recent version of any standard or guideline listed in Schedule 1, excluding any Codes and bylaws, which is in effect at the time of the Effective Date will govern.

2.4.5 CSA Z8000: Canadian Healthcare Facilities

2.4.5.1 CSA Z8000 complements the standards and codes specified in Schedule 1 by providing overarching design principles and referencing specific standards and codes that are appropriate for health care facility design.

2.4.5.2 The Design-Builder will:

2.4.5.2(1) Refer to CSA Z8000 for Design Guidance to resolve issues not otherwise addressed in this Schedule.

2.4.5.3 Use CSA Z8000 as a guideline, together with any minimum standards and codes referenced in CSA Z8000 (except for any minimum space requirements that will be required by those standards and codes);

2.4.5.4 Unless otherwise required by this Schedule comply with infection control provisions as set out in CSA Z8000; and

2.4.5.5 Unless otherwise required by this Schedule comply with requirements for Bariatric Persons as set out in CSA Z8000.

2.4.6 Without limiting Section 2.4.1 of this Schedule, the Design-Builder will undertake the Design and Construction in compliance with all applicable standards and guidelines, including:

2.4.6.1 The standards set out in the Agreement;

2.4.6.2 Fraser Health Technical Design Requirements for Fraser Health Facilities;

2.4.6.3 Fraser Health ED Triage and Registration Standard;

2.4.6.4 Fraser Health Design Requirements when Nitrous Oxide Used as Anesthetic Gas;

2.4.6.5 Fraser Health - Health and Safety Design Standard: Frozen Section Room;

2.4.6.6 Facility Design Standards by Department and Hazard, New Surrey Hospital;

2.4.6.7 Fraser Health – Fraser Health Physical Risk Report;

2.4.6.8 Fraser Health Design Requirements for Consult Rooms;

2.4.6.9 Fraser Health Patient Handling Equipment for Facility Design and Procurement;

2.4.6.10 Fraser Health Ergonomics Standard for Bariatric Design;

2.4.6.11 Fraser Health Guidelines for Installation & Location of Medication Waste Disposal Containers;

2.4.6.12 Fraser Health Guidelines for Location of Sharps Disposal Containers;

2.4.6.13 Fraser Health - Health and Safety Design Standard: Medical Device Reprocessing Department (MDRD);

2.4.6.14 Fraser Health Ventilation Requirements – High level Disinfectants;

2.4.6.15 Fraser Health Design Requirements for Loading Docks;

2.4.6.16 Fraser Health - Health and Safety Position Statement: MDR Ventilation;

2.4.6.17 Fraser Health Chemical Storage Design Requirements;

2.4.6.18 Fraser Health Authority publication Health and Safety Design Standard: Emergency Washing Facilities

2.4.6.19 Fraser Health Emergency Department Decontamination and Isolation Suite Design Standard;

2.4.6.20 Fraser Health Ergonomic Standard for Workstations;

2.4.6.21 Fraser Health Emergency Department Signage Guidelines;

2.4.6.22 Fraser Health Standard: Emergency Department – Patient Check-in Station;

2.4.6.23 Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving and Racks;

2.4.6.24 Fraser Health Fall Protection Requirements for Facility Design;

2.4.6.25 Fraser Health Fume Hoods/LEV Enclosures Design Requirements;

2.4.6.26 Fraser Health Indigenous Design Guidelines;

2.4.6.27 Fraser Health Laser Room Safety Design Standards;

2.4.6.28 Fraser Health Transportation Demand Management and Commuter Services Design Guidelines – Bicycle Parking Facilities;

2.4.6.29 Fraser Health Facilities Management – Facilities Systems & Support (FSS) Facilities Space Information & Drawing Services FSS Drawing Standards & Requirements;

2.4.6.30 Fraser Health Confined Space Entry Program;

2.4.6.31 Fraser Health Reducing Natural Rubber Latex Exposure;

2.4.6.32 Fraser Health Required Design Considerations for Detergent/Soap Dispensers Technical Bulletin 2021-02;

2.4.6.33 Fraser Health Hand Hygiene Sink and Faucet Requirements;

2.4.6.34 Fraser Health Facilities, Maintenance & Operations Fall Protection Program;

2.4.6.35 Fraser Health Commissioning Guidelines;

2.4.6.36 LMPS Quality Recommendations, Pharmacy Sterile Compounding, Recommendations for Sterile Hood Selection;

2.4.6.37 LMPS Quality Recommendations, Pharmacy Sterile Compounding, Hood Placement Location;

2.4.6.38 LMPS Quality Recommendations, Pharmacy Sterile Compounding, Seismic Restraints for Hoods;

2.4.6.39 LMPS Quality Recommendations, Pharmacy Sterile Compounding, Relative Humidity;

2.4.6.40 LMPS Quality Recommendations, Pharmacy Sterile Compounding, Type of Pass-Throughs;

2.4.6.41 LMPS Quality Recommendations, Pharmacy Sterile Compounding, Location of Pass-Throughs;

2.4.6.42 LMPS Quality Recommendations, Pharmacy Sterile Compounding, Sink & Faucets Pairings to Avoid; and

2.4.6.43 Lower Mainland Health Organizations Integrated Protection Services.

2.4.6.44 Standards and Guidelines related to BC Cancer Agency including:

2.4.6.44(1) Replacement of a CT-simulator with an MRI-simulator within a Radiation Oncology Department;

2.4.6.44(2) Health Canada – Good Manufacturing Practices Guide for Drug Products;

2.4.6.44(3) Health Canada - Annex 3B to the Good manufacturing practices guide – Positron-emitting radiopharmaceuticals;

2.4.6.44(4) Health Canada - Guidance Document Annex 3 to the Current Edition of the Good Manufacturing Practices Guidelines - Schedule C Drugs;

2.4.6.44(5) Health Canada - Annex 1 to the Good manufacturing practices guide – Manufacture of sterile drugs;

2.4.6.44(6) Health Canada - Guidance Document Blood Regulations Section 80 Irradiation;

2.4.6.44(7) IAEA Cyclotron Produced Radionuclides: Guidelines for Setting Up a Facility;

2.4.6.44(8) IAEA Cyclotron Produced Radionuclides: Guidance on Facility Design and Production of Fluorodeoxyglucose (FDG);

2.4.6.44(9) ICNIRP Guidelines On Limits Of Exposure To Static Magnetic Fields;

2.4.6.44(10) College of Pharmacists of British Columbia Standards and Guidelines;

2.4.6.44(11) Diagnostic Accreditation Program College of Physicians and Surgeons of British Columbia Self Assessment and Evidence Submission Magnetic Safety;

2.4.6.44(12) CAMRT – MRI Facility Design (RTMR);

2.4.6.44(13) PET CT Current State Workflows, BC Cancer Agency July 2017;

2.4.6.44(14) Nuclear Safety and Control Act;

2.4.6.44(15) Canadian Nuclear Safety Commission – 1.4.1 Licence Application Guide – Nuclear Substances and Radiation Devices;

2.4.6.44(16) Canadian Nuclear Safety Commission – 1.6.1 Licence Application guide – Nuclear Substances and Radiation Devices V2;

2.4.6.44(17) Canadian Nuclear Safety Commission – 2.12.3 Security of Nuclear Substances, Sealed Sources and Category 1, II and III Nuclear Material V2.1;

2.4.6.44(18) Workplace Health Statement of Requirements BC Cancer Surrey and Burnaby new Cancer Centres; and

2.4.6.44(19) Canadian Nuclear Safety Commission: Keeping Radiation Exposures and Doses “As Low as Reasonably Achievable (ALARA)” Regulatory Guide G-129 Revision 1.

2.4.6.45 LMFM Technical Guidelines Division 14 – Vertical Transportation;

2.4.6.46 LMFM Potable Water Systems Sanitation Procedures & Documentation Requirements;

2.4.6.47 LMFM Sinks and Drains Technical Manual;

2.4.6.48 LMFM Waste Management Space Design Guidelines;

2.4.6.49 Lower Mainland Health Organizations: Integrated Protection Services – Electronic Security Systems Specifications V 2.1 (2020);

2.4.6.50 Lower Mainland Pathology and Laboratory Medicine Radiation Safety Program for Blood Irradiators Sealed Sources;

2.4.6.51 PHSA SOP-FC-007 Facility Monitoring;

2.4.6.52 Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the B.C. Mental Health Act, Ministry of Health, Province of British Columbia;

2.4.6.53 PICS, Pharmaceutical Inspection Co-Operation Scheme Guide To Good Manufacturing Practice For Medicinal Products Annexes;

2.4.6.54 AIA Guidelines for Design and Construction of Healthcare Facilities;

2.4.6.55 AAMI TIR 34; Water for Reprocessing of Medical Devices;

2.4.6.56 Ambulance Station Design Standards, BCAS, BC Emergency and Health Services;

2.4.6.57 American Conference of Governmental Hygienists, Industrial Ventilation: A Manual of Recommended Practice;

2.4.6.58 BCSLA and BCLBA - BC Landscape Standard – Current Edition;

2.4.6.59 Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs, Ministry of Health, Province of British Columbia (design/installation sections);

2.4.6.60 Best Practices for Hand Hygiene in All Healthcare Settings and Programs, Ministry of Health, Province of British Columbia (design/installation sections);

2.4.6.61 Biosafety in Microbiological & Biomedical Laboratories;

2.4.6.62 British Columbia Insulation Contractors Association (BCICA), Quality Standards for Mechanical Insulation Manual;

2.4.6.63 Canadian Biosafety Standards and Guidelines, Government of Canada;

2.4.6.64 Design Guide for the Built Environment of Behavioral Health Facilities, National Association of Psychiatric Health Systems;

2.4.6.65 Fire Underwriter Survey – Water Supply for Public Fire Protection;

2.4.6.66 Guidelines for Design and Construction of Hospitals and Outpatient Facilities, FGI;

2.4.6.67 Laboratory Biosafety Guidelines, Health Canada, Government of Canada;

2.4.6.68 Security Design Guidelines for Health Care Facilities, IAHSS, including the following:

2.4.6.68(1) Emergency Departments.

2.4.6.69 Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA) Manuals;

2.4.6.70 NADCA Standard for Assessment, Cleaning, and Restoration of HVAC Systems;

2.4.6.71 NAPRA Practice and Regulatory Standards, including the following:

2.4.6.71(1) NAPRA Model Standards for Pharmacy Compounding of Non Hazardous Sterile Preparations; and

2.4.6.71(2) NAPRA Model Standards for Pharmacy Compounding of Hazardous Sterile Preparations.

2.4.6.72 ANSI / ASHRAE standards and guidelines, including the following:

2.4.6.72(1) Standard 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size;

2.4.6.72(2) Standard 55: Thermal Environmental Conditions for Human Occupancy;

2.4.6.72(3) Standard 62.1: Ventilation for Acceptable Indoor Air Quality;

2.4.6.72(4) Standard 90.1: Energy Standard for Buildings Except Low Rise Residential Buildings;

2.4.6.72(5) Standard 110: Method of Testing Performance of Laboratory;

2.4.6.72(6) Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC Systems;

2.4.6.72(7) Standard 129: Measuring Air Change Effectiveness;

2.4.6.72(8) Standard 135: BACnetTMA Data Communication Protocol for Building Automation and Control Networks; and

2.4.6.72(9) Standard 170: Ventilation of Healthcare Facilities.

2.4.6.73 ASHRAE standards and guidelines, including the following:

2.4.6.73(1) Advanced ENERGY Guide for Hospitals and Healthcare Facilities;

2.4.6.73(2) Handbooks: Fundamentals, Refrigeration, HVAC Applications, Design of Smoke Control Systems;

2.4.6.73(3) Guideline 0-2019: The Commissioning Process;

2.4.6.73(4) Guideline 1.1: HVAC and R Technical Requirements for the Commissioning process;

2.4.6.73(5) Guideline 12-2000: Minimizing the Risk of Legionellosis Associated with Building Water Systems;

2.4.6.73(6) Handbooks: Fundamentals, Refrigeration, HVAC Applications, HVAC Systems and Equipment;

2.4.6.73(7) Standard 180: Methods of Testing for Rating Ducted Air Terminal Units;

2.4.6.73(8) Standard 188: Legionellosis: Risk Management for Building Water Systems; and

2.4.6.73(9) System Design Manual for Hospitals and Clinics.

2.4.6.74 ANSI / AHRI standards and guidelines, including the following:

2.4.6.74(1) Standard 530: Method of measuring sound and vibration of refrigeration compressors;

2.4.6.74(2) Standard 550/590: Performance Rating Of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle;

2.4.6.74(3) Standard 575: Method of Measuring Machinery Sound within an Equipment Space;

2.4.6.74(4) Standard 880: Standard for Air Terminals; and

2.4.6.74(5) Standard 885: Standard for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

2.4.6.75 ANSI / AIHI standards and guidelines, including the following:

2.4.6.75(1) Z9.5-2012 Laboratory Ventilation.

2.4.6.76 ANSI/ASA standards and guidelines, including the following:

2.4.6.76(1) S3.1 Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms.

2.4.6.77 ANSI-ASC A14.3-2008 Standards for Ladders – Fixed – Safety Requirements;

2.4.6.78 ANSI/ASME Standards and Guidelines, including the following:

2.4.6.78(1) A13.1 – Visibility Standard (Pipe Labeling);

2.4.6.78(2) B16 – Piping Component Standards;

2.4.6.78(3) B16.1 – Cast Iron Pipe Flanges and Flanged Fittings;

2.4.6.78(4) B31.1 – Power Piping;

2.4.6.78(5) B31.9 – Building Services Piping;

2.4.6.78(6) B36 – Piping Standards; and

2.4.6.78(7) Boiler and Pressure Vessel Code:

2.4.6.78(7)(a) Section VIII: Pressure Vessels;

2.4.6.78(7)(b) Section IX: Welding Qualifications; and

2.4.6.78(7)(c) Unfired pressure vessels.

2.4.6.79 ANSI/AWWA standards and guidelines, including the following:

2.4.6.79(1) C104 – Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings;

2.4.6.79(2) C110 – Ductile-Iron and Gray-Iron Fittings;

2.4.6.79(3) C151 – Ductile-Iron Pipe, Centrifugally Cast;

2.4.6.79(4) C153 – Ductile Iron Compact Fittings for Water Service;

2.4.6.79(5) C-606 – Standard for Grooved and Shouldered Joints; and

2.4.6.79(6) C651 – Disinfecting Water Mains.

2.4.6.80 ANSI/BIFMA X6.1 - Educational Seating;

2.4.6.81 ANSI/CAN/UL 325: Door, Drapery, Gate, Louver, and Window Operators and Systems;

2.4.6.82 ANSI/NEMA LD 3: High-Pressure Decorative Laminates;

2.4.6.83 ANSI/NEMA LD 3.1: Application, Fabrication, and Installation of High-Pressure Decorative Laminates;

2.4.6.84 ANSI Standards and Guidelines, including the following:

2.4.6.84(1) A21.11 – Rubber Gasket joints for Ductile-Iron Pressure Pipe and Fittings;

2.4.6.84(2) A137.1 – American National Standard Specifications for Ceramic Tile;

2.4.6.84(3) A326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials;

2.4.6.84(4) A1264.2 – Provision of Slip Resistance on Walking/Working Surfaces;

2.4.6.84(5) C37.121, Unit Substations Requirements;

2.4.6.84(6) Z97.1-1984 – Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test;

2.4.6.84(7) Z358.1 – Emergency Eyewash and Shower Equipment; and

2.4.6.84(8) Z535.4 – American National Standard for Product Safety Signs and Labels.

2.4.6.85 ASME standards and guidelines, including the following:

2.4.6.85(1) ASME A112.3.1 – Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above-ground and Below Ground;

2.4.6.85(2) ASME A112.6.3 – Floor and Trench Drains;

2.4.6.85(3) ASME A112.36.2M – Cleanouts;

2.4.6.85(4) ASME B1.20.1 – Pipe Threads, General Purpose (inch);

2.4.6.85(5) ASME B16.3 – Malleable Iron Threaded Fittings;

2.4.6.85(6) ASME B16.5 – Pipe Flanges and Flanged Fittings;

2.4.6.85(7) ASME B16.9 – Factory Made Wrought Steel Buttwelding Fittings;

2.4.6.85(8) ASME B16.10 – Face-to-Face and End-to-End Dimensions of Valves;

2.4.6.85(9) ASME B16.11 – Forged Fittings, Socket-Welding and Threaded;

2.4.6.85(10) ASME B16.15 – Cast Bronze Threaded Fittings, Classes 125 and 250;

2.4.6.85(11) ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings;

2.4.6.85(12) ASME B16.20 – Metallic Gaskets for Pipe Flanges; Ring-Joint, Spiral-Wound, and Jacketed;

2.4.6.85(13) ASME B16.21 – Non-metallic Flat Gaskets for Pipe Flanges;

2.4.6.85(14) ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings;

2.4.6.85(15) ASME B16.23 – Cast Copper Alloy Solder Joint Drainage Fittings: DWV;

2.4.6.85(16) ASME B16.24 – Cast Copper Alloy Pipe Flanges and Flanged Fittings; Class 150, 300, 400, 600, 900, 1500, and 2500;

2.4.6.85(17) ASME B16.29 – Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings-DWV;

2.4.6.85(18) ASME B16.34 – Valves Flanged, Threaded and Welding Ends;

2.4.6.85(19) ASME B16.47 – Large Diameter Steel Flanges: NPS 26 Through NPS 60;

2.4.6.85(20) ASME B16.50 – Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings;

2.4.6.85(21) ASME B16.39 – Malleable Iron Threaded Pipe Unions: Classes 150, 250 and 300;

2.4.6.85(22) ASME B18.2.1 – Square and Hex Bolts and Screws;

2.4.6.85(23) ASME B18.2.2 – Square and Hex Nuts;

2.4.6.85(24) ASME B31.3 – Process Piping;

2.4.6.85(25) ASME BPE – Bioprocessing Equipment; and

2.4.6.85(26) ASME PTC 19.3 TW – Thermowells.

2.4.6.86 AWS standards and guidelines, including the following:

2.4.6.86(1) A5.8 – Specification for Filler Metals for Brazing and Braze Welding; AWS A5.31 – Specification for Fluxes for Brazing and Braze Welding;

2.4.6.86(2) C3.4 – Specification for Torch Brazing;

2.4.6.86(3) D1.3-98 - Structural Welding Code - Sheet Steel; and

2.4.6.86(4) D18.2 – Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube.

2.4.6.87 ASPE Plumbing Engineering Design Handbook, Volumes 1-4;

2.4.6.88 ASTM standards and guidelines, including the following:

2.4.6.88(1) A36 A36M-12 – Standard Specification for Carbon Structural Steel;

2.4.6.88(2) A47 / A47M – Standard Specification for Ferritic Malleable Iron castings;

2.4.6.88(3) A53 – Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless;

2.4.6.88(4) A90/M – Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings;

2.4.6.88(5) A105 – Standard Specification for Carbon Steel Forgings for Piping Applications;

2.4.6.88(6) A106 – Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service;

2.4.6.88(7) A126 – Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings;

2.4.6.88(8) A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip;

2.4.6.88(9) A182 – Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service;

2.4.6.88(10) A193 / A193M-14 – Standard Specification for Alloy –Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications;

2.4.6.88(11) A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both;

2.4.6.88(12) A240/M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications;

2.4.6.88(13) A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service;

2.4.6.88(14) A270 – Specification for seamless and welded austenitic stainless steel sanitary tubing;

2.4.6.88(15) A276 – Standard Specification for Stainless Steel Bars and Shapes;

2.4.6.88(16) A278 – Standard Specification for Gray Iron Castings for Pressure Containing Parts for Temperatures up to 650°F (350°C);

2.4.6.88(17) A283/M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates;

2.4.6.88(18) A285 – Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate Tensile Strength;

2.4.6.88(19) A307-12 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength;

2.4.6.88(20) A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes;

2.4.6.88(21) A326M-13 – Standard Specification for Structural Bolts, Steel, Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric);

2.4.6.88(22) A351 – Standard Specification for Castings, Austenitic, for Pressure Containing Parts;

2.4.6.88(23) A403 – Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings;

2.4.6.88(24) A463/M – Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process;

2.4.6.88(25) A480/M – Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip;

2.4.6.88(26) A490-12 – Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Steel Strength;

2.4.6.88(27) A490M-12 – Standard Specification for High Strength Structural Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel joints (Metric);

2.4.6.88(28) A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes;

2.4.6.88(29) A516 – Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service;

2.4.6.88(30) A536 – Standard Specification for Ductile Iron Castings;

2.4.6.88(31) A563 – Standard Specification for Carbon and Alloy Steel Nuts;

2.4.6.88(32) A564 – Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes;

2.4.6.88(33) A653 / A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process;

2.4.6.88(34) A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar;

2.4.6.88(35) A792 / A792M-10 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process;

2.4.6.88(36) A955 / A955M-17 – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement;

2.4.6.88(37) A924/M – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process;

2.4.6.88(38) A1011/M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength;

2.4.6.88(39) B29 – Standard Specification for Refined Lead;

2.4.6.88(40) B32 – Specification for Solder Metal;

2.4.6.88(41) B62 – Standard Specification for Composition Bronze or Ounce Metal Castings;

2.4.6.88(42) B88 – Standard Specification for Seamless Copper Water Tube;

2.4.6.88(43) B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;

2.4.6.88(44) B306 – Standard Specification for Copper Drainage Tube (DWV);

2.4.6.88(45) B749 – Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate;

2.4.6.88(46) B819 – Standard Specification for Seamless Copper Tube for Medical Gas Systems;

2.4.6.88(47) B828 – Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings;

2.4.6.88(48) C260 / C260M-10a – Standard Specification for Air-Entraining Admixtures for Concrete;

2.4.6.88(49) C411 – Standard Test Method for Hot Surface Performance of High Temperature Thermal Insulation;

2.4.6.88(50) C475/C475M – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board;

2.4.6.88(51) C494 / C494M – 13 – Standard Specification for Chemical Admixtures for Concrete;

2.4.6.88(52) C503-05 – Standard Specification for Marble Dimension Stone;

2.4.6.88(53) C518 – Standard Test Method for Steady State Thermal Transmission Properties by Means of Heat Flo Meter Apparatus;

2.4.6.88(54) C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation;

2.4.6.88(55) C534 – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form;

2.4.6.88(56) C547 – Standard Specification for Mineral Fiber Pipe Insulation;

2.4.6.88(57) C552 – Standard Specification for Cellular Glass Thermal Insulation;

2.4.6.88(58) C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications;

2.4.6.88(59) C564 – Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings;

2.4.6.88(60) C568-03 – Standard Specification for Limestone Dimension Stone;

2.4.6.88(61) C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation;

2.4.6.88(62) C615-03 – Standard Specification for Granite Dimension Stone;

2.4.6.88(63) C616-03 – Standard Specification for Quartz-Based Dimension Stone;

2.4.6.88(64) C635/C635M-17 – Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings;

2.4.6.88(65) C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels;

2.4.6.88(66) C645-18 – Standard Specification for Nonstructural Steel Framing Members;

2.4.6.88(67) C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products;

2.4.6.88(68) C795 – Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel;

2.4.6.88(69) C840-18 Standard Specification for Application and Finishing of Gypsum Board;

2.4.6.88(70) C919 – Standard Practice for Use of Sealants in Acoustical Applications;

2.4.6.88(71) C1048-04 – Standard Specification for Heat-Treated Flat Glass;

2.4.6.88(72) C1036-06 – Standard Specification for Flat Glass;

2.4.6.88(73) C1053 – Borosilicate Glass Pipe and Fittings for Drain Waste and Vent (DWV) Applications;

2.4.6.88(74) C1126 (Gr.1) – Standard Specification for Faced and Unfaced Rigid Cellular Phenolic Thermal Insulation;

2.4.6.88(75) C1349-04 – Standard Specification for Architectural Flat Glass Clad Polycarbonate;

2.4.6.88(76) C1396 / C1396M – Standard Specification for Gypsum Board;

2.4.6.88(77) C1540 – Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings;

2.4.6.88(78) C1629 / C1629M – Standard Classification for Abuse-Resistant Non-decorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels;

2.4.6.88(79) D226/D226M – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing;

2.4.6.88(80) D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes;

2.4.6.88(81) D1781 – Standard Test Method for Climbing Drum Peel for Adhesives;

2.4.6.88(82) D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds;

2.4.6.88(83) D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120;

2.4.6.88(84) D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring;

2.4.6.88(85) D 2467 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80;

2.4.6.88(86) D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings;

2.4.6.88(87) D3222 – Unmodified Poly(Vinylidene Fluoride) (PVDF) Moulding, Extrusion and Coating Materials;

2.4.6.88(88) D3450 – Test Method for Washability Properties of Interior Architectural Coatings;

2.4.6.88(89) D4101 – Specification for Polypropylene Injection and Extrusion Materials;

2.4.6.88(90) D4828 – Standard Test Methods for Practical Washability of Organic Coatings;

2.4.6.88(91) D543 / D543 – 14 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents;

2.4.6.88(92) D790-10 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials;

2.4.6.88(93) E84-12c – Standard Test Method for Surface Burning Characteristics of Building Materials;

2.4.6.88(94) E90-09 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements;

2.4.6.88(95) E108 – (Modified) Standard Test Methods for Fire Tests of Roof Coverings;

2.4.6.88(96) E283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen;

2.4.6.88(97) E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference;

2.4.6.88(98) E331 – Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference;

2.4.6.88(99) E1300-04e1 – Standard Practice for Determining Load Resistance of Glass in Buildings;

2.4.6.88(100) E2074-00: Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies;

2.4.6.88(101) F441 – Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedule 40 and 80;

2.4.6.88(102) F1120 – Standard Specification for Circular Metallic Bellows Type Expansion Joints for Piping Applications;

2.4.6.88(103) F1412 – Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems;

2.4.6.88(104) F1673 – Polyvinylidene Fluoride (PVDF) Corrosive Waste Drainage Systems;

2.4.6.88(105) G21-09 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; and

2.4.6.88(106) S325-10e1 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

2.4.6.89 CAN/ULC standards and guidelines, including:

2.4.6.89(1) C536 – Flexible Metallic Hose;

2.4.6.89(2) C842 – Guide for the investigation of valves for flammable and combustible liquids;

2.4.6.89(3) S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies;

2.4.6.89(4) S104 – Standard Method for Fire Tests of Door Assemblies;

2.4.6.89(5) S107 – Methods of Fire Tests of Roof Coverings;

2.4.6.89(6) S112 – Standard Method of Fire Test of Fire Damper Assemblies;

2.4.6.89(7) S115 – Fire Tests of Fire stop Systems;

2.4.6.89(8) S134-13 – Fire Test of Exterior Wall Assemblies;

2.4.6.89(9) S138 – Standard Method of Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration;

2.4.6.89(10) S524 – Standard for the Installation of Fire Alarm Systems;

2.4.6.89(11) S536 – Inspection and Testing of Fire Alarm Systems;

2.4.6.89(12) S537 – Standard for Verification of Fire Alarm Systems;

2.4.6.89(13) S560 – Standard for Category 3 Aqueous Film-Forming Foam (AFFF) Liquid Concentrates;

2.4.6.89(14) S561 – Installation and Services for Fire Signal Receiving Centres and Systems;

2.4.6.89(15) S576 – Standard for Mass Notification System Equipment and Accessories;

2.4.6.89(16) S631 – Isolation Bushings for Steel Underground Tanks Protected with External Corrosion Protection System;

2.4.6.89(17) S661 – Standard for Overfill Protection Devices for Flammable and Combustible Liquid Storage;

2.4.6.89(18) S663 – Standard for Spill Containment Devices for Flammable and Combustible Liquid Above-ground Storage Tanks;

2.4.6.89(19) S701 – Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering;

2.4.6.89(20) S702 – Standard for Mineral Fibre Thermal Insulation for Buildings;

2.4.6.89(21) S704 – Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced; and

2.4.6.89(22) S1001 – Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.

2.4.6.90 CAN/CGSB standards and guidelines, including the following:

2.4.6.90(1) 12.20-M – Structural Design of Glass for Buildings;

2.4.6.90(2) 19.13-M87 – Sealing Compound, One Component, Elastomeric, Chemical Curing;

2.4.6.90(3) 19.24-M90 – Multi-Component, Chemical Curing Sealing Compound;

2.4.6.90(4) 37-GP-56M – Membrane Modified Bitinous, Prefabricated, and Reinforced for Roofing; and

2.4.6.90(5) 51.34-M86 – Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

2.4.6.91 CNSC regulatory and guidance documents, including the following:

2.4.6.91(1) GD-52 – Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms;

2.4.6.91(2) REGDOC-2.12.3 – Security of Nuclear Substances: Sealed Sources; and

2.4.6.91(3) Cyclotron:

2.4.6.91(3)(a) CNSC REGDOC-1.4.1, Licence Application Guide: Class II Nuclear Facilities and Prescribed Equipment.

2.4.6.91(4) Cyclotron Labs:

2.4.6.91(4)(a) CNSC REGDOC-1.6.1, Licence Application Guide: Nuclear Substances and Radiation Devices, Version 2; and

2.4.6.91(4)(b) CNSC GD-52, Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms.

2.4.6.91(5) PET-CT:

2.4.6.91(5)(a) CNSC GD-52, Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms;

2.4.6.91(5)(b) CNSC REGDOC-1.6.1 Licence Application Guide: Nuclear Substances and Radiation Devices; and

2.4.6.91(5)(c) AAPM Task Group 108: PET/CT Shielding Requirements. Medical Physics.

2.4.6.91(6) Linear Accelerators:

2.4.6.91(6)(a) National Council on Radiation Protection and Measurements, NCRP Report No.151, Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-Ray Radiotherapy Facilities, Bethesda, 2005; and

2.4.6.91(6)(b) CNSC REGDOC-1.4.1 Licence Application Guide: Class II Nuclear Facilities and Prescribed Equipment.

2.4.6.91(7) General:

2.4.6.91(7)(a) CNSC REGDOC-2.12.3, Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2.1

2.4.6.92 CSA standards and guidelines, including the following:

2.4.6.92(1) A23.1 – Concrete Materials and Methods of Concrete Construction;

2.4.6.92(2) A23.1-09/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete;

2.4.6.92(3) A23.3 – Design of Concrete Structures;

2.4.6.92(4) A23.4 – Precast Concrete – Materials and Construction;

2.4.6.92(5) A82.27 – Gypsum Board;

2.4.6.92(6) A123.21 – Standard Test Method for the dynamic wind uplift resistance of membrane roofing systems, Includes Update No. 1;

2.4.6.92(7) A231.1/A231.2 – Precast Concrete Paving Slabs/Precast Concrete Pavers;

2.4.6.92(8) A370-04 – Connectors for Masonry;

2.4.6.92(9) A371 – Masonry Construction for Buildings;

2.4.6.92(10) A660 – Certification of Manufacturers of Steel Building Systems;

2.4.6.92(11) B44 – Safety Code for Elevators and Escalators;

2.4.6.92(12) B44.2 – Maintenance Requirements and Intervals for Elevators, Dumbwaiters, Escalators, and Moving Walks;

2.4.6.92(13) B45 Series – 13: Plumbing Fixtures;

2.4.6.92(14) B51 – Boiler, Pressure vessel and Pressure Piping Code;

2.4.6.92(15) B52 – Mechanical Refrigeration Code;

2.4.6.92(16) B64 Series 21 – Backflow preventers and vacuum breakers;

2.4.6.92(17) B64.10 Series – Selection and installation of backflow preventers / Maintenance and field testing of backflow preventers;

2.4.6.92(18) B70 – Cast Iron Soil Pipe, Fittings, and Means of Joining;

2.4.6.92(19) B72.20 – Installation Code for Lightning Protection Systems;

2.4.6.92(20) B79 – Commercial and Residential Drains and Cleanouts;

2.4.6.92(21) B125 – Plumbing Fittings;

2.4.6.92(22) B128.1/B128.2 – Design And Installation Of Non-Potable Water Systems / Maintenance And Field Testing Of Non-Potable Water Systems;

2.4.6.92(23) B137.5 – Cross-Linked Polyethylene (PEX) Tubing Systems for Pressure Applications;

2.4.6.92(24) B137.6 – Chlorinated polyvinylchloride (CPVC) pipe, tubing, and fittings for hot- and cold-water distribution systems;

2.4.6.92(25) B139 – Installation Code for Oil-Burning Equipment;

2.4.6.92(26) B140.12 – Oil-Fired Service Water Heaters for Domestic Hot Water and Space Heating Use;

2.4.6.92(27) B149.1 – Natural Gas and Propane Installation Code;

2.4.6.92(28) B158.1 – Cast Brass Solder Joint Drainage, Waste, and Vent Fittings;

2.4.6.92(29) B181.2 – PVC Drain Waste and Vent Pipe and Fittings from CSA B 1800 Plastic Non pressure Pipe Compendium;

2.4.6.92(30) B181.3 – Polyolefin Laboratory Drainage Systems;

2.4.6.92(31) B242 – Groove and Shoulder Type Mechanical Pipe Couplings;

2.4.6.92(32) B272 – Pre-Fabricated Self Sealing Roof Vent Flashings;

2.4.6.92(33) B481 – Grease interceptors;

2.4.6.92(34) B602 – Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe;

2.4.6.92(35) B651 – Barrier Free Design;

2.4.6.92(36) C2.1 – Single-Phase and Three-Phase Liquid-Filled Distribution Transformers;

2.4.6.92(37) C9 – Dry Type Transformers;

2.4.6.92(38) C22.1 – Canadian Electrical Code as adopted in British Columbia;

2.4.6.92(39) C235 – Preferred Voltage Levels for AC Systems, 0 to 50,000 V;

2.4.6.92(40) C282-19 – Emergency Electrical Power Supply for Buildings;

2.4.6.92(41) C743 – Performance Standard for Rating Packaged Water Chillers;

2.4.6.92(42) G30.18 – Carbon steel bars for concrete reinforcement;

2.4.6.92(43) G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

2.4.6.92(44) G164 – Hot Dip Galvanizing of Irregularly Shaped Articles;

2.4.6.92(45) O86 – Engineering Design in Wood;

2.4.6.92(46) O177 – Qualification Code for Manufacturers of Structural Glued-Laminated Timber;

2.4.6.92(47) S16 – Design of Steel Structures;

2.4.6.92(48) S136 – North American Specification for Design of Cold Formed Steel Structural Members;

2.4.6.92(49) S157-05/S157.1 – Strength Design in Aluminum;

2.4.6.92(50) S269.3-M92 – Concrete Formwork;

2.4.6.92(51) S304 – Design of Masonry Structures;

2.4.6.92(52) S304.1-04 – Masonry Design for Buildings;

2.4.6.92(53) S413 – Parking Structures;

2.4.6.92(54) S478-19 – Durability in Buildings;

2.4.6.92(55) S832 – Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings;

2.4.6.92(56) W47.1 – Certification of Companies for Fusion Welding of Steel;

2.4.6.92(57) W48 – Filler Metals and Allied Materials for Metal Arc Welding;

2.4.6.92(58) W55.3 – Certification of Companies for Resistance Welding of Steel and Aluminum;

2.4.6.92(59) W59 – Welded Steel Construction (Metal Arc Welding);

2.4.6.92(60) W59.2M – Welded Aluminum Construction;

2.4.6.92(61) W186-M1990 (R2002) – Welding of Reinforcing Bars in Reinforced Concrete Construction;

2.4.6.92(62) Z32.21 – Electrical Safety and Essential Electrical Systems in Health Care Facilities;

2.4.6.92(63) Z305.12 – Safe storage, handling and use of portable oxygen systems in residential buildings and health care facilities;

2.4.6.92(64) Z305.13 – Plume Scavenging;

2.4.6.92(65) Z314.0 – MDR – General requirements;

2.4.6.92(66) Z314.7 – Steam Sterilizers for Health Care Facilities;

2.4.6.92(67) Z314-18 – Canadian Medical Device Reprocessing;

2.4.6.92(68) Z316.5 – Fume Hoods and Associated Exhaust Systems;

2.4.6.92(69) Z317.1 – Special Requirements for Plumbing Installations in Health Care Facilities;

2.4.6.92(70) Z317.2 – Special Requirements for HVAC Systems in Health Care Facilities;

2.4.6.92(71) Z317.5-17 – Illumination Design in Health Care Facilities;

2.4.6.92(72) Z317.10 – Handling of Health Care Waste Materials;

2.4.6.92(73) Z317.11 – Area requirements for Health Care Facilities;

2.4.6.92(74) Z317.13 – Infection Control During Construction, Renovation, and Maintenance of Health Care Facilities;

2.4.6.92(75) Z321 – Signs and Symbols for the Workplace;

2.4.6.92(76) Z358.1 – Emergency Eyewash and Shower Equipment;

2.4.6.92(77) Z364.2.2 – Water Treatment Equipment and Water Quality Requirements for Hemodialysis;

2.4.6.92(78) Z386 – Safe Use of Lasers in Health Care;

2.4.6.92(79) Z412 – Office Ergonomics;

2.4.6.92(80) Z431 – Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators;

2.4.6.92(81) Z462 – Workplace Electrical Safety (Harmonized with NFPA 70E);

2.4.6.92(82) Z902 - Blood and Blood Components

2.4.6.92(83) Z1002 – Occupational Health and Safety;

2.4.6.92(84) Z7396.1 – Medical Gas Pipeline Systems – Part 1: Pipelines for Medical Gases, Medical Vacuum, Medical Support Gases, and Anaesthetic Gas Scavenging Systems;

2.4.6.92(85) Z7396.2 Medical Gas Pipeline Systems - Part 2: Anaesthetic Gas Scavenging Disposal Systems;

2.4.6.92(86) Z8001 – Commissioning of Health Care Facilities;

2.4.6.92(87) Z8002 – Operation and Maintenance of Health Care Facilities;

2.4.6.92(88) Z9170-1 – Terminal Units for Medical gas Pipeline;

2.4.6.92(89) Z10524-2 – Pressure regulators for use with medical gases – Part 2: Manifold and line pressure regulators;

2.4.6.92(90) Z10535.1 – Hoists for the Transfer of Disabled Persons — Requirements and Test Methods;

2.4.6.92(91) Z10535.2 – Lifts for the transfer of persons – Installation, use, and maintenance;

2.4.6.92(92) Z15190 – Medical laboratories – Requirements for Safety;

2.4.6.92(93) Z15883-2 – Washer-disinfectors Requirements and tests for washer disinfectors employing thermal disinfection for surgical instruments, anaesthetic equipment, bowls, dishes, receivers, utensils, glassware, etc.; and

2.4.6.92(94) Z15883-3 – Washer disinfectors – Part 3: Requirements and tests for washer disinfectors employing thermal disinfection for human waste containers.

2.4.6.93 CAN/CSB standards and guidelines, including the following:

2.4.6.93(1) 12.20-M89 – Structural Design of Glass for Buildings;

2.4.6.93(2) 51-GP-52MA – Vapour Barrier, Jacket and Facing Material for Pipe, Duct, and Equipment Thermal Insulation; and

2.4.6.93(3) 51.53 – Poly(Vinyl Chloride) Jacket Sheeting, for Insulated Pipes Vessels and Round Ducts.

2.4.6.94 CSTM Standards for Hospital Transfusion Services.

2.4.6.95 Federal Specifications, including the following:

2.4.6.95(1) QQL-201F – Chemical Analysis - Grade C;

2.4.6.95(2) DD-G-451 – Flat Glass for Glazing, Mirrors and Other Uses;

2.4.6.95(3) QQL-201F – Chemical Analysis, Grade C; and

2.4.6.95(4) DD-G-451.

2.4.6.96 GA standards, including the following:

2.4.6.96(1) 214 Recommended Levels of Finish for Gypsum Board, Glass-Mat and Fiber-Reinforced Gypsum Panels; and

2.4.6.96(2) 216 Recommended Specifications for the Application and Finishing of Gypsum Board.

2.4.6.97 ICC-ES Standard AC-16;

2.4.6.98 IEEE standards and guidelines, including the following:

2.4.6.98(1) 80 Guide for Safety in AC Substation Grounding;

2.4.6.98(2) 299 – Standard Method for Measuring, as modified for MRI Testing Methods of Attenuation Measurements for Electromagnetic Shielding Enclosures for Electrical Test Purposes;

2.4.6.98(3) 519 Recommended Practice and Requirements for Harmonic Control in Electric Power Systems;

2.4.6.98(4) 802.1 – Series for Interworking, Security, Audio/Video Bridging and Data Centre Bridging, and Time Sensitive Networking Standards; and

2.4.6.98(5) 1584 – Guide for Performing Arc-Flash Hazard Calculations.

2.4.6.99 MIL-STD-22A – Method of Insertion – Loss Measurements for Radio Frequency Power Line Filters;

2.4.6.100 MSS standards, including the following:

2.4.6.100(1) SP-25 – Standard Marking System for Valves, Fittings, Flanges, and Unions;

2.4.6.100(2) SP-42 – Corrosion-Resistant Gate, Globe, Angle, and Check Valves with Flanged and Butt Weld Ends (Classes 150, 300, and 600);

2.4.6.100(3) SP-67 – Butterfly Valves;

2.4.6.100(4) SP-68 – High Pressure Butterfly Valves with Offset Design;

2.4.6.100(5) SP-70 – Cast Iron Gate Valves, Flanged and Threaded Ends;

2.4.6.100(6) SP-71 – Cast Iron Swing Check Valves, Flanged and Threaded Ends;

2.4.6.100(7) SP-72 – Ball valves with Flanged or Butt-Welding ends for General Service;

2.4.6.100(8) SP-78 – Cast Iron Plug Valves;

2.4.6.100(9) SP-80 – Bronze Gate, Globe Angle and Check Valves;

2.4.6.100(10) SP-85 – Cast Iron Globe and Angle Valves, Flanged and Threaded Ends;

2.4.6.100(11) SP-97 – Integrally Reinforced Forged Branch Outlet Fittings – Socket Welding, Threaded, and Buttwelding Ends;

2.4.6.100(12) SP-110 – Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends;

2.4.6.100(13) SP-125 – Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves;

2.4.6.100(14) SP-126 – In-Line, Spring-Assisted, Center-Guided Check Valves (Carbon, Alloy Steel, Stainless Steel, and Nickel Alloys);

2.4.6.100(15) SP-136 – Ductile Iron Swing Check Valves;

2.4.6.100(16) SP-139 – Copper Alloy Gate, Globe, Angle, and Check Valves for Low Pressure/Low Temperature Plumbing Applications;

2.4.6.100(17) SP-58 – Pipe Hangers and Supports - Materials Design and Manufacture;

2.4.6.100(18) SP-69 – Pipe Hangers and Supports - Selection and Application;

2.4.6.100(19) SP-77 – Guidelines for Pipe Support Contractual Relationships;

2.4.6.100(20) SP-90 – Guidelines for Terminology for Pipe Hangers and Supports;

2.4.6.100(21) SP-114 – Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000;

2.4.6.100(22) SP-127 – Bracing for Piping Systems Seismic - Wind - Dynamic Design, Selection, Application;

2.4.6.100(23) NAAMM HMMA 840 – Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; and

2.4.6.100(24) NAAMM HMMA 861 – Guide Specifications for Commercial Hollow Metal Doors and Frames.

2.4.6.101 NEMA standards, including the following:

2.4.6.101(1) WC7 / ICEA S-66-524 – Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy;

2.4.6.101(2) ICS 7 – Adjustable-Speed Drives;

2.4.6.101(3) VE 1 – Metal Cable Tray Systems; and

2.4.6.101(4) PB2.2 – Application Guide for Ground-Fault Protection Devices for Equipment.

2.4.6.102 NETA standards and guidelines, including the following:

2.4.6.102(1) ATS Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems; and

2.4.6.102(2) MTS Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems.

2.4.6.103 NFPA (National Fire Protection Association) standards and guidelines, including the following:

2.4.6.103(1) 99: Health Care Facilities Code;

2.4.6.103(2) 3: Standard for Commissioning of Fire Protection and Life Safety Systems;

2.4.6.103(3) 4: Standard for Integrated Fire Protection and Life Safety System Training;

2.4.6.103(4) 10: Standard for Portable Fire Extinguishers;

2.4.6.103(5) 11: Standard for Low, Medium and High Expansion Foam;

2.4.6.103(6) 13: Standard for Installation of Sprinkler Systems;

2.4.6.103(7) 14: Standard for Installation of Standpipe and Hose Systems;

2.4.6.103(8) 16: Standard for the Installation of Standpipe and Hose Systems;

2.4.6.103(9) 17: Standard for Dry-Chemical Extinguishing Systems;

2.4.6.103(10) 17A: Standard for Wet Chemical Extinguishing Systems;

2.4.6.103(11) 20: Standard for the Installation of Stationary Pumps for Fire Protection;

2.4.6.103(12) 24: Standard for the Installation of Private Fire Service Mains and Their Appurtenances;

2.4.6.103(13) 25: Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems;

2.4.6.103(14) 30: Flammable and Combustible Liquids Code;

2.4.6.103(15) 33: Standard for Spray Application Using Flammable or Combustible Materials;

2.4.6.103(16) 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines;

2.4.6.103(17) 45: Standard on Fire Protection for Laboratories Using Chemicals;

2.4.6.103(18) 55: Compressed Gases and Cryogenic Fluids Code;

2.4.6.103(19) 56F: Non-flammable Medical Gas System;

2.4.6.103(20) 70B: Recommended Practice for Electrical Equipment Maintenance;

2.4.6.103(21) 72: National Fire Alarm and Signaling Code;

2.4.6.103(22) 75: Standard for the Fire Protection of Information Technology Equipment;

2.4.6.103(23) 82: Standard on Incinerators and Waste and Linen Handling Systems and Equipment;

2.4.6.103(24) 90A: Standard for Installation of Air Conditioning and Ventilation Systems;

2.4.6.103(25) 92A: Standard for Smoke Control Systems Utilizing Barriers and Pressure Differences;

2.4.6.103(26) 96: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations;

2.4.6.103(27) 101: Life Safety Code;

2.4.6.103(28) 141: Standard for Aircraft Rescue and Fire-Fighting Vehicles;

2.4.6.103(29) 214: Standard on Water-Cooling Towers;

2.4.6.103(30) 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies Containing Combustible Components;

2.4.6.103(31) 412: Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment;

2.4.6.103(32) 770: Standard on Hybrid Water and Inert Gas Fire Extinguishing systems; and

2.4.6.103(33) 2001: Standard on Clean Agent Fire Extinguishing Systems.

2.4.6.104 NSF/ANSI standards and guidelines, including the following:

2.4.6.104(1) 14 – Plastic Piping System Components and Related Materials;

2.4.6.104(2) 61 – Drinking Water System Components – Health Effects; and

2.4.6.104(3) 372 – Drinking Water System Components – Lead Content.

2.4.6.105 Sustainability standards and guidelines, including the following:

2.4.6.105(1) Climate Resilience Guidelines for BC Health Facility Planning & Design, December 2020 V1.1;

2.4.6.105(2) NSHCC Climate Resilience Design Brief Recommendations;

2.4.6.105(3) LEED® Canada Building Design and Construction (BD+C): Healthcare, Latest Edition, Canada Green Building Council;

2.4.6.105(4) LEED® Version 4 Reference Guide for Building Design and Construction: Healthcare, US Green Building Council;

2.4.6.105(5) The Green Guide for Healthcare;

2.4.6.105(6) Green Globes – Environment Assessment for New Buildings;

2.4.6.105(7) Go Green Program, BOMA;

2.4.6.105(8) ASHRAE Green Healthcare Construction Guidance Statement, Jan 2002;

2.4.6.105(9) ASHRAE 90.1 Energy Standards for Buildings;

2.4.6.105(10) ASHRAE Standard 189.1-2017 – Standard for the Design of High-Performance Green Buildings;

2.4.6.105(11) ASHRAE Standard 189.3-2017 – Design, Construction, and Operation of Sustainable High-Performance Health Care Facilities;

2.4.6.105(12) ASHRAE 223P Designation and Classification of Semantic Tags for Building Data;

2.4.6.105(13) ASTM E917.24401-1 Life Cycle Cost Assessment Methodology;

2.4.6.105(14) Building Materials for the Environmentally Hypersensitive, CMHC;

2.4.6.105(15) CleanBC Commercial New Construction Program including:

2.4.6.105(15)(a) Consultant Orientation Manual;

2.4.6.105(15)(b) Energy Modelling Guidelines; and

2.4.6.105(15)(c) New Construction Workbook.

2.4.6.105(16) Low Carbon Resilience and Environmental Sustainability Guidelines for Health-care New Construction;

2.4.6.105(17) LMFM Moving Towards Climate Resilient Health Facilities for Fraser Health;

2.4.6.105(18) Establishing Design Conditions for Climate Resilient Planning & Design;

2.4.6.105(19) Greening Strategies for Co-Benefits;

2.4.6.105(20) Canadian Building Green Hospitals Checklist, Canadian Coalition for Green Healthcare;

2.4.6.105(21) Energy Innovators Initiative, Natural Resources Canada;

2.4.6.105(22) EES Design Guidelines for New Construction and Major Renovations;

2.4.6.105(23) Healthy Built Environment (HBE) Linkages Toolkit, PHSA;

2.4.6.105(24) Metro Vancouver’s Design Guidebook for Maximizing Climate Adaptation Benefits with Trees;

2.4.6.105(25) National Energy Code for Buildings (NECB), National Research Council;

2.4.6.105(26) Sustainable and Climate-Resilient Healthcare Facilities Toolkit; and

2.4.6.105(27) Sustainable Healthcare Architecture, Robin Guenther and Gail Vittori.

2.4.6.106 ISO standards, including the following:

2.4.6.106(1) ISO 10137: Basis for design of structures – serviceability of buildings and walkways against vibration;

2.4.6.106(2) ISO 14644-1: Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration;

2.4.6.106(3) ISO 14644-2: Cleanrooms and associated controlled environments - Part 2: Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration;

2.4.6.106(4) ISO 16745-1 Sustainability in buildings and civil engineering works - Carbon metric of an existing building during use stage - Part 1: Calculation, reporting and communication;

2.4.6.106(5) ISO 16745-2 Sustainability in buildings and civil engineering works - Carbon metric of an existing building during use stage - Part 2: Verification; and

2.4.6.106(6) ISO 19650-1:2018 Organization and digitization of information about buildings and civil engineering works, including Building Information Modelling (BIM).

2.4.6.107 USP standards and guidelines, including the following:

2.4.6.107(1) 797 – Guidebook to Pharmaceutical Compounding—Sterile Preparations;

2.4.6.107(2) 800 – Hazardous Drugs—Handling in Healthcare Settings; and

2.4.6.107(3) 825 – Radiopharmaceuticals—Preparation, Compounding, Dispensing, and Repackaging.

2.4.6.108 Technical Safety BC Regulations and Guidelines;

2.4.6.109 WorkSafe BC Regulations and guidelines, including the following:

2.4.6.109(1) 4.1 Safe Workplace

2.4.6.109(1)(a) A workplace will be planned, constructed, used and maintained to protect from danger any person working at the workplace.

2.4.6.109(2) Illumination

2.4.6.109(2)(a) Part 4, General Conditions, Section 4.64 – 4.69.

2.4.6.109(3) HVAC

2.4.6.109(3)(a) Part 4, General Conditions, Indoor Air Quality, Sections 4.70 – 4.80;

2.4.6.109(3)(b) Part 4, General Conditions, Environmental Tobacco Smoke, Sections 4.81 – 4.82;

2.4.6.109(3)(c) Part 5, Flammable and Combustible Substances, Section 5.35; and

2.4.6.109(3)(d) Part 5, Controlling Exposure, Section 5.56.

2.4.6.109(4) Ergonomics

2.4.6.109(4)(a) Part 4, General Conditions, Ergonomics (MSI) Requirements, Sections 4.46 – 4.53; and

2.4.6.109(4)(b) Guidelines Part 4 – Ergonomics (MSI) Requirements Update 2006, G4.46 – 4.53(2).

2.4.6.109(5) Emergency Eyewash / Showers

2.4.6.109(5)(a) Part 5, Chemical Agents and Biological Agents, Definitions, Section 5.1;

2.4.6.109(5)(b) Part 5, Chemical Agents and Biological Agents, Emergency Washing Facilities, Sections 5.85 – 5.96;

2.4.6.109(5)(c) Guidelines Part 5, Emergency Washing Facilities, Issued 1999; and

2.4.6.109(5)(d) Guidelines Part 30, General Requirements, Plumbing, G30.4, Issued 1999.

2.4.6.109(6) Fall Protection

2.4.6.109(6)(a) Part 4, General Conditions, Work Areas Guards and handrails, Sections 4.54 – 4.63; and

2.4.6.109(6)(b) Part 11, Fall Protection, Section G11.1 – G11.10(0.1).

2.4.6.109(7) Emergency Response

2.4.6.109(7)(a) Part 4, General Conditions, Emergency Preparedness and Response, 4.13 – 4.18.

2.4.6.109(8) Eating Areas / Washrooms / Change Areas / Unsafe Water

2.4.6.109(8)(a) Part 4, General Conditions, Occupational Environment Requirements, Section 4.84 – 4.87.

2.4.6.109(9) Electrical Safety

2.4.6.109(9)(a) Part 4, General Conditions, Buildings, Structures, Equipment and Site Conditions, Conformity to Standards, Section 4.4; and

2.4.6.109(9)(b) Part 19, Electrical Safety.

2.4.6.109(10) Radiation Safety

2.4.6.109(10)(a) Division 3 Radiation Exposure (included ionizing and non-ionizing radiation) Section 7.18 – 7.24 Guidelines Part 7 – Division 3 Radiation Exposure G7.18 – G7.19 (4)-2;

2.4.6.109(10)(b) BCICA Quality Standards for Mechanical Insulation Manual;

2.4.6.109(10)(c) TIAC (Thermal Insulation Association of Canada) standards;

2.4.6.109(10)(d) Canadian Council on Health Services Accreditation Program, Latest Edition; and

2.4.6.109(10)(e) Health Canada Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities.

2.4.6.110 Communications Standards and Specifications

2.4.6.110(1) Appendix 1M [PHSA Communications Infrastructure Standards and Specifications];

2.4.6.110(2) ASHRAE 223P Designation and Classification of Semantic Tags for Building Data;

2.4.6.110(3) UL-1069 Hospital Signalling and Nurse Call Equipment.

2.5 Submittal Documents

2.5.1 Progressive Submittals

2.5.1.1 The Design-Builder will make submissions of the Design and Construction Documents to the Authority for review at progressive 30%, 50%, 70%, 90%, 100% and Record Documentation phases.

2.5.1.2 With each Submittal starting at Design Development 50% complete through to Issued for Construction 100% complete, the Design-Builder will schedule clash review sessions with the Authority. The purpose of these clash review sessions will be to identify and document for resolution:

2.5.1.2(1) The physical conflicts between the different disciplines (e.g. architectural, structural, mechanical, electrical, communications, etc.); and

2.5.1.2(2) Where the Design of the Facility does not meet the minimum accessibility and clearance requirements as set out in the Agreement.

2.5.1.3 Once the 50% Design Phase is completed, the Design-Builder will not request the Authority to engage in the review process as set out in Schedule 2 [Review Procedure] for any specific element of the Design that has not been fully coordinated with other disciplines. If Soft Clashes or Hard Clashes are present in specific elements submitted for review, the Design-Builder will identify the Soft Clashes or Hard Clashes and provide a rationale and plan (including timeline) to resolve; refer to Appendix 1U [BIM Requirements]. The Authority may reject the submission or review a partial submission, at its discretion.

2.5.1.4 30% Design and Construction Documents (30% Phase)

2.5.1.4(1) This phase will include development of drawings and other documents illustrating the scale and character of the Facility, architecture and all engineering systems in sufficient detail to describe how all parts of the Facility functionally relate to each other, such as the site plan, master planning, roadworks design, spatial relationship diagrams, floor plans, flow diagrams, Building Systems, sections, and elevations; together with a written Design Brief.

2.5.1.4(2) In addition to the specific documentation required in this Section 2.5, at a minimum the following items will be addressed:

2.5.1.4(2)(a) Proposal for a Design vision, aesthetics, materials and building character, including Facility elevations;

2.5.1.4(2)(b) How the Design promotes close ties with the neighbourhood and integration with the surrounding community;

2.5.1.4(2)(c) How the Design considers coherent and harmonious integration of the architectural elements into the Site and future buildings;

2.5.1.4(2)(d) Description of the plan and description of how they will operate and interact for Building Systems. This includes integration between Building Systems and between the Building Systems and clinical systems;

2.5.1.4(2)(e) Overall approach to achieving the Design Objectives described in Section 3.1.

2.5.1.4(2)(f)	Site plan, illustrating the Site boundary, provision for Future Expansion, accesses, egresses and drop-offs (pedestrian, bicycle and all vehicular traffic including fire, ambulance and service vehicles) and surrounding buildings;
2.5.1.4(2)(g)	Facility flexibility concepts;
2.5.1.4(2)(h)	Plans of Functional Component blocking, layouts, vertical stacking and links, internal and external flow of circulation and Component drawings and its integration into the Future Expansion areas;
2.5.1.4(2)(i)	Plans demonstrating the flows of Patients, families, Staff, equipment, supplies, medications, food and linens, waste and recycling including flows to and from the Facility;
2.5.1.4(2)(j)	Provide a 3-minute fly-through promotional video that includes exterior and interior renderings, animated motion with music;
2.5.1.4(2)(k)	Identification of deviations from standardization and accessibility design principles with appropriate rationale;
2.5.1.4(2)(l)	Vertical transportation analysis demonstrating the number, size, speed and level of service of the vertical transportation equipment to suit the requirements of the Facility; refer to Section 6.14.1.1(1).
2.5.1.4(2)(m)	Provide a vertical transportation compliance log, demonstrating compliance with Schedule 1 and the LMFM Division 14 – Vertical Transportation Technical Guidelines; refer to Section 6.14.1.1(4).
2.5.1.4(2)(n)	Description of strategy for communications and security systems and how these systems will enable and enhance clinical functionality;
2.5.1.4(2)(o)	CAP Index Report;
2.5.1.4(2)(p)	Preliminary maintenance strategy narrative considering siting of mechanical and storage components;
2.5.1.4(2)(q)	Preliminary Wayfinding and signage report describing the proposed nomenclature and symbolic language and overall approach to

compliance with the Project requirements including Appendix 1R [Wayfinding Standards and Requirements];

2.5.1.4(2)(r) Sustainability Report and LEED project checklist;

2.5.1.4(2)(s) Commissioning Plan Outline;

2.5.1.4(2)(t) Description of strategy for compliance with the Authority's waste management plan;

2.5.1.4(2)(u) Code Report; and

2.5.1.4(2)(v) Demonstration of conformance to City bylaw requirements including CD-20418, zoning restrictions and City Design Guidelines.

2.5.1.4(3) Before the 50% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 30% Phase REVIEWED status or all the outstanding comments on a Submittal will be agreed by the Authority as not being material in nature.

2.5.1.5 50% Design and Construction Documents (50% Phase);

2.5.1.5(1) In addition to the 30% Phase requirements and the detailed requirements of this Section 2.5, this phase will include drawings, Room Data Sheets and other documentation, including details of all Building Systems and related integration between Building Systems and with clinical systems, with outline specifications, to fully describe the size and character of the entire Facility including the architectural, landscaping, civil, structural, mechanical, electrical and communications systems, materials, equipment, furniture and other elements.

2.5.1.5(2) At a minimum the following items will be addressed:

2.5.1.5(2)(a) Update of documents based on the Authority comments from the 30% Design and Construction Documents stage;

2.5.1.5(2)(b) Developed Design, including context plan, Phasing Plan, site plan, all floor plans and a roof plan;

2.5.1.5(2)(c) Integration of the requirements described in Appendix 1R [Wayfinding Standards and Requirements];

2.5.1.5(2)(d) Developed exterior elevations of the Facility, cross-sectional drawings, including indication of surface materials for all areas;

2.5.1.5(2)(e) Developed integration of exterior spaces, including courtyards, plazas and other outdoor spaces, vehicle access/egress (including drop-off and pick-up access to parking, temporary parking, parking numbers, emergency and service vehicle parking, etc.);

2.5.1.5(2)(f) Developed interior concepts and key interior elevations, colours and materials;

2.5.1.5(2)(g) Developed landscape plans;

2.5.1.5(2)(h) Room Data Sheets;

2.5.1.5(2)(i) Developed Energy Model, Energy Cost Adjustment framework template and report detailing energy consumption, the Design and Construction Energy Target, and the target for LEED Gold Certification;

2.5.1.5(2)(j) Developed building operations and related process descriptions based on the integration of Building Systems and clinical systems including failures and alarms, energy management, weather events and other operational impacts for the integrated Building Systems and clinical systems. Include a draft of the related integrations sequence of operations and automated processes;

2.5.1.5(2)(k) Draft Commissioning Plan;

2.5.1.5(2)(l) Sample verification checklists and test procedures; and

2.5.1.5(2)(m) Draft Acoustic Report.

2.5.1.5(3) At a minimum, the following items will be addressed for the clinical aspects of the Facility:

2.5.1.5(3)(a) Plans of each floor level updated based on the Authority comments from the 30% Design and Construction Documents stage and to include all Components and support space including Mechanical and Electrical services, colour coded. Rooms and spaces will be numbered according to the reference numbers in Appendix 1A [Clinical Specifications and Functional Space Requirements];

2.5.1.5(3)(b) A full lighting and switching layout for each room and floor plate;

2.5.1.5(3)(c) Developed interior finishes (flooring, walls, wall protection and ceiling finishes) for all rooms and floor plates, including three options for interior finishes' colour and materials selection boards;

2.5.1.5(3)(d) Efficient integration into the plans of all Equipment and furniture;

2.5.1.5(3)(e) Updated Facility Wayfinding strategy and how it will be incorporated, including draft Wayfinding circulation analysis; preliminary sign and Wayfinding Asset locations and content; updated Project nomenclature and symbolic language and; preliminary sign concepts;

2.5.1.5(3)(f) Review and integration of all Millwork, specialty casework details and systems furniture set out in Appendix 1H [Equipment and Furniture];

2.5.1.5(3)(g) Review of door controls and door hardware concepts/strategies;

2.5.1.5(3)(h) Review of security strategies, including updated security systems floor plans and equipment details and locations of all equipment, connection points and control points;

2.5.1.5(3)(i) Identification of all Permit requirements;

2.5.1.5(3)(j) Review of technology systems detailed plans and integration enabling and enhancing clinical functionality;

2.5.1.5(3)(k) Review of detailed plans for post-disaster management; and

2.5.1.5(3)(l) Identification of all permits, certificates, accreditation and other requirements for Authority Activities, for which the Authority requires documentation, coordination and information from the Design-Builder.

2.5.1.5(4) At a minimum, the following items will be addressed for the technical aspects of the Facility:

2.5.1.5(4)(a) 1:100 plans of all levels including the roof plan and penthouse;

2.5.1.5(4)(b) Main engineering component drawings that relate to the connection of municipal infrastructure and public services;

2.5.1.5(4)(c) Main engineering component drawings that relate to the clinical design;

2.5.1.5(4)(d) Main engineering component drawings that relate to equipment infrastructure;

2.5.1.5(4)(e) Main engineering component drawings that relate to the mechanical HVAC system;

2.5.1.5(4)(f) Indication of all fire separations and the required fire resistance rating, areas of refuge, Contained Use Areas, impeded egress zones and Outbreak Control Zones;

2.5.1.5(4)(g) Main engineering component drawings that relate to the plumbing system;

2.5.1.5(4)(h) Main engineering component drawings that relate to the medical gas system;

2.5.1.5(4)(i) Main engineering component drawings that relate to the power, lighting, fire alarm, communications and electronic safety and security systems;

2.5.1.5(4)(j) Main engineering component drawings that relate to landscaping, exterior lighting and storm water retention;

2.5.1.5(4)(k) Main engineering component drawings that relate to the structural system including allowances for links to Future Expansion;

2.5.1.5(4)(l) Main engineering component drawings that relate to the Life Safety Systems;

2.5.1.5(4)(m) Drawings indicating future engineering system flexibility; and

2.5.1.5(4)(n) Provide preliminary load redundancy and spare capacity calculations.

2.5.1.5(5) Clinical and technical aspects may be combined.

2.5.1.5(6) At a minimum the following items will be addressed for Equipment and communications:

2.5.1.5(6)(a) Main component drawings that relate to the Equipment; and

2.5.1.5(6)(b) Main component drawings that relate to all communications.

2.5.1.5(7) Written reports detailing and describing the manner in which the following have been taken into account in the Design:

2.5.1.5(7)(a) Clinical operations and delivery including the following flows: Patients, family, Staff, equipment, medication, supplies, food, linen and waste and recycling;

2.5.1.5(7)(b) Interior and exterior materials selection;

2.5.1.5(7)(c) Constructability, Flexibility and Maintainability;

2.5.1.5(7)(d) The CAP Index Report including security and post-disaster management;

2.5.1.5(7)(e) Building operating systems;

2.5.1.5(7)(f) Technology systems:

2.5.1.5.7.(f).1 Integrated automation systems: Integrated Building Systems and integrated clinical systems including integrations between Building Systems and clinical systems. Provide details on where they are integrated, and the functionality provided by that integration;

2.5.1.5.7.(f).2 Communications systems; and

2.5.1.5.7.(f).3 Electronic safety and security systems.

2.5.1.5(7)(g) Any other report Submittals the Authority reasonably requires.

2.5.1.5(8) Before the 70% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 50% Phase REVIEWED status or all the outstanding comments on a Submittal will be agreed by the Authority as not being material in nature.

2.5.1.6 70% Design and Construction Documents (70% Phase);

2.5.1.6(1) In addition to the 50% Phase requirements and the detailed requirements of this Section 2.5, at a minimum the following items will be addressed:

2.5.1.6(1)(a) Update of documents based on the comments from the Authority on the 50% Design and Construction Documents stage;

2.5.1.6(1)(b) Developed room numbering plan for Authority use (public and Patient Wayfinding and FMO);

2.5.1.6(1)(c) Confirmed Facility, Site and Component Nomenclature report for Wayfinding;

2.5.1.6(1)(d) Developed Life Cycle analysis framework of expected renewals, refurbishments and replacement of building elements; and

2.5.1.6(1)(e) Door Schedule and Door Hardware Schedule with descriptions of sequences of operation, to be reviewed in meetings with the Authority, and others concerned with door installations.

2.5.1.6(2) Before the 90% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 70% Phase REVIEWED status or all the outstanding comments on a Submittal will be agreed by the Authority as not being material in nature.

2.5.1.7 90% Design and Construction Documents (90% Phase);

2.5.1.7(1)(a) In addition to the 70% Phase requirements and the detailed requirements of this Section 2.5, at a minimum the following items will be addressed:

2.5.1.7.1.(a).1 Update of documents based on the comments from the 70% Design and Construction Documents stage.

2.5.1.7(2) Before the 100% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 90% Phase REVIEWED status or all of the outstanding comments on a Submittal will be agreed by the Authority as not being material in nature.

2.5.1.8 100% Design and Construction Documents (IFC);

2.5.1.8(1) This Issued for Construction documents (IFC) phase will include construction documents consisting of drawings and specifications describing in detail the requirements for the construction of all Components, systems and equipment of the Facility delivered to the Authority in accordance with the Submittal Schedule, in a timely way in advance of Construction with sufficient detail to permit the Authority to understand and assess the Design of the Facility.

2.5.1.8(2) If the Design-Builder intends to proceed with Construction of an element of the Facility in advance of the completion of the Design of the entire Facility, then the Design-Builder will schedule and deliver the appropriate Design and Construction Documents for that element with sufficient accompanying detail to permit the Authority to understand and assess the design of that element in advance of the Design and Construction Documents for other elements of the Facility.

2.5.1.9 In each Design and Construction Document phase, the Design-Builder will provide the requirements as set out in Appendix 1U [BIM Requirements] and Appendix 1V [Asset Management Requirements].

2.5.1.10 In each Design and Construction Document phase, the Design-Builder will provide to the Authority the level of detail and documentation that the Authority would customarily receive, or expect to receive, for a healthcare facility similar to the Facility in accordance with Good Industry Practice, including as applicable to a particular phase:

2.5.1.10(1) Dimensioned floor plans and elevations showing all Millwork and specialty casework;

2.5.1.10(2) All plans will indicate Equipment installation, removal and horizontal and vertical `maintenance clearances;

2.5.1.10(3) Show routes of travel for Equipment installation/replacement from point of entry into the Facility.

2.5.1.10(4) Reflected ceiling plans;

2.5.1.10(5) Interior finishes;

2.5.1.10(6) Furniture and systems furniture and equipment and with all equipment description labels;

2.5.1.10(7) Interior elevations for all rooms and spaces, including all interior finishes, Millwork, specialty casework, technology systems, mechanical and electrical;

2.5.1.10(8) Exterior elevations;

2.5.1.10(9) 3D, photo-realistic colour renderings;

2.5.1.10(10) Completed site and landscaping plans;

2.5.1.10(11) Room finish schedules;

2.5.1.11 The Design-Builder will provide, at the 30% and 50% Phases, a written Design Brief, which will also address the methodology and solutions for each discipline’s design in addition to the following items:

2.5.1.11(1) Clinical operations and functionality, including at minimum:

2.5.1.11(1)(a) Standardization;

2.5.1.11(1)(b) Drawings indicating Line of Sight;

2.5.1.11(1)(c) Personal safety of Patient, Staff and visitors and risk reduction;

2.5.1.11(1)(d) Wellness, including how views, both internal and external, and images of nature in the Design support the Authority's intention to help speed healing and recovery time;

2.5.1.11(1)(e) Drawings indicating Direct Natural Light and Borrowed Light;

2.5.1.11(1)(f) Lighting strategies including controls;

2.5.1.11(1)(g) Floor plate flexibility;

2.5.1.11(1)(h) Drawings indicating accessibility for Persons with Disabilities;

2.5.1.11(1)(i) Logistics and Support Services (including clean and soiled material and equipment flows);

2.5.1.11(1)(j) Facility operations and maintainability; including Asset Management system;

2.5.1.11(1)(k) Sequence of Operation for the Facility systems such as HVAC, medical gas. Emergency power generation and distribution, fire alarm and smoke control/exhaust, nurse call, Staff duress, access control, IPVS, intrusion detection and the integration of systems;

2.5.1.11(1)(l) LEED Gold Certification, including energy efficiency/sustainability and the relevant LEED project checklist and points;

2.5.1.11(1)(m) Material and colour selections for both interior and exterior;

2.5.1.11(1)(n) Artwork;

2.5.1.11(1)(o) Wayfinding and Site connections;

2.5.1.11(1)(p) Spare capacity and Future Expansion;

2.5.1.11(1)(q) Functionality of the sustainability and energy savings features;

2.5.1.11(1)(r) The CAP Index Report; and

2.5.1.11(1)(s) Clearly identifying sections for:

- 2.5.1.11.1.(s).1 Architectural design;
- 2.5.1.11.1.(s).2 Interior design;
- 2.5.1.11.1.(s).3 Site development and landscaping;
- 2.5.1.11.1.(s).4 Structural design;
- 2.5.1.11.1.(s).5 Mechanical design;
- 2.5.1.11.1.(s).6 Electrical design;
- 2.5.1.11.1.(s).7 Integrated automation systems design;
- 2.5.1.11.1.(s).8 Communications systems design;
- 2.5.1.11.1.(s).9 Electronic safety and security systems design; and
- 2.5.1.11.1.(s).10 Sustainable design.

2.5.1.12 Each Submittal package will include a set of Design and Construction documents that is fully coordinated across all disciplines in accordance with Good Industry Practice.

2.5.1.13 The Design-Builder will only issue drawings and specifications for Construction purposes based on Reviewed Design and Construction Documents as described in Schedule 2 [Review Procedure].

2.5.1.14 Section 2.5 does not limit the Design-Builder's obligation to comply with any requirements set out in Schedule 2 [Review Procedure] and this Schedule in relation to the stages and requirements for Design.

2.5.1.15 Refer to the corresponding sections and tables within this Section 2.5 for minimum lists of Design and Construction Submittal documents to be submitted at each stage.

2.5.1.16 Asset Renewal Expenditure Forecast and Vendor Sign Off Forms in accordance with Appendix 1V [Asset Management Requirements]:

2.5.1.16(1) At each design phase (30%, 50%, 70%, 90%, 100% and Record Documentation) the Design-Builder will submit an Asset Renewal Expenditure Forecast in the original Excel format as provided by the Authority, and for the selected items noted in the Asset Renewal Expenditure Forecast, an executed Vendor/Manufacturer sign-off form.

2.5.1.16(2) At each Submittal, the Design-Builder will provide an updated vendors list of equipment to allow the Authority to track changes between submissions.

2.5.1.16(3) At 70% the Design-Builder will supply a complete and final vendor list of all equipment and system components for the items

listed in Appendix 1Q (by system such as Fire, Plumbing, Hydronic, Electrical, Elevators, etc.) including the executed vendor sign-off forms for review by FMO project lead.

2.5.1.17 Design Service Life

2.5.1.17(1) The Design-Builder will demonstrate compliance with the design service life requirements as set out in Section 3.8 to the satisfaction of the Authority through the shop drawing Submittals or other appropriate submission during the Design process as agreed by the Authority. Compliance will be demonstrated through written attestation, certifications or other guarantees to be reviewed and approved by the Authority, which confirm the materials and/or products proposed have a minimum Design Life equal to or greater than that specified in Section 3.8.2 and 3.8.3.

2.5.1.18 Management Plans

2.5.1.18(1) Within 30 days of the Effective Date, the Design-Builder will submit to the Authority for review the following Management Plans:

2.5.1.18(1)(a) Design Management Plan, including:

- 2.5.1.18.1.(a).1 Design process including key Design Objectives;
- 2.5.1.18.1.(a).2 Design responsibility matrix;
- 2.5.1.18.1.(a).3 Communication and documentation process;
- 2.5.1.18.1.(a).4 Authority engagement and user consultation;
- 2.5.1.18.1.(a).5 Design quality control and reporting procedures;
- 2.5.1.18.1.(a).6 AM Submission Plan as set out in Appendix 1V [Asset Management Requirements];
- 2.5.1.18.1.(a).7 How the Design will adapt to emerging technologies; and
- 2.5.1.18.1.(a).8 Construction issues and Design change management.

2.5.1.18(1)(b) Phasing Plan in accordance with Schedule 2, including:

- 2.5.1.18.1.(b).1 Site access, egress and construction staging areas;
- 2.5.1.18.1.(b).2 Coordination details for adjacent construction site activities;
- 2.5.1.18.1.(b).3 Site preparation, earthworks and roadworks;
- 2.5.1.18.1.(b).4 Overall Construction methodology and general approach;
- 2.5.1.18.1.(b).5 Management of technology integration;
- 2.5.1.18.1.(b).6 Constraints, risks and mitigation strategies;

2.5.1.18.1.(b).7 Communication plan regarding the impact to the neighbourhood and municipality;

2.5.1.18.1.(b).8 Safety, including a Health and Safety Plan; and

2.5.1.18.1.(b).9 Management of shipping, handling, and storage of Construction materials in accordance with CSA Z317.13 Infection Control During Construction, including a description of how the infection control measures will be monitored during Construction.

2.5.1.18(1)(c) Demolition Plan;

2.5.1.18(1)(d) Waste Management Plan;

2.5.1.18(1)(e) Project information and BIM standards as set out in Appendix 1U [BIM Requirements] and the associated BIM Execution Plan and documentation; and

2.5.1.18(1)(f) Tree Management Plan.

2.5.1.19 Radiation Protection Survey and CNSC Licensing

2.5.1.19(1) The Design-Builder will not commence Construction without all required licensing permissions from the applicable regulatory bodies.

2.5.1.19(2) The Design-Builder's Radiation Protection Advisor will work closely with the Authority's medical physicist and will provide all documentation required for the complete application for certification and licensing with the applicable regulatory bodies such as CNSC to the Authority for review and approval prior to the Design-Builder's application.

2.5.1.19(3) The Design-Builder will transfer all licenses and permits over to the Authority prior to Substantial Completion.

2.5.1.19(4) A minimum three (3) month prior to the Design-Builder's application for the CNSC licence, the Design-Builder will provide the Authority's Radiation Safety Officer the following documentation for review and approval, which will be complete to a sufficient level of detail as will be required by the CNSC:

2.5.1.19(4)(a) Architectural and engineering drawings;

2.5.1.19(4)(b) Radiation protection shielding specifications and calculations; and

2.5.1.19(4)(c) Other materials the Authority would customarily expect to receive in order to complete the CSNC application.

2.5.1.19(5) The Design-Builder will provide a Radiation Protection Survey as set out in Section 6.13.2.1(3)(a).

2.5.1.20 The Design-Builder will deliver hardcopies of each Design and Construction Submittal (drawings, specifications, reports, etc.), including seven (7) full size hard copies of all drawings (to scale), seven (7) 11x17 reduced size hard copies of all drawings, and electronic versions on a USB device of each document. Submissions will be delivered; consult the Authority prior to printing and shipping to confirm hardcopy submission requirements and destination(s). Refer to Appendix 1U [BIM Requirements] for additional electronic Submittals utilizing the specified cloud sharing method which will include published drawings and model.

2.5.1.21 The Design-Builder will deliver individual PDF sheets and compiled PDFs of all drawing Submittals by discipline. Provide text searchable True PDFs wherever PDF's are noted as required.

2.5.1.22 Should the Authority deem Submittals to be incomplete, the cost of resubmission will be in accordance with Schedule 2 [Review Procedure].

2.5.1.23 All drawings and specifications will be submitted in an orderly sequence and in accordance with the Project Schedule. Drawing packages for the different stages as indicated in this Section 2.5 will be submitted in accordance with the Submittal Schedule as reviewed and approved by the Authority.

2.5.1.24 Record Documentation will be in accordance with Fraser Health Facilities Management – Facilities Systems & Support (FSS) Facilities Space Information & Drawing Services FSS Drawing Standards & Requirements.

2.5.2 Information Management and BIM Principles

2.5.2.1 The Design-Builder will:

2.5.2.1(1) lead and manage the BIM process through the implementation stage of the Project and development of the BIM Execution Plan. The BIM process is required to provide Asset Management data at the end of the implementation stage of the Project; refer to Appendix 1V [Asset Management Requirements];

2.5.2.1(2) adhere to ISO 19650 for Facility Asset information management as amended by Appendix 1U [BIM Requirements];

2.5.2.1(3) comply with the Appendix 1U [BIM Requirements] for Asset information deliverables;

2.5.2.1(4) comply with the documentation and standards developed as part of the Appendix 1U [BIM Requirements] including any responses

and associated information, e.g. the BIM Execution Plan and Information Delivery Plans;

2.5.2.1(5) have the appropriate capacity and capability to deliver information in accordance with the Appendix 1U [BIM Requirements]; and

2.5.2.1(6) submit the Information Model at each design phase in accordance with the Appendix 1U [BIM Requirements] for review.

2.5.2.2 Information and Submittal documents, such as drawings and schedules and other Facility Asset information, will be authored from using a three-dimensional Building Information Modeling software. Refer to Appendix 1U [BIM Requirements] for extent of implementation required.

2.5.2.3 At every Submittal stage. (30%, 50%, 70%, 90%, 100% and Record Documentation) provide an Information Model and Asset database for all disciplines.

2.5.2.4 The Information Delivery Plan for BIM deliverables will be determined in consultation with the Authority to support Authority activities.

2.5.2.5 The Design-Builder will support the Authority in their review and Commissioning activities by sharing and re-uploading the most up to date design models at the Authority's request.

2.5.3 Drawings, Models, and Visualization

2.5.3.1 Project Collaboration Software

2.5.3.1(1) The document control software will be provided by the Design-Builder and based on the capability requirements set out in Appendix 1U [BIM Requirements].

2.5.3.2 Building Information Modeling Software Authoring Software Requirements

2.5.3.2(1) The Design-Builder will undertake and provide the following:

2.5.3.2(1)(a) Design and utilize a three-dimensional, object-oriented Building Information Modeling (BIM) authoring software solution with full data integration;

2.5.3.2(1)(b) The BIM design models will be accurate representations of the current design intent and will be continually revised and updated through feedback from the Authority to form accurate representations of the as-built conditions for the Project;

2.5.3.2.1.(b).1 The Design-Builder will update and share the design models with the Authority in accordance with the coordination and

collaboration requirements set out in Appendix 1U [BIM Requirements] and the associated BIM documentation; and

2.5.3.2.1.(b).2 The Design-Builder will provide a final, complete copy of the BIM design models representing as-built conditions of the Site as part of the Record Documentation for the Project.

2.5.3.2(1)(c) Ensure virtual coordination technologies will facilitate low-cost and scalable cloud-computing software and software plugins to access, share and coordinate with the BIM model without requiring the Authority to purchase proprietary design software or incur licensing fees.

2.5.3.2(1)(d) Provide a BIM Execution Plan including:

2.5.3.2.1.(d).1 Approach to ensure field validation of the BIM model;

2.5.3.2.1.(d).2 Handover requirements for the Authority's Work Management System;

2.5.3.2.1.(d).3 Requirements of the data collection and exchange environment;

2.5.3.2.1.(d).4 Details regarding the updating of the BIM design models to become Record Documentation models of as-built conditions incorporating all post-IFC changes; and

2.5.3.2.1.(d).5 Data Geometry and Specification (DGS):

(d).5.1 The process for identifying critical Asset, Components and the attribute requirements for Asset types;

(d).5.2 Rationalizing Asset attribute requirements to prevent duplication;

(d).5.3 Confirming related attribute information links. For example, capture Design Life for Assets and Components that require an install date; and

(d).5.4 Integrating the hierarchical relationships and Asset locations.

2.5.3.2(1)(e) In consultation with the Authority to ensure compatibility with the Authority's CMMS, the Design-Builder will provide an Asset database to support efficient Facility Management operations;

2.5.3.2.1.(e).1 Asset attributes (Asset metadata and associated documents) will be provided in a format that can be accommodated by the

Authority's management tool, refer to Appendix 1U [BIM Requirements].

2.5.3.2(1)(f) Tracked Assets that are required to be modelled will be refined in consultation with the Authority and will be augmented with more information throughout Construction to support use by Facilities Maintenance and Operations (FMO) in accordance with Appendix 1U [BIM Requirements].

2.5.3.2(1)(g) The Design-Builder will employ a software agnostic, cloud-based virtual coordination tool, such as Revizto, to allow all parties to collaborate and coordinate on BIM files. This tool will assist with the tracking and management of Authority comments and revisions during the process described in Schedule 2 [Review Procedure] and Appendix 1U [BIM Requirements].

2.5.3.3 3D Renders and Visualisation

2.5.3.3(1) Provide 3D, photo-realistic colour exterior and interior renderings, including:

2.5.3.3(1)(a) All Facility elevations, including the Energy Centre as viewed from all four directions;

2.5.3.3(1)(b) Main Entrance Spaces, as viewed from the arrival points along James Hill Drive;

2.5.3.3(1)(c) Main Entrance Lobby including the Waiting Area, Public Passenger Elevators and Reception – Cancer Centre;

2.5.3.3(1)(d) Emergency Department Vestibule-Walk-in Entry from the Patients' arrival area;

2.5.3.3(1)(e) Secure Outdoor Spaces;

2.5.3.3(1)(f) Plaza;

2.5.3.3(1)(g) Emergency Department Waiting Area and Patient Check-In;

2.5.3.3(1)(h) A typical Patient Room as determined in consultation with the Authority such as:

2.5.3.3.1.(h).1 B1.01 Patient Room – Private; and

2.5.3.3.1.(h).2 B3.01 Patient Room – Private – HAU;

2.5.3.3(1)(i) Operating Room; and

2.5.3.3(1)(j) Imaging Room – CT with Control Room – CT..

2.5.3.3(2) At 70% Design submittal stage and before any concrete structure is poured (or other similar structure erected) for the Energy Centre and mechanical rooms, provide the final mechanical and electrical equipment and systems schematic and associated BIM model at a level of detail which indicates the interior of the Energy Centre space, complete with access platforms, maintenance access, piping, insulation, valves, accessories, specialties, VFDs, disconnects, transformers, pads and equipment, etc.

2.5.3.3(3) All 3D photo realistic renderings will be prepared using Enscape or software with similar output quality. All 3D photo realistic renderings will be updated as the Design progresses and provided at each of the Design and Construction Documents stages as indicated in this Section. The Design-Builder will consult with the Authority regarding quantity of 3D photo realistic renderings required at each stage.

2.5.3.4 All drawings will be in metric (millimetre) and prepared in accordance with Good Industry Practice.

2.5.3.5 All drawings will be scaled appropriately for the information conveyed in the drawing.

2.5.3.6 Site context plan will be to 1:500 scale.

2.5.3.7 Site Mapping Workflow – 360 cameras with cloud software platform

2.5.3.7(1) The Design-Builder will utilize 360 camera technology and cloud software to map, manage and organize real world Construction conditions for all rooms in a coordinated strategy throughout each stage of the Project to facilitate improved coordination with all stakeholders:

2.5.3.7(1)(a) The Design-Builder will provide cloud software licencing (Holobuilder or approved equal) to store and organize 360 photos on a common set of construction PDF drawing backgrounds for sharing with Authority stakeholders.

2.5.3.7(2) Cloud software will provide a smartphone app that can be used to synchronize 360 camera photographs within floor plan locations in an off-line mode for Construction walkthroughs.

2.5.3.7(3) Standard photos and metadata will be embedded within the 360 photos within the cloud software program to provide additional resolution and information to document installation progress and details.

2.5.3.7(4) The Design-Builder will transfer ownership of the completed site mapping model as part of the Record Documentation for the Project.

2.5.3.7(5) The following photographs will be provided to document the progressive activity of the Project:

2.5.3.7(5)(a) Building Systems and equipment:

2.5.3.7.5.(a).1 Foundations before concrete pours;

2.5.3.7.5.(a).2 all incoming Utility locations entering and exiting the building concrete structure, all major electrical, mechanical, and Telecommunications infrastructure risers before installing cabling, ducting, or pipes, and any in-slab conduit being installed prior to pouring concrete;

2.5.3.7.5.(a).3 Mechanical, electrical and plumbing systems sequenced during construction; and

2.5.3.7.5.(a).4 Rough-in images prior to enclosing behind walls, ceilings and floors.

2.5.3.7(5)(b) Interior views

2.5.3.7.5.(b).1 Still images demonstrating finish material installation techniques;

2.5.3.7.5.(b).2 Final finishes, including images of product labels if available; and

2.5.3.7.5.(b).3 Time (date or time period).

2.5.3.7(5)(c) Construction milestones (pre-slab, post-slab, etc.);

2.5.3.7(5)(d) Area progressions (exterior, interior);

2.5.3.7(5)(e) Systems (mechanical, electrical, plumbing, technology systems etc.);

2.5.3.7(5)(f) In addition to still images - videos, PDFs and test reports can be embedded to demonstrate the Construction progression and Record Documentation; and

2.5.3.7(5)(g) Include photos in as-built documents and link to the CMMS. Not all photos will be required to be included; coordinate with FHA FMO.

2.5.3.8 Specifications

2.5.3.8(1) Submit specifications as hard copies and electronic copies in PDF and Word format.

2.5.3.8(2) Specifications for all disciplines will be organized according to CSI/CSC Master Format using CSC full-page Section Format/Page Format.

2.5.3.8(3) The Design-Builder will provide specifications for all disciplines progressively with sufficient information to enable the Authority to verify the compliance with the requirements of this Schedule and the Agreement and to accurately construct the Facility as intended.

2.5.3.8(4) Use proprietary specifications where proprietary products are known:

2.5.3.8(4)(a) Research sufficient additional materials to provide a range of acceptable products that will match the performance requirements specified.

2.5.3.8(4)(b) When a single source product, type and model are listed within the specification, it will include a full technical specification that lists critical technical characteristics deemed necessary to permit a review to assess compliance of any potential substitution.

2.5.3.8(4)(c) Shop drawings and product data sheets are not considered as specifications for the progress Submittals.

2.5.3.9 Shop Drawing Requirements

2.5.3.9(1) Shop drawings means drawings, diagrams, illustration, samples, schedules, performance charts, listings, certifications, documentation, literature, brochures, and other data to be provided by the Design-Builder to illustrate details of a portion of the Design and Construction.

2.5.3.9(2) Submit fully detailed shop drawings, indicating materials, methods of Construction and attachment or anchorage, erection diagrams, connections, explanatory notes, required backing or accessories including those to be provided by others, colour charts for selecting colour where applicable, design calculations, and other pertinent information necessary to complete the Design and Construction. Where items attach to other items, or to waterproof membranes, indicate that such items have been coordinated, regardless of the section under which such adjacent items are supplied and installed. Indicate cross references to the requirements of this Agreement. For piping and equipment, provide shop drawings with technical data on all types of insulation to be installed by application (piping (include elbows

and joints), valves, ducting, accessories, etc.) indicating where each is to be used.

2.5.3.9(3) Shop drawings will be in metric units (measurements and dimensions).

2.5.3.9(4) Shop drawings will include a documented review by the Design-Builder's Design Professional Engineer of Record indicated by a reviewed stamp prior to submission to the Authority.

2.5.3.9(5) Review of shop drawings by the Authority is for the sole purpose of ascertaining general conformance with the Agreement. The Authority's review does not constitute approval of detail design inherent in shop drawings, the responsibility for which remains with the Design-Builder. Such review does not relieve responsibility for meeting requirements of this Agreement unless the Authority has accepted a deviation in writing.

2.5.3.9(6) Shop drawings for all system and sub-system devices referenced within Integrated Automation (Division 25) systems will be provided with a BACnet (PICS) Protocol Implementation Conformance Statement.

2.5.3.9(7) Shop drawings will be submitted in electronic PDF format or provide software to enable viewing of files of the other formats at no additional cost to the Authority.

2.5.3.9(8) Provide the most current shop drawing/official certification documentation/listings with tested and approved water contact temperatures for domestic water products including pipe, valves, fittings, accessories, OEM, factory supplied as well as fabricated assemblies/spools that come into contact with domestic water, tested and certified to NSF/ANSI/ CAN 61 and NSF/ANSI 372 for commercial hot and cold water temperature ratings (as applicable).

2.5.3.9(9) Provide shop drawings that the Authority would customarily receive, or expect to receive, for a healthcare facility similar to the Facility in accordance with Good Industry Practice, including for all products and materials used in the Facility such as:

Customary Shop Drawing Examples		
Cast-in-Place Concrete	Balancing Valves (All Systems)	Stainless Steam Piping (MDR)
Concrete Topping	Pressure Reducing Valves/Stations (All Systems)	Heat Exchangers
Clay Unit Masonry Assemblies	Back-flow Prevention Devices	Expansion Tanks (All Systems)
Concrete Unit Masonry	Hangers and Supports	Refrigeration Piping
Structural Steel	Vibration and Seismic Controls	Refrigerant Detection System
Steel Decking	Seismic Restraint Systems	AC Chillers

Customary Shop Drawing Examples		
Load Bearing Steel Studs (Metal Support Assemblies)	Identification and Labelling (All Systems)	Heat Recovery Chillers
Metal Fabrications	Equipment Insulation	Cooling Towers
Glazed Detention and Windscreen Enclosures	Piping Insulation	Cooling Towers – Automatic Blown-Down TDS System
Rough Carpentry	Ductwork Insulations	Air Handling Units
Finish Carpentry	Acoustic Liners	Makeup Air Units
Architectural Woodwork	Air Distribution Systems Silencers	Ducted and Ductless Split Air Conditioners
Below Grade Sheet Waterproofing	Ductwork (All Systems)	Hydronic Coils (All Systems)
Cold Fluid Applied Waterproofing (for above grade applications)	Manual Air Dampers	Electric Reheat Coils
Two Component Cold Joint Crystalline Waterproofing	Motorized Air Dampers	Heat Tracing
Foamed in Place Polyurethane Insulation	Backdraft Dampers	Unit Heaters
Weather Barriers	Start-Up and Performance Testing Reporting	Cabinet Heaters
Metal Wall Panels	Fire Protection Standpipe System	Radiant Slab Systems
Composite Wall Panels	Wet Pipe Sprinkler System	EMC General Requirements
Wood Siding	Dry Pipe Sprinkler System	FMO Network Components and Infrastructure
Mineral Fibre Reinforced Composite Panels	Pre-action Sprinkler System	Integrated Building Management Platform
SBS Membrane Roofing	Packaged Fire Pump(s)	Facility Metering
Standing Seam Metal Roofing	Clean Agent Systems	High Voltage Equipment
Sheet Metal Flashing and Trim	Hybrid Water and Inert Gas Extinguishing Systems	Switchgear
Applied Fireproofing	Plumbing Pumps	MDP
Firestopping and Smoke Seals	Incoming City Water Filtration System	CDPs
Metal Doors and Frames	Domestic Water Piping Fittings, Valves and Joint Methods	Panelboards
Wood Doors	Domestic Water Heaters /Generators	SPDs
Access Doors and Panels	RO Systems	Generators (Complete System, including Silencers, Day Tanks, Pumps)
Coiling Doors and Grilles	Rainwater Harvesting System	Load Banks
Sound Control Door Assemblies	Underground Tanks	Paralleling Control and Load Management Systems
Folding Security Grilles	Plumbing Specialties	Transfer Switches
Aluminum Framed Entrances and Storefronts	Plumbing Fixtures and Trim	UPS Systems
Automatic Entrances	Grease Interceptors	Transformers
Glazed Aluminum Curtain Walls	Oil Interceptors	Power Factor and Harmonic Correction Equipment
Door Hardware	Medical Gas Systems	Firestop Details
Access Control Hardware	Technical/Service Gases Systems (All Systems Other Than Medical Gas Systems)	Maintenance Holes
Glass and Glazing	Facility Fuel Oil Piping	Wiring Products and Raceways
Louvres and Vents	Natural Gas Systems	Wiring Devices
Acoustical Ceilings	Oil Storage Tanks	Lightning Protection and Grounding Equipment
Visual Display Surfaces	Fuel Oil Pumps	EVSE
Signage	Fuel Filtration Systems	Luminaires, including Static Graphic Displays, UVC and CDL fixtures
Toilet Compartments	Fuel Oil Polishing System	Lighting Control Systems and Devices
Cubicle Curtain and Track	Fuel Management System	Clocks

Customary Shop Drawing Examples		
Wall and Door Protection	Water Specialties-Heating and Cooling	Fire Alarm System and Devices
Toilet and Bath Accessories	Steel Pipe, Valves (Including balance & control valves) and Fittings – Heating and Cooling	Fire Alarm Annunciator Graphic and CACF Layout
Fire Protection Specialties	Piping, Valves and Fittings Systems (For All Systems)	Communications Systems (refer to Section 2.5.8.6)
Metal Lockers	All Piping Joint Methods for All Piping Associated Systems	Access Control System
Exterior Sun Control Devices	Pumps and Pump Accessories – All Systems	Wireless Staff Duress System
Fall Arrest Equipment	Hydronic Closed Loops Chemical Treatment Systems	Fixed Duress System
Food Services Equipment	Condenser Water Open Loop Filtration and Chemical Treatment Systems	Intrusion Detection System
Artwork Supports	Fans	Overdose Notification System
Window Coverings	Terminal Boxes/VAVs	Intercommunications System
Countertops	Fan Coil Units	IP Video Surveillance System
Entrance Floor Grilles	Fan Filtered HEPA Filtration Units	Clinical Observation Camera System
Furniture	Air Filters (All Types of Filtration Other Than Specifically Listed Here)	MRI Quench Tubes
Site Furnishings	Kitchen Grease Removal Filtration System	Security Signage
Manufactured Planters	Isolation Rooms Contaminated Exhaust Filtration Units	Patient Wandering System
	Grilles, Registers and Diffusers	Chain Link Fences and Gates
Elevators	Louvers	Irrigation
Motors Starters and Wiring	Fabricated Breeching and Accessories	Growing Medium Preparation
Adjustable Frequency Drives	Fabricated Stacks	Storm water detention facilities
Controls System Components (BMS)	Insulated Sectional Chimneys	Storm water treatment facilities including oil-grit separators
Flex Connections, Expansion Joints, Anchors and Guides	Packaged Hot Water Boiler (including ancillary equipment)	Flow control manholes
Flow and Energy Meters	Steam Boilers/Generators (including ancillary equipment)	Box culverts
Indicating Gauges	Humidifiers	Headwalls
Valves (All Systems)	Deaerators	Water meter chamber
Check Valves (All Systems)	Condensate Receiving System(s)	Manholes
Strainers (All Systems)	Steam Specialties	Pneumatic Tube Systems
Vibration Isolation Pump Drops	Suction Diffusers	

2.5.3.10 Vendor and /or Manufacturer Sign-off Form

2.5.3.10(1) Provide complete fully executed vendor and /or manufacturer sign-off forms at 70% Submittal Stage; refer to Appendix 1V [Asset Management Requirements] Attachment 2 – Vendor and /or Manufacturer Sign-off Form.

2.5.3.11 Samples

2.5.3.11(1) Provide two sample mock-ups of each type of insulation by application (piping (include elbows and joints), valves, ducting, accessories, etc.) indicating where each is to be used and a sample of a typical vapour barrier dam. Sample mock-ups will be

mounted on boards. One will be kept at the Contractor's site office and the other will be turned over to the Authority.

2.5.3.11(2) Submit physical samples of all interior and exterior finished materials that the Authority would customarily receive, or expect to receive, for a healthcare facility similar to the Facility in accordance with Good Industry Practice.

2.5.3.11(3) Submit samples of each luminaire, illuminated sign, and lighting sensor/control device type for review by the Authority. Each approved sample will be retained on job site until Substantial Completion.

2.5.3.11(4) Submit samples of each type of wiring and nurse call device type (complete with cover plates), re-penetrable firestop systems, and permanent labels/nameplates for review by the Authority. Each approved sample will be retained on job site until Substantial Completion.

2.5.3.11(5) Luminaires, equipment and devices that do not match quality and workmanship of standard sample will be rejected.

2.5.3.11(6) Provide a sample of each IP system device within the Integrated Automation (Division 25) system for potential third-party testing purposes.

2.5.3.12 Operation and Maintenance Manuals

2.5.3.12(1) Refer to Appendix 1U [BIM Requirements] for information on handling and naming requirements to link manuals to the BIM and Asset database.

2.5.3.12(2) Format Requirements

2.5.3.12(2)(a) Provide operation and maintenance manuals in bound hard copy and electronic formats. Include operating and maintenance instructions for each system and major piece of equipment, as well as maintenance instructions for building elements, fixtures and finishes.

2.5.3.12(2)(b) Hard copy formats will be as set out in Appendix 1V [Asset Management Requirements].

2.5.3.12(2)(c) Electronic formats will be as set out in Appendix 1V [Asset Management Requirements] with the following provisions:

2.5.3.12.2.(c).1 Provide a copy of each maintenance manual in portable document format (PDF) file format on a separate USB memory key;

2.5.3.12.2.(c).2 Break down large files into sections and use bookmark structure for easy navigation; and

2.5.3.12.2.(c).3 Organize electronic data using directories and sub-directories as generally described in Section 2.5.3.8(3). Prior to assembling the electronic data, submit to the Authority a detailed list of the proposed directory/sub-directory structure including proposed file names which will be in accordance with ISO 19650. File names will be easily recognizable so that there is no need to open the document to know what information the file contains. Directory structure and file naming is subject to the approval of the Authority.

2.5.3.12(3) Content Requirements

2.5.3.12(3)(a) Operation and maintenance manuals will include, at minimum, the following:

2.5.3.12.3.(a).1 Copies of product data sheets (with checkmarks for all options included);

2.5.3.12.3.(a).2 Reviewed shop drawings;

2.5.3.12.3.(a).3 Manufacturer’s certificates;

2.5.3.12.3.(a).4 Field test reports;

2.5.3.12.3.(a).5 Material safety data sheets;

2.5.3.12.3.(a).6 Installation instructions;

2.5.3.12.3.(a).7 parts lists and operation or instruction data for operating equipment and building components;

2.5.3.12.3.(a).8 Cleaning and maintenance schedules;

2.5.3.12.3.(a).9 Filters, overhaul, replacement, servicing, lubrication and adjustment schedules;

2.5.3.12.3.(a).10 Emergency procedures where applicable;

2.5.3.12.3.(a).11 Valve schedule and flow diagrams including for trap primers as indicated in Section 7.4.2.23(4)(y); and

2.5.3.12.3.(a).12 Similar maintenance information.

2.5.3.12(3)(b) Provide separate data manuals which will include data sheets, test reports, Commissioning reports, balancing reports and alike in accordance with CSA Z8002 Operation And Maintenance Of Health Care Facilities.

2.5.3.12(3)(c) Instructions in manuals will be written in plain language (Canadian English) so as to guide the Authority in the proper operation and maintenance of building materials, Components, equipment and

systems; refer to Appendix 1V [Asset Management Requirements].

2.5.3.12(3)(d) Cover Page: Include title of project, date of submission, names, addresses, and telephone numbers of the Authority and contractor with the names of responsible parties.

2.5.3.12(3)(e) Table of Contents: Arrange content by systems under section numbers and sequence of table of contents.

2.5.3.12(3)(f) Contact Information: For each product or system, list name, contact, full address, telephone and facsimile numbers, internet and email addresses of subcontractors and suppliers, including the local source of supplies and replacement parts.

2.5.3.12(3)(g) Product Data: Mark each sheet to clearly identify specific products and component parts; delete inapplicable information. Provide sequence of instructions for each process and procedure, incorporating manufacturer's written installation instructions.

2.5.3.12(3)(h) Shop Drawings: Include complete set of final reviewed shop drawings with seals and stamps indicating review by subcontractor, contractor, Professional Engineer (where required), and applicable consultants.

2.5.3.12(3)(i) Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

2.5.3.12(3)(j) Certificates of Acceptance: Relevant certificates issued by AHJ, including code compliance certificate Life Safety Systems performance certificate and pressure vessel acceptance.

2.5.3.12(3)(k) Update the manuals periodically during the installation and Commissioning phase of the Work so that the manuals are final by Total Completion.

2.5.3.12(3)(l) Include Equipment supplied by the Authority.

2.5.3.13 Record Documentation

2.5.3.13(1) At a minimum, the Record Documentation package supplied by the Design-Builder will include:

2.5.3.13(1)(a) PDF (combined into a single document per system);

2.5.3.13(1)(b) BIM derived Asset database;

2.5.3.13(1)(c) The completed BIM software model representing the as-built conditions of the Project; refer to Appendix 1U [BIM Requirements];

2.5.3.13(1)(d) Full size set of Record Documentation drawings; and

2.5.3.13(1)(e) (3) USB memory keys.

2.5.4 Architectural Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
Title sheet, legends, drawing list, key plans and assembly listings	X	X	X	X	X	X
Site plans, context site plan	X	X	X	X	X	X
Floor plans and roof plans	X	X	X	X	X	X
Reflected ceiling plans	-	X	X	X	X	X
Exterior elevations	X	X	X	X	X	X
Interior elevations	-	X	X	X	X	X
Building sections, transverse, longitudinal	X	X	X	X	X	X
Wall sections	-	X	X	X	X	X
Large Scale (1:50) Room Data Sheets	-	X	X	X	X	X
Plan and section details	-	X	X	X	X	X
Vertical Movement (Plans) –	X	X	X	X	X	X
Vertical Movement (Sections and Details)		X	X	X	X	X
Special elements, signage, etc.	-	X	X	X	X	X
Schedules, doors, windows, hardware, finishes, etc.	-	X	X	X	X	X
Millwork – (Plans)	-	X	X	X	X	X
Millwork – (Sections and Details)	-	X	X	X	X	X
Code Compliance Fire Separations (vertical and horizontal), Exiting Travel Distance Plans	X	X	X	X	X	X
Occupant loads, and exit width capacities	X	X	X	X	X	X
*BIM Models **						
Architectural Information Model	X	X	X	X	X	X
COBie Dataset	X	X	X	X	X	X
Specifications						
Table of Contents	-	X	X	X	X	X
General Requirements	-	X	X	X	X	X
Existing Conditions (if any)	-	X	X	X	X	X
Concrete	-	X	X	X	X	X
Masonry	-	X	X	X	X	X
Metals	-	X	X	X	X	X
Wood, Plastics and Composites	-	X	X	X	X	X
Thermal and Moisture Protection	-	X	X	X	X	X
Openings	-	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Finishes	-	X	X	X	X	X
Specialties	-	X	X	X	X	X
Equipment	-	X	X	X	X	X
Furnishings	-	X	X	X	X	X
Conveying Equipment -Elevators	-	X	X	X	X	X
Other						
Basis of Design	X	X	X	X	X	X
Pneumatic Tube Station Study	X	X				
Code Compliance Report	X	X	X	X	X	X
Acoustic Report	X	X	X	X	X	-
Interior Design Package	-	X	X	X	X	-
3-Minute Fly-Through Promotional Video	X					
Colour Boards Master Colour Palette	-	X	X	X	X	-
Life Cycle Matrix and Vendor Sign Off Forms	X	X	X	X	X	X
Future CC Rooms and Spaces	X	X				
Resilient Design Review Worksheet	X	X	X	X	X	X
Wind Study	-	X	X	X	X	X

2.5.4.1 Schedule of Accommodations

2.5.4.1(1) With each progressive Submittal, provide a comparison between the Design-Builder's Design and Appendix 1A [Clinical Specifications and Functional Space Requirements] utilizing the Schedule of Accommodation format (in excel). Include the following:

2.5.4.1(1)(a) Room-by-room comparison of programmed area compared to drawn area (in NSM);

2.5.4.1(1)(b) Room-by-room percentage variance between the programmed area and the drawn area;

2.5.4.1(1)(c) Area totals (NSM) per Sub-Component and/or Component expressed as the total programmed compared to drawn area. Also include total CGSM per Component along with Component net-to-gross ratio (NSM to CGSM); and

2.5.4.1(1)(d) Area summary table listing all CGSM per floor and the total BGSM for the Facility along with Component to building gross ratio per floor and for the entire building (CGSM to BGSM).

2.5.4.2 Interior Design Package will contain the following:

2.5.4.2(1) Material sample boards which communicate to the Authority all proposed interior finishes including Millwork, furniture, paint, flooring, ceilings and alike. Provide consolidated interior design drawings coordinated with other interior Components such as Wayfinding signage, lighting and artwork.

2.5.4.3 Plans, sections and elevations will contain the following:

2.5.4.3(1) Floor elevations (geodetic, on floor plans, sections and elevations) complete with floor level changes, stairs and ramps;

2.5.4.3(2) Floor finishing tolerances, slopes for drainage, drain openings, etc. will be identified;

2.5.4.3(3) Gridlines and gridline dimensions;

2.5.4.3(4) Outlines of the exterior walls and partitions in relation to the structural framework complete with graphical representation of materials cross- referenced to partition types and dimensions;

2.5.4.3(5) Clearly indicated functions of each building material Component and Rain Screen construction Component (e.g., air barrier, vapour barrier, moisture barrier, acoustical barrier, security barrier, fire resistance, thermal resistance, etc.);

2.5.4.3(6) The location of doors and windows, and other openings complete with cross-references to door, window and hardware schedules;

2.5.4.3(7) The location of fixtures and equipment for all spaces including mechanical rooms, Electrical Rooms and Communications Rooms complete with cross-references to equipment schedules, notes and dimensions;

2.5.4.3(8) Clearly indicate access for Persons with Disabilities, path of travel, clearances complete with notes and dimensions;

2.5.4.3(9) Designate room name and number of interior spaces. Maintain the Authority room reference number as stated in the Appendix 1A [Clinical Specifications and Functional Space Requirements] Schedule of Accommodation. The Record Documentation will include final room numbering as set out in Appendix 1R [Wayfinding Standards and Requirements] and as coordinated with and approved by the Authority;

2.5.4.3(10) Graphically represent Construction and finish materials for walls and floors;

2.5.4.3(11) Graphically represent the wall thickness on the floor plans and indicate the overall construction assembly including shielding;

2.5.4.3(12) Illustrate built-in seating elements, Millwork, specialty casework and Equipment;

2.5.4.3(13) Graphically illustrate fire separation(s), Areas of Refuge, Contained Use Areas, Outbreak Control Zones, acoustic separation(s), security separation(s), etc.; and

2.5.4.3(14) Vertical movement plans, sections and details will contain clearly indicated rise and run, headroom clearances, landing elevations, vertical and horizontal dimensions, railing and guards complete with clearances for Persons with Disabilities, and notes.

2.5.4.4 Equipment access and replacement route plans will clearly indicate access provisions and routes designed for the installation and replacement of equipment, including medical Equipment.

2.5.4.5 Identification of confined spaces in the Design. Provide drawings including signage and risk mitigation strategies which demonstrate compliance with all applicable standards for confined space.

2.5.4.6 Reflected ceiling plans will contain:

2.5.4.6(1) Graphical representation of ceiling finishes, equipment (such as x-y gantry ceiling lifts), luminaires complete with cross-reference to lighting, security, sprinkler, HVAC, fire alarm, and Ceiling Heights etc.;

2.5.4.6(2) Clearly indicated bulkheads complete with graphical representation of Construction and materials, notes, Ceiling Heights and dimensions; and

2.5.4.6(3) Clearly indicated graphical representation of systems and equipment interference for structural, mechanical, electrical, communications, safety and security, etc., complete with cross-reference notes and dimensions.

2.5.4.7 Penthouse and roof plans will contain:

2.5.4.7(1) The location of fixtures and equipment for mechanical, electrical, maintenance, etc. complete with notes and dimensions;

2.5.4.7(2) Indication of access pathways and reinforced landing spots for movement and removal/replacement of heavy equipment;

2.5.4.7(3) Clearly indicated roof penetrations for equipment, hatches, rooftop access pathways, fall arrest anchors, antennae supports/ties, etc.; and

2.5.4.7(4) Graphically represent Construction and finish materials for roof.

2.5.4.8 Exterior elevations will contain:

2.5.4.8(1) The location of doors and windows, sidelights, and other openings;

2.5.4.8(2) Graphical representation of Construction and finish materials, including a legend and notations;

2.5.4.8(3) Scuppers, downs spouts or drainage systems, hose bibbs and electrical outlet and exterior light locations; and

2.5.4.8(4) Landscape treatment proposed in relation to exterior and windows.

2.5.4.9 Interior elevations will contain:

2.5.4.9(1) The location (height) of doors, windows, and other openings; all wall-mounted equipment, mechanical, electrical, communications and safety and security, dimensions of vertical changes in materials or finishes and room numbers;

2.5.4.9(2) Graphical representation of Construction and finish materials including a legend and notations is to be provided; and

2.5.4.9(3) Clearly indicate wall finishes, colour choices and details.

2.5.4.10 Building sections will contain:

2.5.4.10(1) Clearly indicated floor construction/assemblies, floor elevations, dimensions and finished ceiling elevations; and

2.5.4.10(2) Clearly indicated graphical representation of systems and equipment interference for structural, mechanical, electrical, communications, safety and security, etc., complete with cross-reference notes and dimensions.

2.5.4.11 Wall sections (scale 1:20) will contain:

2.5.4.11(1) Clearly indicated detail location tags and references to the floor plans; wall type notations; and critical dimensions; and

2.5.4.11(2) Clearly indicated graphical representation of systems and equipment interference for structural, mechanical, electrical, communications, safety and security, etc., complete with cross-reference notes and dimensions.

2.5.4.12 Room Data Sheets will include, on one (1) or two (2) coordinated drawing sheets per room or space:

2.5.4.12(1) The following spaces, including all rooms related to them as shown in the Schedule of Accommodations in Appendix 1A [Clinical Specifications and Functional Space Requirements]:

2.5.4.12(1)(a) Rooms and areas listed under the space descriptions / variants listed in Appendix 1N [Electrical and Communications Matrix];

2.5.4.12(1)(b) Other rooms and spaces as required by the Authority for the process described in Schedule 2 [Review Procedure];

2.5.4.12(1)(c) Mechanical Rooms;

2.5.4.12(1)(d) Electrical Rooms; and

2.5.4.12(1)(e) Communications Rooms; refer to Sections 2.5.9.2(20) and 2.5.9.2(28)(i) for additional Communications and Multimedia Rooms requirements.

2.5.4.12(2) 1:50 scale floor plans complete with dimensions which demonstrate the following:

2.5.4.12(2)(a) room proportions and any fixed projections into the space such as columns;

2.5.4.12(2)(b) clearances for wheelchairs, stretchers or other mobile Equipment maneuverability;

2.5.4.12(2)(c) clearances for Persons with Disabilities such as at door openings and at plumbing fixtures;

2.5.4.12(2)(d) clearances around or between items of Equipment and fixed elements such structure, walls for Millwork; and

2.5.4.12(2)(e) clearances for any service or maintenance access as set out in this Schedule.

2.5.4.12(3) Provide 1:50 scale interior elevations and reflected ceiling plans, with all relevant furniture, systems furniture, and Equipment shown and including structural, mechanical, electrical, communications, safety, security and service requirements;

2.5.4.12(4) Architectural requirements including interior finishes, doors, Millwork, specialty casework, wall protection, door protection, room accessories and window coverings;

2.5.4.12(5) Mechanical requirements including HVAC type, plumbing fixtures, room controls, ventilation diffusers, sprinkler system and medical gases;

2.5.4.12(6) Electrical requirements including power, lighting, and lighting controls;

2.5.4.12(7) Communications requirements including Division 27 systems and device locations; and

2.5.4.12(8) Safety and security requirements including Division 28 systems and device locations.

2.5.4.13 Millwork plans, sections and details will include:

2.5.4.13(1) Millwork layout, sections, elevations and details complete with material choices, workstation locations including keyboards and monitor(s), notes and dimensions.

2.5.4.14 Special elements, furniture, systems furniture and signage will include:

2.5.4.14(1) Detailed graphical representations of the above noted items in relation to exterior and interior walls, structural framework, material connections and interrelationships complete with cross-reference to schedules, notes, materials, and dimensions;

2.5.4.14(2) Detailed location of fixtures and equipment for communications, safety and security complete with cross-reference to equipment schedules, notes and dimensions; and

2.5.4.14(3) Base-building elements will be graphically distinct from special elements.

2.5.4.15 Schedules (doors, door hardware, windows, room finishes, furniture, systems furniture, signage, etc.) will include:

2.5.4.15(1) Clearly indicated material, size, fire / thermal / acoustic / security resistance rating, colour, texture, pattern, etc.; and

2.5.4.15(2) Schedules may be graphical and/or tabular in drawing or specification format.

2.5.4.15(3) The door hardware schedule will include descriptions of sequences of operation.

2.5.4.16 Keying Plan and Pin Codes

2.5.4.16(1) Provide a door hardware keying plan with pin codes and key types identified on the door schedule and floor plans.

2.5.4.16(2) Coordinate with the Authority to approve the supply of key bitting information, schedule and ‘blanks’ from the Design-Builder’s supplier.

2.5.4.17 Firestopping Report

2.5.4.17(1) Provide a Firestopping Report to the Authority which documents the locations and firestopping product that were installed at all

core holes within the structural slab. The Firestopping Report will include all third-party reviews and acceptances of the firestopping as set out in Section 6.7.25 Firestopping.

2.5.4.18 Acoustic and Vibration Submittals

2.5.4.18(1) The Design-Builder will demonstrate compliance with the Agreement, Authority design reviews, and input by the Acoustic and Vibration Consultant with the submission of Acoustic and Vibration Reports at each Phase.

2.5.4.18(2) The 30% Phase Submittal will include at minimum:

2.5.4.18(2)(a) Site noise and vibration assessment and mitigation requirements to meet specified noise and vibration limits as set out in this Schedule, with consideration of the adjacent rail yard activity and roadway noise and their potential effect on vibration sensitive spaces, indoor Patient areas, and outdoor spaces that will be exposed to rail noise;

2.5.4.18(2)(b) Building structural vibration assessment for footfalls and vehicle induced vibration in vibration sensitive spaces;

2.5.4.18(2)(c) Preliminary assessment of mechanical equipment noise with focus on Major Mechanical Equipment (e.g., generators) and mechanical room noise control intent to meet indoor and outdoor requirements;

2.5.4.18(2)(d) Room acoustics assessment and recommendations;

2.5.4.18(2)(e) Review any recommendations for any gym or similar activity space where impact noise control is required;

2.5.4.18(2)(f) Exterior noise ingress assessment, façade acoustic performance assessment, recommendations; and

2.5.4.18(2)(g) Interior partition designs and assignments, including assessment and recommendations.

2.5.4.18(3) The 50% Phase Acoustic and Vibration Submittal will include at minimum:

2.5.4.18(3)(a) Review, confirm, and update recommendations provided in 30% Phase Submittals and check for changes that require further review;

2.5.4.18(3)(b) Confirmation that the building envelope sound isolation will meet the design requirements; and

2.5.4.18(3)(c) Confirmation that the Minimum STC ratings of demising walls and floor/ceiling assemblies will be met throughout the Hospital.

2.5.4.18(4) The 70% and 90% Phase Acoustic Report Submittal will include at minimum:

2.5.4.18(4)(a) Review, confirm, and update recommendations provided in 50% Phase Submittals and check for changes that require further review;

2.5.4.18(4)(b) Minimum STC ratings of demising walls and floor/ceiling assemblies;

2.5.4.18(4)(c) Detailed assessment of mechanical noise radiation to the exterior surroundings and a strategy for meeting Project requirements;

2.5.4.18(4)(d) Detailed mechanical noise assessment of interior noise levels with noise and vibration controls specified; and

2.5.4.18(4)(e) Confirmation of implementation of recommendations from all previous Submittals.

2.5.4.18(5) The 100% and Record Documentation will include at minimum:

2.5.4.18(5)(a) Confirmation of implementation of recommendations from all previous acoustic, vibration, and noise Submittals and a list of outstanding deficiencies with recommendations for corrections; and

2.5.4.18(5)(b) Compliance planning and testing reporting as required in Section 5.6.21.

2.5.4.19 Building Code Submittals

2.5.4.19(1) BC Building Code compliance report will contain the following:

2.5.4.19(1)(a) Approach to compliance with Division B Part 3 of the BCBC, with more specific information on compliance with requirements for treatment occupancies such as compartmentation within floor areas containing Patients' sleeping rooms, and areas of refuge if applicable;

2.5.4.19(1)(b) BC Building Code compliance drawings indicating information such as

2.5.4.19.1.(b).1 fire department access both interior and exterior including designated fire lanes with required turning radius;

2.5.4.19.1.(b).2 fire department access to hydrants and fire sprinkler connections;

2.5.4.19.1.(b).3 fire separations;

2.5.4.19.1.(b).4 travel distances to exits;

2.5.4.19.1.(b).5 spatial separation requirements if applicable; and

2.5.4.19.1.(b).6 compartmentation for floor levels with Patients' sleeping rooms;

2.5.4.19(1)(c) BCBC Data Matrix including design considerations; and

2.5.4.19(1)(d) Fire and Life Safety Data Summary (may be illustrated graphically).

2.5.4.19(2) When applicable, alternative solutions will contain:

2.5.4.19(2)(a) All information required by the AHJ;

2.5.4.19(2)(b) The reason(s) why the alternative solution is necessary or desirable;

2.5.4.19(2)(c) Any operational impacts of the Alternate Solution; and

2.5.4.19(2)(d) Any operations and maintenance impacts of the Alternate Solution.

2.5.4.20 Maintenance Manuals

2.5.4.20(1) The Design-Builder will provide maintenance manuals containing the following and in accordance with Appendix 1V [Asset Management Requirements]:

2.5.4.20(1)(a) Copy of hardware schedule for products, as installed;

2.5.4.20(1)(b) Copy of material and paint colour schedules, with complete description and manufacturer's product identification names and numbers;

2.5.4.20(1)(c) Manufacturer's equipment, materials, and products, including data, details, identification, schedules of maintenance, operational and installation instruction information;

2.5.4.20(1)(d) Guarantees, warranties, maintenance bonds, certificates, letters of verification, and registration cards, including the following information:

2.5.4.20.1.(d).1 Name and address of subject/project; and

2.5.4.20.1.(d).2 Signature and seal of the contractor, installer, manufacturer and/or supplier, as applicable, providing the guarantee or warranty.

2.5.4.20(1)(e) Certificates of Inspection;

2.5.4.20(1)(f) Test reports and certificates, as applicable; and

2.5.4.20(1)(g) Confirmation letters:

2.5.4.20.1.(g).1 Confirmation letters that all portable units, equipment, materials such as fire extinguishers, special tools, supplies and spares been properly handed over, bar coded and/or documented in a spreadsheet with description, manufacturer details, usage and location as well as entering into the Asset Management system for tracked Assets, and that they have been received by the Authority in good order.

2.5.4.20.1.(g).2 Confirmation letters that all keys for all equipment and/or panels, elevator pads/accessories, and keys to Millwork, systems furniture and specialty casework have been properly handed over by labelling and placing in the Key Management systems secure storage and entered into the Key Management Systems software.

2.5.4.21 Resilient Design Review Worksheet

2.5.4.21(1) The Design-Builder will provide a worksheet using the format as provided by the Authority, which demonstrates how the Design meets the Authority's requirements for climate resiliency including compliance with the requirements as set out in this Schedule. Refer to Section 3.7 for additional requirements.

2.5.4.22 Wind Study

2.5.4.22(1) Provide a Wind Study consisting of physical models which includes the following:

2.5.4.22(1)(a) Demonstration to the satisfaction of the Authority, that Facility exhaust systems are not a nuisance or otherwise detrimental to users of the Facility, including with regards to prevailing winds;

2.5.4.22(1)(b) Physical modeling for the Site and key surrounding buildings. The physical model(s) will be handed over to the Authority for use during Future Expansions as a condition of Substantial Completion; and

2.5.4.22(1)(c) Demonstration to the satisfaction of the Authority, that the Design does not create adverse or extreme wind conditions detrimental to pedestrian comfort.

2.5.4.23 Record Documentation

2.5.4.23(1) The Design-Builder will supply a Record Documentation package in accordance with Section 2.5.3.13.

2.5.5 Civil Construction Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
On-Site Drawings Title sheet, typical sections and details used on this Project	X	X	X	X	X	X
Existing Conditions	X	X	X	X	X	-
Erosion and Sediment Control	X	X	X	X	X	-
Site Coordination Layout, turning templates for emergency and service vehicles	X	X	X	X	X	-
Storm Water Management Plan	X	X	X	X	X	X
Grading, Site Servicing, Roads, Parking Lot(s)	X	X	X	X	X	X
Utilities Plan and Profile	X	X	X	X	X	X
Electrical and Streetlights Plan	X	X	X	X	X	X
Third-party Utilities Plan	X	X	X	X	X	X
Sections and details	-	X	X	X	X	X
Pavement Marking and Signage Plans	-	X	X	X	X	X
Groundwater Management - Hydrogeological Study by GeoPacific Geotechnical Engineering Consultant	X	X		X	X	X
Site Servicing Design Brief (Basis of Design)	X	X	X	X	X	X
Off-Site Drawings						
Deep and Shallow Utilities Plan and Profile		X	X	X	X	X
Roadworks Plan and Profile		X	X	X	X	X
Right-of-way Plans	X	X	X	X	X	-
Erosion and Sediment Control	X	X	X	X	X	-
Storm Water Culvert Plan and Profile and Ditch Profile		X	X	X	X	X
Storm Water Control Plan	X	X	X	X	X	X
Street Lighting and Traffic Signalization Plans	X	X	X	X	X	X
Storm water Model and Storm water Modelling Report	X	X	X	X	X	-

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
*BIM Models **						
Civil Construction Information Model	X	X	X	X	X	X
COBie Dataset (if applicable)	X	X	X	X	X	X
Specifications						
Civil Specifications	-	-	-	X	X	-

2.5.5.1 Plans, sections and elevations will contain the following:

2.5.5.1(1) Provide diagrams describing:

2.5.5.1(1)(a) How general traffic works during Construction; and

2.5.5.1(1)(b) How parking stall allocation works during Construction.

2.5.5.1(2) Existing site conditions;

2.5.5.1(3) Erosion and sediment control plans;

2.5.5.1(4) Storm sewer drainage profiles and plans including detention facilities and watercourse setbacks;

2.5.5.1(5) Sanitary sewer profiles and plans;

2.5.5.1(6) Water main profiles and plans;

2.5.5.1(6)(a) Design-Builder will be responsible for submitting watermain drawings to Fraser Health Environmental Health Services through the Application for Water Works Construction Permit and obtaining the Waterworks Construction Permit;

2.5.5.1(7) Third-party Utilities plans;

2.5.5.1(8) Site coordination layouts, including turning movements for emergency and service vehicles;

2.5.5.1(9) Site grading and roadworks plans;

2.5.5.1(10) Pavement marking and signage plans;

2.5.5.1(11) Site Servicing Design Brief:

2.5.5.1(11)(a) Water analysis design brief identifying the demands of the Site and the impact on the surrounding network; and

2.5.5.1(11)(b) Sanitary analysis design brief identifying the demands of the Site and the impact on the surrounding network.

2.5.5.1(12) Storm water management plan;

2.5.5.1(12)(a) Storm water management analysis design brief identifying the demands of the Site and the impact on the surrounding network.

2.5.5.1(12)(b) Storm water management drawing identifying storm water facilities and the fulfillment of the requirements outlined in Section 4.15.7.

2.5.5.1(12)(c) Refer to Section 4.14.10.5 for storm water modelling requirements.

2.5.5.1(13) Developed Off-Site drawings:

2.5.5.1(13)(a) Roadway Infrastructure profiles and plans;

2.5.5.1(13)(b) Storm sewer drainage, culvert and ditch profiles and plans;

2.5.5.1(13)(c) Storm water control plan;

2.5.5.1(13)(d) Sanitary sewer profiles and plans;

2.5.5.1(13)(e) Water main profiles and plans;

2.5.5.1(13)(f) Street lighting and traffic signal plans

2.5.5.1(13)(g) Third-party Utilities plans; and

2.5.5.1(13)(h) Right-of-way plans.

2.5.5.2 Existing conditions drawing will contain all pertinent topographic information, contours at appropriate interval with spot elevations in clear legible format, all underground Utilities including inverts and depths, size and type, borehole and test pit locations and elevations, existing and new survey monuments.

2.5.5.3 Erosion and Sediment Control

2.5.5.3(1) The Design-Builder will obtain an Erosion & Sediment Control permit from the City of Surrey Engineering Department for the Off-Site works as part of the works and services for this site.

2.5.5.3(2) The Design-Builder will obtain an Erosion & Sediment Control permit from the City of Surrey Engineering Department for the On-Site works prior to issuance of the building permit.

2.5.5.3(3) The Erosion & Sediment Control (ESC) Permit process requires submission and approval of an ESC Plan that is developed in accordance with Best Management Practices to meet the

performance requirements as set out in Bylaw 2006, No. 16138 during construction.

2.5.5.3(4) Erosion and sediment control drawings will contain existing topographic information, contours at appropriate intervals with spot elevations, calculations for sizing of erosion and sediment control facilities, design and layout of each Facility, storm water discharge connection and location, quality measurement point and details of erosion and sediment control facilities.

2.5.5.4 Site coordination and layout drawing will contain:

2.5.5.4(1) Horizontal and vertical control, the principal site elements to be constructed, survey monuments and/or nearby buildings or structures that may be used to show the relative location of the proposed structure of work, sufficient dimensions or coordinates that the exact location of proposed work is clearly identified, Construction lay down area, relative locations of all below and above ground Utilities (e.g., electrical, water main, sanitary sewer, storm sewer, etc.), site removals; and

2.5.5.4(2) Demonstrated vehicle and pedestrian movements for all types of expected traffic to and from the Facility.

2.5.5.5 Grading plan will contain the footprint and finished floor elevation of the Facility, proposed grades with existing contours/grades provided in background in light font, dimensions and proposed site development features, including pavement/curb, sidewalk type, and street light locations.

2.5.5.6 Deep and shallow Utilities plan and profile will contain horizontal location and vertical depths of new, existing, and temporary services; Utilities; manholes numbered; drainage structures numbered; valves; roof leader tie in points; location of foundation drainage (if required); structure data table; pipe load and capacities per the BC Plumbing Code for the On-Site system and the City of Surrey – Design Criteria for the Off-Site system.

2.5.5.7 Site servicing plan will include a Phasing Plan for water main flushing, pressure testing and disinfecting the services to the Facility. Plan to be submitted and reviewed by the AHJ for approval.

2.5.5.8 Storm Water Control Plan will contain catchment areas, existing storm sewer system, flow direction, and calculations using hydrologic computer programs using the hydrograph generation methodology confirming system capacity and assessing the 5-year and 100-year post development flows to the nearest downstream trunk storm sewer servicing an area greater than 20 hectares and completed in accordance with the references, design criteria, climate change requirements, and all other requirements referenced in the Stormwater Management Report completed by R.F. Binnie and Associates.

2.5.5.9 Storm Water Management Plan will contain catchment areas, existing storm sewer system, flow direction, calculations for pre-development and post-development flows, detention calculations, and best management practices. Flow calculations will be calculated using either rational method or hydrologic computer programs using the hydrograph generation methodology.

2.5.5.9(1) The Design-Builder will submit a Storm Water Management Plan for Development Permit application which will be required to include:

2.5.5.9(1)(a) An overview of how the Site intends to meet the City's storm sewer volume reduction, water quality and release rate criteria, for both pre- and post-site conditions specific to each Precinct, a summary of the rainwater management approach being taken, calculations and assumptions to support any figures provided;

2.5.5.9(1)(b) A Storm Water Management Plan which shows the surface types and identifies the rainwater management method that will be used in each area. The plan will indicate any rainwater routing into proposed practices, show the extents of underground parking and the location of any proposed practices. If landscaping will be used to capture any runoff, then area and depth of landscaping will be provided;

2.5.5.9(1)(c) A Site Servicing and Grading plan which shows the locations of all proposed rainwater management practices or devices with service connections to the municipal network and surface grading and drainage patterns;

2.5.5.9(1)(d) An Infiltration Report which supports any proposal for infiltration On-Site, prepared by a qualified professional. Any proposed infiltration practices will be designed based on site-specific conditions, including pollutant loading, groundwater elevation/contamination, infiltration rates, etc.;

2.5.5.9(1)(e) Detailed drawings for any proposed system or device being employed which include tank and orifice specifications, raingarden, swale or tree trench design drawings. Typical detail for each green infrastructure practice is to include inflow locations, flow dissipation, safe overflows, and sub-drains;

2.5.5.9(1)(f) Proprietary information for any proposed water quality treatment device, demonstrating that it meets the City of Surrey's Design Criteria Manual and ESC Bylaw requirements. If the device is being used as a primary treatment tool for high pollutant surfaces, then it will have the 'basic treatment' certification for 85% TSS removal, otherwise lower performing devices can be used for pre-treatment or as part of a treatment train. The Design-Builder may propose other technologies but will provide supporting information that shows the technology meets the standards; and

2.5.5.9(1)(g) Operation & Maintenance (O&M) Manual for all rainwater systems will be employed On-Site and Off-Site. O&M Manual will describe the level of effort and frequency of tasks required to maintain optimal performance for each individual component of the system.

2.5.5.10 Off-Site drawings will follow the City's most recent Drawing Standard Specifications. The Design-Builder will meet all requirements of the short-form Servicing Agreement and will submit all drawings, calculations, and details required by the City in order for the Authority to execute the Amending (Long Form) Servicing Agreement for the Off-Site works.

2.5.5.11 Groundwater Management

2.5.5.11(1) The Design-Builder will submit a Hydrogeological Study for Development Permit application, which will be based on the following:

2.5.5.11(1)(a) The requirements as shown in the City's current Groundwater Management Bulletin; and

2.5.5.11(1)(b) The Preliminary Hydrogeological Study Prepared by GeoPacific Geotechnical Consultant (May 2021).

2.5.5.12 Testing Documentation

2.5.5.12(1) The Design-Builder will supply all accompanying testing results and documentation in accordance with the MMCD Platinum Edition and the City of Surrey's latest Supplementary Master Municipal Construction Documents.

2.5.5.13 Record Documentation

2.5.5.13(1) The Design-Builder will supply a Record Documentation package in accordance with Section 2.5.3.13.

2.5.6 Structural Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
Title Sheet, General Notes	X	X	X	X	X	X
Typical Details	X	X	X	X	X	X
Structural moat wall plan, section and details	X	X	X	X	X	X
Slab, Column, Beam, Wall Schedules	X	X	X	X	X	X
Foundation Plans	X	X	X	X	X	X
Floor and Roof Framing Plans	X	X	X	X	X	X
Sections and Details	X	X	X	X	X	X
Wall and Bracing Elevations	X	X	X	X	X	X
Wall Sections	X	X	X	X	X	X
Specifications						
Concrete (Division 03)	X	X	X	X	X	-
Masonry (Division 04)	X	X	X	X	X	-
Metals (Division 05)	X	X	X	X	X	-
Wood (Division 06)	X	X	X	X	X	-
Earthwork and Piling (Division 31)	X	X	X	X	X	-
*BIM Models **						
Structural Information Model	X	X	X	X	X	X
Reports						
Basis of Design report, including the seismically isolated building structure	X	X	X	X	X	-
Calculation reports	X	X	X	X	X	-
Evaluation on the geotechnical aspects of the Seismically isolated building structure including calculation and testing reports as per Section 5.12.14 and the third-party geotechnical peer review reports of the seismically isolated building structure (refer to Section 5.12.14.8 for the requirements of the third-party geotechnical peer review.)	X	X	X	X	X	-
Snow Loading and Snow Drift Study	X	X	X	X	X	-

2.5.6.1 Title Sheet, General Notes, will contain:

2.5.6.1(1) General description of the structure including the structural moat wall and its base embedment anchorage and tied back anchors, its main components, gravity load resisting and lateral load resisting systems;

2.5.6.1(2) Codes and standards, with dates of issue, to which the design conforms;

2.5.6.1(3) Description of the lateral load resisting system will indicate values of Rd (ductility factor) and Ro (over strength factor) used in the design;

2.5.6.1(4) Importance factors used in the Design;

2.5.6.1(5) Design criteria indicating vertical design loads including dead and superimposed dead loads; occupancy live loads; exterior grade dead load and live load surcharge around the perimeter of the structural moat wall; snow loads (including drift); wind uplift loads; mechanical equipment loads; Construction loads; x-y gantry ceiling lift loads; special loading considerations;

2.5.6.1(6) Horizontal design loads indicated including seismic loads, wind loads, lateral earth pressures and hydrostatic pressures;

2.5.6.1(7) Loading plans showing area loads not covered by design criteria information such as planter and soil loads with an indication of maximum soil depth;

2.5.6.1(8) Geotechnical information used in the design including reference to the Geotechnical Reports, lateral pressure acting on the structural moat wall, footing or pile bearing capacities, site classification and site coefficients;

2.5.6.1(9) Concrete mix requirements indicating application, exposure classification, minimum 28-day compressive strength, and maximum aggregate size; and

2.5.6.1(10) Concrete cover requirements, based on weather and soil exposure, fire resistance rating, or chloride penetration.

2.5.6.2 Schedules as required for items such as columns, beams, slabs, walls, foundations, baseplates, and embed plates.

2.5.6.3 Structural moat wall plans, section and details, fully coordinated with other consultants' drawings, will contain:

2.5.6.3(1) Gridlines and gridline dimensions;

2.5.6.3(2) Wall types, sizes, thickness, and reinforcement, including its base embedment, tied back soil anchors and grade beams, if applicable. Walls will be located relative to the isolated Facility structures; indicate the moat wall cut-off elevations, penetration through the wall. Indicate frost protection and freeze mitigation measures, if applicable; and

2.5.6.3(3) Clearly indicate the plan and details of the structural moat walls and, if detailed elsewhere, ensure adequate referencing. Ensure seismic gap clearance, supported structures and its isolation details, wall corners, openings, intersections control joints, expansion joints, and construction joints are sufficiently detailed. Provide full height wall sections as required.

2.5.6.4 Foundation plans, fully coordinated with other consultants' drawings, will contain:

2.5.6.4(1) Gridlines and gridline dimensions;

2.5.6.4(2) Foundation types, sizes and reinforcement, including strip footings, pad footings, rafts, piles and pile caps, soil anchors and grade beams. Foundations will be located relative to the supported structure. Indicatively show and detail steps in footings; indicate pile base and cut-off elevations. Indicate frost protection and freeze mitigation measures;

2.5.6.4(3) Interior slabs-on-grade including thickness, reinforcement, contraction joint requirements, and subgrade requirements including moisture barrier if required. Indicate step heights or top of slab elevations and ensure step conditions etc. are sufficiently detailed. Show pits for elevators and mechanical openings;

2.5.6.4(4) Concrete walls including thickness and reinforcement. Clearly indicate shear walls and, if detailed elsewhere, ensure adequate referencing. Ensure wall corners, openings, intersections control joints, expansion joints, and construction joints are sufficiently detailed. Provide full height wall sections as required;

2.5.6.4(5) Concrete columns, pedestals and pilasters including dimensions and reinforcement, including tie arrangement details;

2.5.6.4(6) Steel columns and other steel framing elements including size and base plate details; and

2.5.6.4(7) Load bearing masonry walls if applicable, including masonry unit dimensions, reinforcement and grouting. Stud walls, if applicable, including stud sizes and spacing, plywood sheathing thickness and nailing requirements. Provide sufficient details as required.

2.5.6.5 Floor and roof framing plans, fully coordinated with other consultants' drawings, will contain, at a minimum, the following items:

2.5.6.5(1) Gridlines and gridline dimensions;

2.5.6.5(2) Concrete slabs including thickness, cambers and reinforcement. Show all openings coordinated with other consultants. Indicate step heights or relative elevations. Ensure step conditions, slab edge conditions, construction joints, delay strips, and such are sufficiently detailed;

2.5.6.5(3) Concrete walls including thickness and reinforcement. Clearly indicate shear walls and, if detailed elsewhere, ensure adequate referencing. Ensure wall corners, intersections, control and construction joints are sufficiently detailed. Provide full height wall sections as required;

2.5.6.5(4) Concrete columns, pedestals and pilasters including size and reinforcement, including tie and column rebar arrangement details. Ensure that columns starting, stopping and continuing are sufficiently detailed; ensure that offset column transitions are sufficiently detailed;

2.5.6.5(5) Concrete beams including dimensions and reinforcement. Elevate beams with complex reinforcement. Ensure beams are sufficiently detailed;

2.5.6.5(6) Detail concrete stairs, including throat thickness, reinforcement and sufficient details for cast in place stairs. For precast concrete stairs provide sufficient seating details;

2.5.6.5(7) Steel deck with or without concrete topping including thicknesses, deck type, connection to supporting structure, and shear transfer elements. Ensure sufficient deck edges, mechanical openings, ledger angles, framing around openings, and structural requirements for support of equipment are adequately detailed;

2.5.6.5(8) Steel beams, open web steel joists and steel trusses, including member sizes or depths, spacing, embed plates where connected to concrete and cambers. Ensure all design forces and moments are provided for use by connection designer, open web steel joist designer and truss designer. Ensure steel girts and ledgers between levels are clearly called up. Ensure desired intent for visually exposed connections is specified. Provide elevations for members between levels if required for clarity;

2.5.6.5(9) Steel columns including size, base plate, embed plate and cap plate details; and

2.5.6.5(10) Detail steel stairs, including stringer sizes and connection details.

2.5.6.6 Elevations, fully coordinated with other consultants' drawings, will contain, at a minimum, the following items:

2.5.6.6(1) Concrete wall or shear wall elevations as required to convey information not detailed on plan including complex areas of reinforcement, openings, shear wall zones, headers and such;

2.5.6.6(2) Concrete beam elevations for beams with complex reinforcement;

2.5.6.6(3) Steel bracing elevations including member sizes, forces and sufficient information for connection designer; and

2.5.6.6(4) Any other elevations deemed necessary to convey sufficient structural information.

2.5.6.7 Sections and details will contain information for all structural conditions not dealt with completely on plans, elevations or schedules. Additional information includes clarification of structural geometry, reinforcement, connection configurations and welding.

2.5.6.8 Seismically Isolated Building Structure

2.5.6.8(1) The Design-Builder will provide a third-party geotechnical peer review according to Section 5.12.14.8 for the design of the Seismically Isolated Building Structure for review by the Authority.

2.5.6.8(2) At the Submittal stages indicated in Section 2.5.6, the Authority will review the Basis of Design Report, including the seismically isolated building structures, the evaluation on the geotechnical aspects of the Seismically isolated building structure including calculation and testing reports, and the third-party geotechnical peer review reports of the seismically isolated building structure and any other document needed for compliance with the Seismically Isolated Building Structure requirements in Section 5.12.14.

2.5.6.8(3) The Basis of Design Report will include:

2.5.6.8(3)(a) Structural moat wall, seismic isolation gap or plane and strategy for items such as ramp access and Utility connections through the moat wall, where required, and across the seismic isolation gap;

2.5.6.8(3)(b) Testing requirements and methodology;

2.5.6.8(3)(c) Analysis and design methodology;

2.5.6.8(3)(d) Design assumptions and data;

2.5.6.8(3)(e) Performance objectives and acceptance criteria as per the post-disaster requirements of BCBC (or NBC 2020); and

2.5.6.8(3)(f) Schedule for the structural moat wall design, construction, testing and delivery.

2.5.6.9 Snow Loading and Snow Drift Study

2.5.6.9(1) Provide a Snow Loading and Snow Drift Study to:

2.5.6.9(2) demonstrate to the satisfaction of the Authority, that the accumulation of ice and/or snow will not fall, slide or be blown off a building or structure and cause harm to Facility users; and

2.5.6.9(3) be utilized as an alternate to the BC Building Code design snow loading, if it is more stringent.

2.5.6.10 Calculation Report Requirements

2.5.6.10(1) 30% - Schematic Design calculation summary report encompassing the design criteria adopted including the loading information, severability criteria and schematic layout and preliminary sizing of all structural elements including the foundation and superstructure for compliance with the structural requirements of the Agreement and to meet the requirements of other disciplines.

2.5.6.10(2) 50% - Design Development design calculation summary report to further confirm the design criteria adopted during Schematic Design and sizing of all structural elements for its conformance to structural requirements of the Agreement and to meet the requirements of other disciplines.

2.5.6.10(3) 70% - Construction Documentation design calculation summary report to further confirm the design criteria, arrangement, and sizing of all structural components for its conformance to the structural requirements of the Agreement and confirm its coordination with the requirements of the other design disciplines.

2.5.6.10(4) 90% - Construction Documentation design calculation summary report to further confirm the design the criteria, arrangement, and sizing of all structural components for its conformance to the structural requirements of the Agreement and confirm its coordination with the requirements of the other design disciplines.

2.5.6.10(5) 100% - A final Construction Documentation design calculation summary report to confirm the design criteria, arrangement, and sizing of all structural components for its conformance to the structural requirements of the Agreement and confirm its design has been coordinated with the requirements of the other design disciplines.

2.5.6.11 Record Documentation

2.5.6.11(1) The Design-Builder will supply a Record Documentation package in accordance with Section 2.5.3.13.

2.5.7 Mechanical Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
Legends, regulatory data, drawing list, key plans	X	X	X	X	X	X
Fire suppression - plans, sections, details	-	X	X	X	X	X
Plumbing - plans, sections, details	X	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Heating and Cooling (Hydronic) - plans, sections, details	X	X	X	X	X	X
HVAC - plans, sections, details	X	X	X	X	X	X
Integrated Automation and IBMP Systems – Design Narratives and System Integration Diagrams	X	X	X	X	X	X
FMO VLAN Network Structured Cabling Riser Diagram	-	-	X	X	X	X
FMO VLAN Network System Diagram	-	-	X	X	X	X
FMO VLAN Network Data Drop Floor plans	-	-	-	X	X	X
BMS - Network Structured Cabling Schematic (Primary and Secondary Network) and integration matrix	-	-	X	X	X	X
BMS - sequence of operations (preliminary at 50% and detailed at 90% and thereafter)	-	X	-	X	X	X
BMS - plans, sections, details schematics and schedules indicating control panel/main controllers (excluding terminal units)	-	-	-	X	X	X
BMS – DDC points list (preliminary at 50% and detailed at 90% and thereafter)	-	X	-	X	X	X
IBMP Platform – specifications, integration system matrix	-	-	X	X	X	X
FMO VLAN/BMS network/IBMP integration virtual lab demonstration/presentation.	-	-	X	X	X	-
BIM Models						
Mechanical Information Model (including all mechanical rooms and Energy Centre c/w mechanical and electrical systems, etc.)	X	X	X	X	X	X
COBie Dataset	X	X	X	X	X	X
Specifications						
General Requirements	-	X	X	X	X	-
Fire Suppression	-	X	X	X	X	-
Plumbing	-	X	X	X	X	-
Heating, Ventilating and Air Conditioning	-	X	X	X	X	-
BMS Integrated Automation	-	-	X	X	X	-
Other						
Basis of Design	X	X	X	X	X	X
Updated Energy Model and Report	X	X	-	-	X	-
Fire suppression – Calculations	-	X	X	X	X	X
Plumbing – Calculations	X	X	X	X	X	X
Plumbing Domestic Hot - Thermal movement and anchor force load calculations.	-	-	X	X	X	X
Heating and Cooling (Hydraulic) - Calculations	X	X	X	X	X	X
Heating - Thermal movement and anchor force load calculations	-	-	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
HVAC - Calculations	X	X	X	X	X	X
Dispersion Study (CFD analysis)	-	X	-	-	X	-

2.5.7.1 Regulatory Sheet (may be included on title sheet) will contain:

2.5.7.1(1) Design load assumptions and calculations including rainfall intensity.

2.5.7.1(2) Calculate and submit an electronic spreadsheet to the Authority demonstrating the estimated maximum flow requirement for the domestic hot water supply. The calculation will include a complete fixture unit count for each of the plumbing system components, pressure drop, and pipe sizes including future allowance.

2.5.7.2 Shop Drawings

2.5.7.2(1) The purpose of shop drawing Submittals is to demonstrate Design-Builder understanding of the design intent. This understanding is demonstrated by articulating which equipment and material is required, and by what methods of fabrication and installation will be utilized.

2.5.7.2(2) Before installation of any pipe, fabricated assembly, equipment, valves, accessories or related material, equipment or hardware, Design-Builder will submit shop drawings and product data sheets for each component supplied to the Authority for review.

2.5.7.2(3) Shop drawings and product data sheets will indicate manufacture, model, type, connection type, operating characteristics for each required item, design conditions and specific application the product will be utilized in. Identify the core equipment being provided, all available options and the specific ones selected. As well as any required agency certification by application, pressure, and temperature. i.e.: NFPA for fire, CRN for steam or NSF for domestic water.

2.5.7.2(4) The Submittals will be reviewed for general compliance with the Design-Build Agreement and not for dimensions, quantities, etc. The Submittals that are returned will be used for procurement. The responsibility of correct procurement remains solely with Design-Builder. The Submittal review will not relieve Design-Builder of responsibility for errors or omissions and deviations from the requirements of the Design-Build Agreement.

2.5.7.2(5) Equipment and material substitutions are prohibited unless accepted by the Authority through the acceptable alternative's approval process.

2.5.7.2(6) Provide shop drawing and bill of material data for all materials including, equipment, each system valve, accessory, fitting, coupling, device and user peripherals for those items listed in Section 2.5.3.9(9).

2.5.7.3 Fire Suppression – Plans, Sections, Calculations and Details will contain:

2.5.7.3(1) Design calculations for water flow with water supply flow data, fire pump (if required), and smoke control;

2.5.7.3(2) All design calculations will indicate the planned design conditions and the allowance for spare and future provisions identified;

2.5.7.3(3) Sprinkler zoning including indication of wet, dry pipe, vortex, clean agent and pre-action systems;

2.5.7.3(4) Provisions to accommodate security hazard classifications;

2.5.7.3(5) Clearly indicated ceiling and slab elevations (geodetic) complete with level changes, bulkheads, beams, etc.;

2.5.7.3(6) The location of doors and windows, and other openings;

2.5.7.3(7) The location of "special fire hazard / load" conditions such as compact storage shelving, vaults, electronic data processing rooms, etc.;

2.5.7.3(8) The location of interconnected floor spaces;

2.5.7.3(9) The location of fixtures and equipment for washrooms, kitchens, meeting rooms, equipment, mechanical, electrical and Communications Rooms;

2.5.7.3(10) The designation (usually by room name and number) of interior spaces including sprinkler head type;

2.5.7.3(11) Graphic indication of fire separation(s), acoustic separation(s), security separation(s), etc.; and

2.5.7.3(12) Specialist fire suppression elements required as part of an alternative solution.

2.5.7.4 Plumbing - Plans, Sections, Calculations and Details will contain:

2.5.7.4(1) The following design calculations will be submitted at the time of Project submission for Building Permit to the City and at the completion of the Project:

2.5.7.4(1)(a) Domestic cold water system;

2.5.7.4(1)(b) Domestic hot water system;

2.5.7.4(1)(c) Domestic hot water storage tank sizing;

2.5.7.4(1)(d) RO system sizing;

2.5.7.4(1)(e) Storm water system complete with all rainfall calculations as described in this Schedule;

2.5.7.4(1)(f) Sanitary drainage system;

2.5.7.4(1)(g) Contaminated waste system;

2.5.7.4(1)(h) Grease / solids / acid neutralizer / interceptor sizing calculations;

2.5.7.4(1)(i) Post-disaster water and sewage waste holding tank sizing;

2.5.7.4(1)(j) Laboratory air compressor and pipe sizing;

2.5.7.4(1)(k) Utility (Shop) air compressor and pipe sizing;

2.5.7.4(1)(l) Medical Gas pipe sizing;

2.5.7.4(1)(m) Medical Gas Compressor and Vacuum Pump sizing (including all intake and exhaust piping);

2.5.7.4(1)(n) Medical Gas AGSS system and pipe sizing (including all intake and exhaust piping);

2.5.7.4(1)(o) Medical Gas Cylinder sizing for both normal use and post-disaster conditions;

2.5.7.4(1)(p) Other medical gases sizing; and

2.5.7.4(1)(q) Lab gases sizing.

2.5.7.4(2) All design calculations will be in an excel spreadsheet that is not locked, or password protected;

2.5.7.4(3) All design calculations will indicate the planned design conditions the allowance for spare and future provisions identified;

2.5.7.4(4) Design calculations will indicate the number of, and the rationale for, the amount of bottle storage that has been provided in the medical gas systems for the post-disaster condition;

2.5.7.4(5) Design calculations will be updated throughout Design and Construction and the final submission will reflect the final Construction conditions as released to the Authority;

2.5.7.4(6) All final design calculations will be provided to the Authority at the completion of the Project to assist in calculating any changes that occur in the Facility post-completion;

2.5.7.4(7) Provide a Legionella Mitigation Plan for both the design and future maintenance of the domestic hot water systems. The legionella mitigation plan will incorporate the requirements of the latest version of CSA 317.1, ASHRAE AE / NSF Standard 514, NSF, ASHRAE Standard 188, ASHRAE Guideline 12, and ASPE standards on Legionella design and control in Health Care Facilities;

2.5.7.4(8) Design calculations for water supply including pressure, hot water heating, sanitary waste sizing and roof drainage;

2.5.7.4(9) Riser diagrams with flows indicated for domestic hot and cold water lines, waste and vent lines;

2.5.7.4(10) Annotated piping diagram showing anchor and guide locations, as well as the force load on the anchors (structure); and

2.5.7.4(11) Plumbing fixture schedule.

2.5.7.5 Heating and Cooling (Hydronic) - Plans, Sections, Calculations and Details will contain:

2.5.7.5(1) Design calculations for water supply including pressure, hot water heating, glycol solution and chilled water;

2.5.7.5(2) Riser diagrams with flows indicated for hot, steam and chilled water lines;

2.5.7.5(3) Annotated piping diagram showing anchor and guide locations, as well as the force load on the anchors(structure);

2.5.7.5(4) Mechanical rooms; hydronic piping to be modeled in Revit to level 400 and include pad and equipment layouts, pipe routing with supports, pipe elevations, pipe insulation, and include space for maintenance (strainer cleaning, valve adjustments, etc.) and removal / replacement of mechanical equipment (coils, heat exchangers, pumps, boilers, chiller tube bundles, etc.); and

2.5.7.5(5) Equipment schedule.

2.5.7.6 Heating, Cooling and Ventilation (HVAC) - Plans, Sections, Calculations and Details will contain:

2.5.7.6(1) Design calculations for block loads for heating and refrigeration, system load and airflow calculations including minimum outside air to be admitted and duct leakage allowance, system pressure static analysis at peak and minimum block loads, acoustical calculations, building heating, cooling and ventilation loads, flow and head calculations for pumping systems, sizing of fuel storage, distribution and vibration isolation;

2.5.7.6(2) All design calculations will indicate the planned design conditions and will indicate the allowance for spare and future provisions identified;

2.5.7.6(3) HVAC piping layouts including valves complete with locations where temperature, pressure, flow, Contaminant/combustion gases, vibration gauges and remote sensing is required;

2.5.7.6(4) HVAC duct layouts and true sizes (double line) including fire and/or smoke dampers and volume control dampers;

2.5.7.6(5) Layout of equipment rooms showing mechanical equipment including space for maintenance (filter replacement, valve adjustments, etc.) and removal / replacement of mechanical equipment (coils, heat exchangers, pumps, boilers, chiller tube bundles, etc.);

2.5.7.6(6) Roof plan with roof-mounted equipment and penthouses complete with indication of servicing and maintenance access;

2.5.7.6(7) Provide third-party Dispersion Study Analysis and Report to support the placement of intakes; refer to Section 5.4.2;

2.5.7.6(8) HVAC outside air intake and exhaust air discharge including louver sizes and locations relative to each other, ensuring security and acoustic concerns have been taken into consideration;

2.5.7.6(9) HVAC riser diagram(s), schematic flow and riser diagrams including airflow and water flow quantities and balancing for heating and cooling equipment, flow energy measuring devices for water and air systems. Clear indication of penetrations through rated wall, floor and roof assemblies complete with details;

2.5.7.6(10) Automatic temperature control diagram(s) including control flow diagrams showing sensors, valves and controllers, sequence of operation of systems, diagram showing control signal interface with sequence of operation, locations and connections of energy metering devices for Major Mechanical Equipment;

2.5.7.6(11) Equipment schedule including chillers, boilers, pumps, air handling units, fans, terminal units, diffusers and grilles;

2.5.7.6(12) Clear indication of seismic restraints for HVAC systems and equipment; and

2.5.7.6(13) Plans indicating fire compartments with the direction of air flow and the relative differential pressures between spaces indicating relative pressurization between compartments during normal and fire modes of operation.

2.5.7.7 Integrated automation details will contain:

2.5.7.7(1) Integrated automation layout (refer to BMS Controls shop drawings requirements).

2.5.7.8 Drawings and schedules will contain:

2.5.7.8(1) Clearly indicated type, flow, head, speed, class, BHP, electrical, etc.; and

2.5.7.8(2) Schedules may be graphical and/or tabular in drawing and/or specification format.

2.5.7.9 Energy Modeling

2.5.7.9(1) Refer to energy modelling methodology, Schedule 5 [Energy Guarantee] for detailed requirements.

2.5.7.9(2) Using ASHRAE 140 compliant software, as detailed in the BCH New Construction Energy Modeling Guideline, demonstrate that the proposed Design meets the energy use provisions of this Schedule as detailed in PART 7.

2.5.7.9(3) Provide updated Energy Model report, which will include the following information as a minimum:

2.5.7.9(3)(a) Executive Summary;

2.5.7.9(3)(b) Facility information, including the location, weather file used, total floor area, outdoor design temperatures and humidity;

2.5.7.9(3)(c) Building envelope inputs for both reference building and proposed building, including roof assembly U-value, wall assembly U-value, fenestration overall U-value, window to wall ratio, shading coefficient, internal and external shading devices;

2.5.7.9(3)(d) Internal loads inputs per room for both reference building and proposed building, including lighting

power density, lighting control, plug loads, occupants;

2.5.7.9(3)(e) Indoor design conditions per room for both reference building and proposed building, including occupancy schedules, indoor design temperatures, indoor design humidity levels, ventilation air;

2.5.7.9(3)(f) Mechanical systems for both reference building and proposed building, including system description, fan control, fan power, outdoor air, exhaust air, heat recovery system, equipment efficiencies;

2.5.7.9(3)(g) Facility energy plant for both reference building and proposed building, including heating type and efficiencies, cooling type and efficiencies, service water heating type and efficiencies;

2.5.7.9(3)(h) Utility rates for all types of fuel;

2.5.7.9(3)(i) Energy modelling results for both reference building and proposed building, including energy summary by end use, energy type, energy use and energy intensity, energy use savings and energy cost savings; and

2.5.7.9(3)(j) List of recommended energy conservation measures, including annual estimated savings, incremental capital costs, life expectancy, and Life Cycle Cost analysis.

2.5.7.10 Mechanical Maintenance Manuals

2.5.7.10(1) The Design-Builder will provide maintenance manuals which contain the following (as minimum) for each system:

2.5.7.10(1)(a) Narratives and simple diagrams for system;

2.5.7.10(1)(b) List of equipment supplier(s), including contact info and local service contact(s);

2.5.7.10(1)(c) Set of all final reviewed shop drawings including controls shop drawings;

2.5.7.10(1)(d) A copy of all record drawings;

2.5.7.10(1)(e) Records of all testing procedures and certificates;

2.5.7.10(1)(f) Regular maintenance/service schedule;

2.5.7.10(1)(g) 360 record photos of all mechanical rooms and service spaces/rooms;

2.5.7.10(1)(h) Manufacturer Warranty documents for equipment and workmanship;

2.5.7.10(1)(i) Manufacturer certification and test result printouts;

2.5.7.10(1)(j) Part List;

2.5.7.10(1)(k) Final Balancing Report; and

2.5.7.10(1)(l) Final Commissioning Report.

2.5.7.11 Record Documentation

2.5.7.11(1) The Design-Builder will supply a Record Documentation package in accordance with Section 2.5.3.13.

2.5.7.12 Piping Systems Stress Analysis:

2.5.7.12(1) Reports

2.5.7.13 Mechanical Systems Pressure Testing:

2.5.7.13(1) Reports

2.5.7.14 Dispersion Study

2.5.7.14(1) Provide a third-party Dispersion Study (CFD analysis) to analyze the exhaust from the Facility and any sources of pollutants and to support the placement of air intakes. Account for prevailing winds.

2.5.7.14(2) Demonstrate that the sources of pollution or contamination will not be a nuisance or health hazard for occupants of the Facility and that Facility sources of pollutants will not be a nuisance or health hazard for adjacent buildings. Refer to Section 7.5.11.2(10) for further information.

2.5.7.15 Sample Boards

2.5.7.15(1) Provide two (2) sample mock-ups of each type of insulation by application (equipment, piping including elbows and joints, valves, ducting, accessories, finishing jacket, etc.) indicating where each is to be used and a sample of a typical vapour barrier dam. One will be kept at the Design-Builder’s site office and the other will be turned over to the Authority for approval. The Authority will grant approval prior to the Design-Builder commencing installation of insulation. Further requirements are as follows:

2.5.7.15(1)(a) Design-Builder will submit sample assembly of each type of insulation and covering. Mount samples on PVC coroplast board with typewritten label beneath each sample indicating service and material specification; and

2.5.7.15(1)(b) Include samples of vapor barrier installation including coatings (indoors), mastics (outdoors), and reinforcing membranes, on a round surface sample minimum 300 mm x 300 mm (12 in x 12 in) for equipment and a pipe butt joint with an elbow.

2.5.8 Electrical Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
Legends, regulatory data, drawing list, key plans	X	X	X	X	X	X
Site plans	X	X	X	X	X	X
Power Single Line Diagram	X	X	X	X	X	X
Power Riser Diagram	X	X	X	X	X	X
Large Scale - Electrical Room equipment layouts (only one typical room of each type required for 30% Submittal)	X	X	X	X	X	X
Large Scale - Electrical Room 3D equipment layouts including equipment dimensions.	-	-	X	X	X	X
Grounding and Bonding Riser Diagram	X	X	X	X	X	X
Grounding Details	-	-	-	X	X	X
Lightning Protection Riser, Plans	-	X	X	X	X	X
Lightning Protection Details	-	-	-	X	X	X
Lighting Control Riser	X	X	X	X	X	X
Lighting Control Details	-	-	X	X	X	X
Clock System Riser	-	-	X	X	X	X
Metering Risers	-	X	X	X	X	X
Fire Alarm and Voice Communication System Riser	X	X	X	X	X	X
Lighting and Lighting Control:						
Plans	X	X	X	X	X	X
Circuiting	-	-	-	X	X	X
Power:						
Plans	X	X	X	X	X	X
Circuiting	-	-	-	X	X	X
Fire Alarm and Voice Communication Systems Plans	X	X	X	X	X	X
Switchgear/CDP/Unit Substation, elevations, and schedules	-	X	X	X	X	X
Generator enclosure 3D elevations and layouts including fuel and exhaust piping.	-	X	X	X	X	X
Fire Alarm and Voice Communication Systems schedules	-	-	X	X	X	X
Site Service Details	-	X	X	X	X	X
Sequence of Operations for all electrical systems, including interconnections to other systems.	-	X	X	X	X	X
Miscellaneous Details	-	-	-	X	X	X
All other drawings	-	-	-	X	X	X
*BIM Models **						

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Electrical Information Model	X	X	X	X	X	X
COBie Dataset	X	X	X	X	X	X
Specifications						
Table of Contents: listing all sections	X	X	X	X	X	X
General Requirements	X	X	X	X	X	X
Electrical	X	X	X	X	X	X
Branch Circuit Panelboard Schedules	-	-	-	X	X	X
Luminaire Schedules	X	X	X	X	X	X
Lighting Control Schedules	-	-	X	X	X	X
Communications (clock system and interval timers)	-	X	X	X	X	X
Electronic Safety and Security	-	-	X	X	X	X
Other						
Basis of Design	X	X	X	X	X	X
Total load calculations (Utility electric service)	X	X	X	X	X	X
Total load calculations (generator power)	X	X	X	X	X	X
Load calculations (transformer loadings)	X	X	X	X	X	X
Load calculations IM/IT UPS (with load type breakdown)	X	X	X	X	X	X
Load calculations for Clinical UPS (with load type breakdown)	X	X	X	X	X	X
Power system ground grid calculations	-	X	X	X	X	X
Voltage drop calculations	-	-	-	X	X	X
Short circuit calculations	-	X	X	X	X	X
Arc Flash Study and Calculations	-	-	-	X	X	X
Coordination Study	-	-	X	X	X	X
Magnetic Field study	-	-	-	X	X	X
Lighting calculations	-	-	X	X	X	X
Cable tray calculations	-	-	-	X	X	X

2.5.8.1 Regulatory Data (may be included on title sheet) will contain:

2.5.8.1(1) Design load assumptions and calculations to demonstrate code compliance.

2.5.8.2 Site plans will include:

2.5.8.2(1) Property limits;

2.5.8.2(2) Public and private roadways and lighting;

2.5.8.2(3) Driveways;

2.5.8.2(4) Parking lots;

2.5.8.2(5) Electric Utility services;

2.5.8.2(6) Electrical high voltage feeders;

2.5.8.2(7) Generator enclosure location and conduits;

2.5.8.2(8) Future Expansion conduit and pull boxes;

2.5.8.2(9) Site lighting and underground conduits;

2.5.8.2(10) Exterior Facility lighting;

2.5.8.2(11) Exterior Signage;

2.5.8.2(12) Parking control systems;

2.5.8.2(13) Electric vehicle supply equipment and bicycle share power infrastructure;

2.5.8.2(14) Maintenance hole locations with sump pump circuits as applicable;

2.5.8.2(15) Hand holes, duct banks, pull pits; and

2.5.8.2(16) High voltage and lightning protection ground grids.

2.5.8.3 Indicate on floor plans the removal aisle ways and routes for Major Electrical Equipment such as diesel generators, transformers sized 300 kVA and greater, switchgear sections, ATS and UPS cabinets.

2.5.8.4 Power Single Line Diagrams (SLD) will flow from utility connection (and generators) to MDPs, to CDPs and to individual panelboards from top of the drawing to the bottom. Minimize the use of feeder tags to interrupt the connection of the source to the end point connection on another Drawing. Provide an EC SLD, CH SLD and CC SLD on separate drawings. Breaking up the SLD by room, by system or by floors is not acceptable. Coordinate the layout of the SLD diagram with the Authority for their approval during the design phase. SLD schematic drawings for power distribution systems and symbols will be in compliance with the CSA Z32, CSA Z462, CSA C282 & CEC and will include the following:

2.5.8.4(1) The entire electrical system from the Utility service to and including high voltage switchgear, MDPs, CDPs, panelboards, MCCs, chillers, imaging equipment, motors 50 HP or larger, elevators, generators, synchronization boards, power and distribution transformers, transfer switches, splitters, bus ducts, power factor harmonic correction units, feeders and feeder breakers;

2.5.8.4(2) Ratings of transformers, generators, breakers, switches, fuses, transfer switches, high voltage switchgear, MDPs, CDPs, MCCs;

2.5.8.4(3) Ratings of fuses, bus ducts, feeders, splitters, safety switches, panelboards, power factor / harmonic correction units, etc., for 50%, 70%, 90% and 100% Submittals;

2.5.8.4(4) Identification of fire rated conductors;

2.5.8.4(5) Transformer and generator winding arrangements, phase shifts, and system grounding locations;

2.5.8.4(6) Calculated maximum fault levels, symmetrical and asymmetrical, equipment short circuit current ratings, and protective device symmetrical interrupting ratings, for 70%, 90% and 100% Submittals;

2.5.8.4(7) Calculated arc flash incident energy level at each power distribution equipment bus, for 90% and 100% Submittals;

2.5.8.4(8) Interlock schemes;

2.5.8.4(9) Potential and current transformers, including neutral or ground fault current sensors;

2.5.8.4(10) Protective and control relays on all high voltage breakers including transfer switches;

2.5.8.4(11) Metering, for 50%, 70%, 90% and 100% Submittals; \

2.5.8.4(12) Equipment names, following a consistent equipment naming methodology/convention that is suitable for use in Future Expansions, renovations, and future buildings; and

2.5.8.4(13) Identification for Future Expansion equipment connections.

2.5.8.5 Power Riser Diagram will include:

2.5.8.5(1) The entire electrical system from the Utility service to and including high voltage switchgear, MDPs, CDPs, panelboards, MCCs, chillers, imaging equipment, motors over 50 HP, elevators, generators, transformers, switches, splitters, bus ducts, power factor / harmonic correction units, and feeders;

2.5.8.5(2) Equipment shown in elevation relative to its actual size;

2.5.8.5(3) Equipment shown on the floor level where it will be installed;

2.5.8.5(4) A two-dimensional relative representation of where the equipment will be located;

2.5.8.5(5) Feeders to equipment with fire protection requirements noted where applicable;

2.5.8.5(6) A two-dimensional representation of the routing of the feeders; and

2.5.8.5(7) Equipment names, following a consistent equipment naming methodology.

2.5.8.6 Large Scale - Electrical Room Equipment Layouts will include:

2.5.8.6(1) All Electrical Rooms (including the Generator enclosure)drawn to a scale of not less than 1:50;

2.5.8.6(2) All equipment in the room shown to scale;

2.5.8.6(3) Dimensions of equipment shown, for 50%, 70%, 90% and 100% Submittals;

2.5.8.6(4) Widths of access aisles dimensioned, and paths for removal and replacement of large equipment, for 50%, 70%, 90% and 100% Submittals;

2.5.8.6(5) Dimensions of drawn-out equipment components shown in their drawn-out positions, for 50%, 70%, 90% and 100% Submittals;

2.5.8.6(6) Dimensions of spare floor space, wall space, and adjacent areas reserved for Future Expansion requirements;

2.5.8.6(7) Equipment door swings indicated;

2.5.8.6(8) Room doors shown;

2.5.8.6(9) Room names and numbers;

2.5.8.6(10) Horizontal and vertical provisions for future Raceways and wiring; and

2.5.8.6(11) Three-dimensional drawing files provided for 70%, 90% and 100% Submittals.

2.5.8.7 Grounding and Bonding Riser Diagram and Details will include:

2.5.8.7(1) The entire electrical grounding and bonding system from the ground grid to each Electrical Room and generator unit enclosures;

2.5.8.7(2) Ground rods, buried ground grid conductors, bonding buses, grounding and equipotential bonding conductors;

2.5.8.7(3) Equipment shown in elevation;

2.5.8.7(4) Equipment shown on the floor level where they will be installed;

2.5.8.7(5) A two-dimensional relative representation of where the equipment will be located;

2.5.8.7(6) A two-dimensional representation of the routing of the conductors;

2.5.8.7(7) Connections to IM/IT bonding system and other connections to the bonding system;

2.5.8.7(8) CSA Z32 bonding connections to panelboard level;

2.5.8.7(9) Bond bus names, following a consistent naming methodology/convention, for 70%, 90% and 100% Submittals;

2.5.8.7(10) Equipment and conductor sizing; and

2.5.8.7(11) Details of ground and bond bus design and mounting, for 90% and 100% Submittals.

2.5.8.8 Lightning Protection Riser, Plans and Details will include:

2.5.8.8(1) The entire lightning protection system from the ground grid to the air terminals and rooftop equipment connected to the system;

2.5.8.8(2) Ground electrode and grid down conductors, interconnecting conductors and bonding details;

2.5.8.8(3) Equipment shown in elevation;

2.5.8.8(4) Equipment shown on the floor level where they will be installed;

2.5.8.8(5) A two-dimensional relative representation of where the equipment will be located;

2.5.8.8(6) A two-dimensional representation of the routing of the down conductors and interconnecting conductors;

2.5.8.8(7) Equipment sizing;

2.5.8.8(8) Details of:

2.5.8.8(8)(a) Parapet mounting;

2.5.8.8(8)(b) Roof mounting;

2.5.8.8(8)(c) Roof penetrations;

2.5.8.8(8)(d) Conductor connections;

2.5.8.8(8)(e) Conductor interconnections; and

2.5.8.8(8)(f) Bonding straps for other equipment.

2.5.8.9 Lighting control riser and details will include:

2.5.8.9(1) All lighting controllers and network connections;

2.5.8.9(2) Lighting controllers shown on the floor level where they will be installed;

2.5.8.9(3) A two-dimensional relative representation of where the lighting controllers will be located and the areas they serve;

2.5.8.9(4) Wiring runs to equipment;

2.5.8.9(5) A two-dimensional representation of the routing of the wiring runs;

2.5.8.9(6) Wiring details for each type of control device and major space types, showing wiring topology and methods, clearly indicating how luminaires, sensors, switches, controllers and network interfaces connect;

2.5.8.9(7) Equipment names, following a consistent equipment naming methodology/convention; and

2.5.8.9(8) Details of integration with other systems.

2.5.8.10 Clock System Riser will include:

2.5.8.10(1) Clock system communications network nodes and links, including transmitters, receivers, and booster units;

2.5.8.10(2) Equipment shown on the floor level where they will be installed;

2.5.8.10(3) A two-dimensional relative representation of where the equipment will be located;

2.5.8.10(4) Wiring runs and wireless communications links between equipment and to remote time servers;

2.5.8.10(5) Equipment names, following a consistent equipment naming methodology/convention; and

2.5.8.10(6) Details of integration with other systems.

2.5.8.11 Metering Riser will include:

2.5.8.11(1) The entire system including network connections and interfaces to other systems;

2.5.8.11(2) Equipment shown on the floor level where they will be installed;

2.5.8.11(3) A two-dimensional relative representation of where the equipment will be located;

2.5.8.11(4) Wiring runs to equipment;

2.5.8.11(5) A two-dimensional representation of the routing of the wiring runs; and

2.5.8.11(6) Equipment names, following a consistent equipment naming methodology/convention.

2.5.8.12 Fire alarm and voice communication system riser will include:

2.5.8.12(1) The entire fire alarm and voice communication system;

2.5.8.12(2) Equipment shown on the floor level where they will be installed;

2.5.8.12(3) A two-dimensional relative representation of where the equipment will be located;

2.5.8.12(4) Communication wiring between the head end and local panels, and between local panels;

2.5.8.12(5) A two-dimensional representation of the routing of the wiring between the head end and the local panels and between the local panels;

2.5.8.12(6) Each initiating loop out of a local panel, including identifying physical location for every isolation module used in the loop;

2.5.8.12(7) Indication of each initiating zone;

2.5.8.12(8) Indication of each notification zone;

2.5.8.12(9) A typical representation of the initiating, monitoring and control devices installed on each segment of a loop (i.e. between isolation modules);

2.5.8.12(10) Each notification circuit out of a local panel;

2.5.8.12(11) A typical representation of the notification devices installed on each signal circuit;

2.5.8.12(12) Interconnections with other systems; and

2.5.8.12(13) Equipment names, following a consistent equipment naming methodology.

2.5.8.13 Lighting and lighting control plans will include:

2.5.8.13(1) Reflected ceiling plans to scale showing all luminaires, including emergency lighting and exit signs, in their relative locations;

2.5.8.13(2) An indication of the luminaire types, corresponding to the luminaire schedules;

2.5.8.13(3) Circuiting of each luminaire;

2.5.8.13(4) Lighting control devices, in their relative locations;

2.5.8.13(5) Control panels, in their relative locations;

2.5.8.13(6) Lighting control zoning;

2.5.8.13(7) Lighting panelboards, in their relative locations; and

2.5.8.13(8) Room names and numbers, doors and windows, corridor names.

2.5.8.14 Lighting control schedules will include:

2.5.8.14(1) A separate schedule for each control panel;

2.5.8.14(2) Lighting control zone designations;

2.5.8.14(3) Circuits and sub-circuits controlled;

2.5.8.14(4) Designation of each control relay;

2.5.8.14(5) Rating of each control relay;

2.5.8.14(6) A description of the type of control;

2.5.8.14(7) A listing of “scenes” allocated to the zone; and

2.5.8.14(8) Interfaces with other panels, head end equipment, other systems.

2.5.8.15 Power Plans will include:

2.5.8.15(1) Floor plans to scale showing all:

2.5.8.15(1)(a) receptacles;

2.5.8.15(1)(b) equipment connections;

2.5.8.15(1)(c) safety switches;

2.5.8.15(1)(d) transfer switches;

2.5.8.15(1)(e) feeders;

2.5.8.15(1)(f) splitters;

2.5.8.15(1)(g) panelboards;

2.5.8.15(1)(h) switches controlling receptacles or equipment;

2.5.8.15(1)(i) timers;

2.5.8.15(1)(j) clocks;

2.5.8.15(1)(k) contactors;

2.5.8.15(1)(l) high voltage switchgear;

2.5.8.15(1)(m) MDPs;

2.5.8.15(1)(n) CDPs;

2.5.8.15(1)(o) power factor or harmonic correction units;

2.5.8.15(1)(p) power and distribution transformers;

2.5.8.15(1)(q) generators;

2.5.8.15(1)(r) UPS equipment;

2.5.8.15(1)(s) motor control centres;

2.5.8.15(1)(t) chillers;

2.5.8.15(1)(u) motors over 50 HP;

2.5.8.15(1)(v) automatic door controls;

2.5.8.15(1)(w) control equipment (other than lighting control), shown in their relative locations;

2.5.8.15(1)(x) an indication of the equipment types, corresponding to the legend;

2.5.8.15(1)(y) conduit runs embedded in the concrete structure or in trenches;

2.5.8.15(1)(z) circuiting of each item of equipment; and

2.5.8.15(1)(aa) room names and numbers, doors and windows, corridor and other space names.

2.5.8.16 Fire alarm system plans will include:

2.5.8.16(1) Reflected ceiling plans to scale showing all initiating devices, notification devices, control devices, monitoring devices, isolation modules, in their relative locations;

2.5.8.16(2) An indication of the equipment types, corresponding to the Legend;

2.5.8.16(3) Annunciators, head end equipment, local panels, battery cabinets, paging stations, control centres, in their relative locations;

2.5.8.16(4) Identification of each zone boundary;

2.5.8.16(5) Circuiting of items requiring power for 90% and 100% Submittals;

2.5.8.16(6) Room names and numbers, doors and windows, corridor names;

2.5.8.16(7) Zone names; and

2.5.8.16(8) Fire walls, fire separations.

2.5.8.17 Switchgear/MDP/CDP/High Voltage Distribution/MCC, Elevations and Schedules will include:

2.5.8.17(1) The elevation of each item of switchgear, paralleling switchgear, HVATS switchgear, each MDP, each CDP, each MCC and each high voltage distribution showing protective devices, switching devices, bus arrangements, protective relays, control relays, metering, labelling, surge protective devices; and

2.5.8.17(2) Schedules identifying each protective device, switching device, transformer, bus, showing the ratings of these plus the settings of each protective device, including:

2.5.8.17(2)(a) Long-time pickup;

2.5.8.17(2)(b) Long-time delay;

2.5.8.17(2)(c) Short time pickup;

2.5.8.17(2)(d) Short time delay;

2.5.8.17(2)(e) Instantaneous;

2.5.8.17(2)(f) Ground fault pickup; and

2.5.8.17(2)(g) Ground fault delay, etc. as applicable.

2.5.8.18 MDP, CDP and Panelboard Schedules will include:

2.5.8.18(1) Unique branch circuit descriptors for each branch circuit;

2.5.8.18(2) Connected load for each phase;

2.5.8.18(3) Applied demand for each load type;

2.5.8.18(4) Total load after applied demand for the panelboard;

2.5.8.18(5) Trip setting and ampere interrupting rating for branch circuit breakers;

2.5.8.18(6) Maximum number of branch breaker poles that the panelboard can accommodate;

2.5.8.18(7) Main breaker trip setting, as applicable;

2.5.8.18(8) Buss ampacity and voltage rating;

2.5.8.18(9) Surge Protection Device (integral to panelboard), as applicable;

2.5.8.18(10) Double lug, double neutral bus indicators, as applicable; and

2.5.8.18(11) MDP, CDP or Panelboard location and upstream source name.

2.5.8.19 Fire alarm and voice communication system schedules will include, in a matrix format:

2.5.8.19(1) All initiating, monitoring and control zone designations;

2.5.8.19(2) All notification zone designations;

2.5.8.19(3) A description of the area or equipment involved;

2.5.8.19(4) An indication of the system operation related to that zone;

2.5.8.19(5) All voice communications zone designations;

2.5.8.19(6) A description of the area involved for each voice communications zone; and

2.5.8.19(7) A description of the smoke control/smoke venting systems operations for each initiating zone.

2.5.8.20 Site Service Details will include:

2.5.8.20(1) Maintenance holes and hand holes;

2.5.8.20(2) Cable racking inside maintenance holes;

2.5.8.20(3) Cable pulling provisions inside maintenance holes;

2.5.8.20(4) Built in ladders inside maintenance holes;

2.5.8.20(5) Means of draining maintenance holes including gravity drainage and sump pump systems;

2.5.8.20(6) High water alarms for maintenance holes;

2.5.8.20(7) Lighting and power provisions inside maintenance holes;

2.5.8.20(8) Cross sections of each duct bank;

2.5.8.20(9) Cross sections of any direct buried cables;

2.5.8.20(10) Bases for lighting standards;

2.5.8.20(11) Bases for bollards;

2.5.8.20(12) Bases for other equipment;

2.5.8.20(13) Snow melting details; and

2.5.8.20(14) Roof and gutter de-icing details.

2.5.8.21 Miscellaneous Details will include:

2.5.8.21(1) CSA Z32 bonding details, including typical bonding and branch circuit wiring sizes;

2.5.8.21(2) Ground and buss bar details including buss bar elevations, lug and connector details and labelling scheme;

2.5.8.21(3) Mounding details for luminaires, wall mounted transformers, prefabricated conduit and piping racks, clocks, conduit seals for pressurized rooms, surface mounted wireways and in-floor boxes;

2.5.8.21(4) Conduit and box installation details for A/V systems;

2.5.8.21(5) Typical mounting elevations for electrical devices;

2.5.8.21(6) Seismic restraints utilized for the Facility;

2.5.8.21(7) EMF interference plan study results;

2.5.8.21(8) Fire rated conductor installation and support details;

2.5.8.21(9) Conduit riser plans identifying each feeder in each riser in elevation or plan view;

2.5.8.21(10) Electrical fire stopping methods and details utilized for the Facility; and

2.5.8.21(11) All other details required for the full description of the Design and Construction and the Facility not included on other drawings.

2.5.8.22 All Other Drawings will include:

2.5.8.22(1) Drawings as required for the full description of the Design and Construction and the Facility not included on other drawings.

2.5.8.23 Record Documentation will include:

2.5.8.23(1) Drawings included in the 100% Submittals plus any changes made and any drawings added up to the completion of Construction;

2.5.8.23(2) Updating of each drawing to the final “as built” condition;

2.5.8.23(3) Final locations of duct banks, maintenance holes, hand holes, conduit, outlets, panels, branch wiring, system wiring, pull boxes, bus ducts, and equipment;

2.5.8.23(4) Dimensions from column lines or edge of roadways to the location of buried conductors/ducts, and burial depth of each;

2.5.8.23(5) Updated sequence of operations for power systems, fire alarm (including interconnections to other systems), Lighting controls (including interconnections to other systems), nurse call (including interconnections to other systems and security systems; and

2.5.8.23(6) Project surveyor's information on the site services record drawings.

2.5.8.24 Electrical Specifications will include:

2.5.8.24(1) Sections in sufficient detail to unequivocally describe each material and each item of equipment to be used on the electrical scope of work for the Project;

2.5.8.24(2) The method of installation, testing, Commissioning and documenting for each material, item of equipment, and system that is part of the electrical scope of work for the Project; and

2.5.8.24(3) Identification of the codes and standards that the materials, equipment, and systems will be provided in accordance with.

2.5.8.25 Calculations will be:

2.5.8.25(1) Published, handwritten calculations will not be submitted;

2.5.8.25(2) Fully detailed to allow review of each step of the calculations;

2.5.8.25(3) With power demand, diversity factors, spare and future provisions identified; and

2.5.8.25(4) With all assumptions clearly stated.

2.5.8.26 Total Load Calculations (Utility Electric Service) will include:

2.5.8.26(1) Calculation of the annual peak demand load, in kW and kVA, expected for the Site; and

2.5.8.26(2) Calculation of the annual peak demand load, in kW and kVA, on the Utility service under typical operating conditions, indicating the spare capacity on each service.

2.5.8.27 Total Load Calculations (Generator Power) will include:

2.5.8.27(1) Calculation of the annual peak demand load on the generating system, in kW and kVA, expected for the Site;

2.5.8.27(2) Calculation of the annual peak demand load, in kW and kVA, on each generator under typical operating conditions, indicating the spare capacity on each generator;

2.5.8.27(3) Calculation of the annual peak demand load, in kW and kVA, on each generator with one generator out of service;

2.5.8.27(4) Calculation of the reserve generator capacity for required spare, motor starting, and stepped loads;

2.5.8.27(5) Calculation of the annual peak demand load, in kW and kVA, on each HVATS; and

2.5.8.27(6) Calculation of each load shedding step at minimum and maximum loading conditions.

2.5.8.28 Load Calculations (Transformer Loadings) will include:

2.5.8.28(1) Calculation of the annual peak demand load, in kW and kVA, on each transformer under typical operating conditions;

2.5.8.28(2) Calculation of the annual peak demand load, in kW and kVA, on each transformer with one transformer out of service, the transformer out of service to be one that causes the load to be transferred to the transformer for which the load calculation is being performed (e.g. it's twin);

2.5.8.28(3) Calculation of the anticipated future load growth on each transformer; and

2.5.8.28(4) Calculation of the spare capacity provided for in each transformer.

2.5.8.29 Load Calculations (UPS Power) will include:

2.5.8.29(1) Calculation of the annual peak demand load, in kW and kVA, on each UPS system under typical operating conditions;

2.5.8.29(2) Calculation of the anticipated future load growth on each UPS system;

2.5.8.29(3) Calculation of the spare capacity provided for in each UPS system; and

2.5.8.29(4) Calculation of the battery support time of each UPS system, based on:

2.5.8.29(4)(a) full load operation;

2.5.8.29(4)(b) with the redundant system not available;

2.5.8.29(4)(c) with the battery capacity derated to the actual ambient room temperature, and

2.5.8.29(4)(d) with the batteries at “end of life”.

2.5.8.30 Power System Ground Grid Calculations will include:

2.5.8.30(1) Identification of soil resistivity based on site testing, two layer resistivity values and depths used in computer models if applicable; and

2.5.8.30(2) Calculation of the GPR, step and touch potentials, in accordance with IEEE 80.

2.5.8.31 Voltage Drop Calculations will include:

2.5.8.31(1) Calculations of the steady state voltage drop from the Utility service though to the last power utilizing device on each circuit;

2.5.8.31(2) Provided that a maximum of 3% voltage drop is allowed for each branch circuit then the voltage drop calculations can end at the branch panelboard or MCC;

2.5.8.31(3) Calculations based on a load equal to the maximum continuous load rating of the breaker or fuse protecting the circuit, unless the load is fixed and known (e.g.: a single motor), in which case the fixed known load can be used; and

2.5.8.31(4) Calculations based on a power factor of 95% unless a different power factor is known to apply in which case the known power factor is to be used.

2.5.8.31(5) CSA Z32 volt drop calculations for the furthest end use device or receptacle on each panelboard in all Patient Care Areas.

2.5.8.32 Short Circuit Calculations will include:

2.5.8.32(1) Calculations of symmetrical and asymmetrical values of fault currents, based on the calculated X/R ratio of the system;

2.5.8.32(2) Calculations of the maximum three phase fault current, the maximum line to line fault current, the maximum line to ground fault current and the maximum line to ground fault current at every protective device and switching device in the electrical system, excluding local switches on branch circuits;

2.5.8.32(3) The maximum fault currents based on the Utility supply in parallel with the generator supply, where closed transition transfer switches are used;

2.5.8.32(4) The Utility and generator ultimate design fault levels;

2.5.8.32(5) Motor contribution; and

2.5.8.32(6) Actual transformer impedances, but until actual impedances are available, worst case (low) impedances.

2.5.8.33 Arc Flash Study and Calculations will include:

2.5.8.33(1) Calculations of the arc flash incident energy at every piece of distribution equipment, protective device and every switching device in the system, excluding local switches on branch circuits;

2.5.8.33(2) Arc flash labels produced for all power distribution equipment, excluding local switches on branch circuits; and

2.5.8.33(3) Completed modelling software file included with the O&M's and provided to the Authority.

2.5.8.34 Coordination Study will include:

2.5.8.34(1) Graphs of each portion of the electrical system on log paper showing:

2.5.8.34(1)(a) The operating characteristics of each protective device;

2.5.8.34(1)(b) Full load ratings of transformers;

2.5.8.34(1)(c) Full load ratings of individual generators and generators in parallel;

2.5.8.34(1)(d) The maximum and minimum fault level at each protective device and each switching device;

2.5.8.34(1)(e) Transformer inrush current;

2.5.8.34(1)(f) Motor starting current;

2.5.8.34(1)(g) Cable damage curves;

2.5.8.34(1)(h) Transformer damage curves;

2.5.8.34(1)(i) Full load ratings of generators;

2.5.8.34(1)(j) Generator damage curves;

2.5.8.34(1)(k) Generator decrement curves for individual generators and paralleled generators;

2.5.8.34(1)(l) Full load ratings of UPS systems;

2.5.8.34(1)(m) UPS system fault levels;

2.5.8.34(1)(n) UPS system maintenance bypass fault levels; and

2.5.8.34(1)(o) A single line diagram of the portion of the system involved including the equipment names, ratings and settings.

2.5.8.34(2) No more than five-time current curves of protective devices on each graph;

2.5.8.34(3) Graphs showing operation on Utility power;

2.5.8.34(4) Graphs showing operation on generator power;

2.5.8.34(5) Graphs showing operation on UPS power;

2.5.8.34(6) A sufficient number of graphs to depict the entire electrical system including the Utilities protective devices and the generators down to feeders to lighting/receptacle/lab panels, splitters, motor control centres, chillers, motors of 50 HP and larger;

2.5.8.34(7) Separate graphs for phase currents;

2.5.8.34(8) Separate graphs for ground currents with phase trip curves shown as needed for ground fault coordination;

2.5.8.34(9) Schedules showing each protective device that is equipped with an adjustable trip unit, showing the device frame size, CT ratios and the detailed settings of its trip unit;

2.5.8.34(10) Identification of areas where equipment protection is not adequate; and

2.5.8.34(11) Identification of areas where full coordination is not achieved.

2.5.8.35 Magnetic field study will include:

2.5.8.35(1) Post-installation magnetic field measurements (60Hz magnetic field strength, in milligauss) in any areas with sensitive equipment located near transformers, motors, or other field-producing equipment; and

2.5.8.35(2) Field measurements to be made where requested by the Authority.

2.5.8.36 Lighting calculations will include:

2.5.8.36(1) Minimum and average light levels measured in lux, for each unique room, stairway, corridor, public space, service space, Patient Care Area type, including multiple switching scenarios when applicable. Calculations also to indicated max to min ratios

in each room. Calculations to be based on grids not exceeding 0.3 m x 0.3 m and calculated at the workplane or wall/floor as appropriate;

2.5.8.36(2) Night light levels in public areas and Patient Care Areas; and

2.5.8.36(3) Exterior minimum and average light levels at exits, walking paths/sidewalks, roadways and parking areas, drive aisles, and gathering areas. Calculations to be based on grids not exceeding 1m x 1m.

2.5.8.37 Cable Tray calculations will include:

2.5.8.37(1) Number and type of cables at each location terminating at a service room, closet, or distribution equipment, and each location where there is a reduction in size of the cable tray; and

2.5.8.37(2) The fill space available will be included based on percentage of cable type(s) and similar sizes in the cable tray for each of the locations noted above.

2.5.8.38 Submit reports for the following:

2.5.8.38(1) Operating and Maintenance Manuals;

2.5.8.38(2) Training session records;

2.5.8.38(3) Short circuit, protective device coordination, and arc flash studies.

2.5.8.38(4) Panelboard loading test results;

2.5.8.38(5) Transformer loading test results;

2.5.8.38(6) Motor control centre loading test results;

2.5.8.38(7) Seismic restraints;

2.5.8.38(8) Testing of Patient Care Areas to CSA Z32;

2.5.8.38(9) Lighting level (illuminance) measurements (to be completed at night);

2.5.8.38(10) Daylight harvesting/dimming illuminance measurements taken during the day at 8am, noon and 3pm.

2.5.8.38(11) Factory witness testing;

2.5.8.38(12) Site acceptance (pre-service) testing;

2.5.8.38(13) Ground resistance measurements;

2.5.8.38(14) Lightning protection grounding resistance;

2.5.8.38(15) UPS battery testing;

2.5.8.38(16) UPS performance testing;

2.5.8.38(17) Generator testing;

2.5.8.38(18) Transfer switch testing;

2.5.8.38(19) Transformer testing;

2.5.8.38(20) High voltage cable testing;

2.5.8.38(21) Switchgear/ MDP/CDP testing;

2.5.8.38(22) Distribution system dynamic performance verification;

2.5.8.38(23) Magnetic field studies for sensitive areas and post-installation measurements;

2.5.8.38(24) Fire alarm verification report with deficiencies noted and including dB and %ALCON measurements and

2.5.8.38(25) Clock system signal coverage.

2.5.8.39 Submit the following certificates and verifications:

2.5.8.39(1) Manufacturers' letters verifying that the equipment has been installed in accordance with their instructions for the following, at a minimum:

2.5.8.39(1)(a) Firestopping;

2.5.8.39(1)(b) Fire rated wiring;

2.5.8.39(1)(c) Lighting control systems;

2.5.8.39(1)(d) Clock system;

2.5.8.39(1)(e) Automatic transfer switches;

2.5.8.39(1)(f) Generators;

2.5.8.39(1)(g) Paralleling and load management systems;

2.5.8.39(1)(h) UPS systems;

2.5.8.39(1)(i) UPS batteries;

2.5.8.39(1)(j) EVSE;

2.5.8.39(1)(k) Power factor and harmonic correction units; and

2.5.8.39(1)(l) Metering.

2.5.8.39(2) Seismic certifications and letters of assurance for:

2.5.8.39(2)(a) Transformers;

2.5.8.39(2)(b) Generators;

2.5.8.39(2)(c) Transfer switches;

2.5.8.39(2)(d) Switchgear /CDPs/MCCs; and

2.5.8.39(2)(e) Seismic restraints/anchorage of other electrical components.

2.5.8.39(3) Other documentation:

2.5.8.39(3)(a) Fire alarm system verification;

2.5.8.39(3)(b) Radio license for clock system;

2.5.8.39(3)(c) Request for final review;

2.5.8.39(3)(d) Electrical engineer’s letter of assurance; and

2.5.8.39(3)(e) Equipment warranties.

2.5.8.40 Maintenance Manuals

2.5.8.40(1) The Design-Builder will provide maintenance manuals that contain the following for each system:

2.5.8.40(1)(a) Narratives and simple diagrams for standard operating procedures and maintenance procedures;

2.5.8.40(1)(b) Sequence of operations for each electrical system;

2.5.8.40(1)(c) Lock-out and equipment maintenance procedures for major components on each electrical system;

2.5.8.40(1)(d) Digital training video by the manufacturer and contractor for each major component on each electrical system showing how to complete lock-out procedures and maintenance procedures.

2.5.8.40(1)(e) Set of final reviewed shop drawings;

2.5.8.40(1)(f) A copy of all record drawings;

2.5.8.40(1)(g) Bill of materials list for each system;

2.5.8.40(1)(h) Manufacturer Warranty documents for equipment and workmanship;

2.5.8.40(1)(i) Manufacturer certification and test result printouts;

2.5.8.40(1)(j) Fire-stop design and records documentation; and

2.5.8.40(1)(k) Names, addresses, phone numbers and facsimile numbers of the Design-Builder, the Design-Builder's sub-contractors and suppliers used on the work together with a specification reference of the portion of the work they undertook.

2.5.8.41 Record Documentation

2.5.8.41(1) The Design-Builder will supply a Record Documentation package in accordance with Section 2.5.3.13.

2.5.9 Communications Systems Design and Construction Documents.

2.5.9.1 In addition to all other applicable Submittal requirements the Communications Documents will include the information indicated in the following table for the different Design Stages:

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
Cover Page	X	X	X	X	X	X
Site Plan	X	X	X	X	X	X
CPPS, Service Entrance Facilities and related details	X	X	X	X	X	X
Floor Plans (Overall and Enlarged)	X	X	X	X	X	X
Medical Boom and "Head of the Bed" Elevations						
Stairwell Elevations	X	X	X	X	X	X
Communications Room Layouts	X	X	X	X	X	X
Equipment Rack/Server Cabinet Elevations	X	X	X	X	X	X
Structured Cabling Labelling Details	X	X	X	X	X	X
Telecommunications Bonding and Grounding Riser Diagram	X	X	X	X	X	X
Backbone Communications Pathway System Riser Diagram	X	X	X	X	X	X
Isometric Backbone Communications Pathway System Riser Diagram	X	X	X	X	X	X
Backbone Cabling Riser diagram	X	X	X	X	X	X
Public Address Riser and Systems Diagram	X	X	X	X	X	X
Patient Physiological Monitoring Riser and Systems Diagram	-	X	X	X	X	X
Multimedia Room Layouts	X	X	X	X	X	X
RTLS System Drawings and Documentation	X	X	X	X	X	X
Nurse Call Riser and System Diagram	X	X	X	X	X	X
Nurse Call Typical Room Device Layouts	X	X	X	X	X	X
AV and Multimedia System Block Diagrams	X	X	X	X	X	X
Digital Wayfinding Renderings, Journey Mapping, Floor Plans and UI Documentation	X	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Digital Signage and CATV Details	X	X	X	X	X	X
*BIM Models **						
Communication Systems Information Model	X	X	X	X	X	X
COBie Dataset	X	X	X	X	X	X
Specifications and other Submittals						
Communications (Division 27) Specifications	X	X	X	X	X	X
Basis of Design	X	X	X	X	X	X
ERDS – Communications and Multimedia Rooms						
Reflected Ceiling Plans showing communications devices and equipment (See Architectural Documents Section)	X	X	X	X	X	X
Category 6A Data Drop Inventory	X	X	X	X	X	X
Cable Fill Calculations for Communications Pathways	X	X	X	X	X	X
Standard Operating Procedures narrative and scenario examples for each system in editable spreadsheet format		X	X	X	X	X
Bill of Materials Spreadsheet Tables						
Communications (Division 27) All Systems		X	X	X	X	X

2.5.9.2 Drawings

2.5.9.2(1) Drawings related to the Communications (Division 27) scope of work will be identified as “T” series (Telecommunications) drawings.

2.5.9.2(2) The “T” series (Telecommunications) drawings will be kept separated from “E” (Electrical- Division 26) drawings and will not contain any information related to the Division 28 scope of work.

2.5.9.2(3) The “T” series (Telecommunications) drawings as well as other disciplines’ drawings for the Facility will include information relating to systems that are designed by the Authority. This includes, information relating to the IM/IT Wi-Fi network and the DAS system detailed in the Communications (Division 27) section of this Schedule. This information will be kept current on the “T” series (Telecommunications) drawings as well as other disciplines’ drawings for the Facility throughout the duration of the Project.

2.5.9.2(4) The “T” series (Telecommunications) drawings and renderings will be produced, reviewed and stamped or certified by the RCDD employed by the Design-Builder.

2.5.9.2(5) Industry standard graphic symbols and legends will be employed when creating the “T” series (Telecommunications) drawings.

Refer to Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] for Authority approved symbols that are to serve as the base for the legend.

2.5.9.2(6) Drawing notes provide information that clarifies the requirements for the item(s) delineated. As such, drawing notes will be identified on the drawing they are associated with. Notes will not be identified on a drawing if the information conveyed on the note is not relevant to the item(s) delineated on that specific drawing or rendering.

2.5.9.2(7) All existing, proposed and future features of the design shown on the T" series (Telecommunications) drawings and renderings will be clearly distinguishable from each other. Grey scales are not allowed because of their tendency to be lost during typical reproduction or photocopying.

2.5.9.2(8) When a design spans more than one drawing or sheet, a design match mark will be established to reference the continuation of the design from one sheet to another.

2.5.9.2(9) All drawings (floor plans, sections, interior elevations, etc.) will identify architectural room numbers designated for each interior space, and exterior spaces as applicable, all room names and numbers corresponding to those indicated in Appendix 1A [Clinical Specifications and Functional Space Requirements] and the alphanumerical ID for the Communications Rooms as indicated in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications].

2.5.9.2(10) All drawings and renderings including the Enhanced Room Data Sheets (ERDS) will include the necessary number of individual drawings or sheets at the scale required to ensure all the Design information is uncluttered and easy to read and review. If required, the Design-Builder will increase the number of drawings, sheets renderings or to the drawing scale over and above what is specified in this section as requested by the Authority acting reasonably.

2.5.9.2(11) All drawings will be in metric (millimeter) and prepared to current industry standards and to the requirements in this Schedule.

2.5.9.2(12) The cover page will include:

2.5.9.2(12)(a) Drawing list;

2.5.9.2(12)(b) Legend of all drawing symbols and detailed graphical representation of equipment, panels, devices and components shown on the T-drawings;

2.5.9.2(12)(c) Abbreviations; and

2.5.9.2(12)(d) General, construction and key notes.

2.5.9.2(13) The site plan will be at a scale of 1:500 and will include the following details:

2.5.9.2(13)(a) Property limits;

2.5.9.2(13)(b) Outline of existing buildings and structures and the Facility and proposed structures;

2.5.9.2(13)(c) Public roadways and road names;

2.5.9.2(13)(d) Landscaped areas;

2.5.9.2(13)(e) Driveways;

2.5.9.2(13)(f) Sidewalks;

2.5.9.2(13)(g) Ditches, wetlands, streams, swales, springs and streams;

2.5.9.2(13)(h) Parking lots and laybys indicating parking spaces for fibre splicing vehicles; and

2.5.9.2(13)(i) The CPPS, Service Entrance Facility and all other underground Communications Pathways Systems.

2.5.9.2(14) The Design of the CPPS, Service Entrance Facilities and all other underground Communications Pathway will consist of:

2.5.9.2(14)(a) Combined plan and profile sheets where the Design is broken down into segments:

2.5.9.2.14.(a).1 The plan (or horizontal) scale of each sheet will be 1:250 and the vertical scale will be 1:50;

2.5.9.2.14.(a).2 On each sheet, the plan view of the segment will be shown on top with the profile for the same segment shown directly below;

2.5.9.2.14.(a).3 Sheets will include stations numbers on both plan and profile views. The station numbers and their locations shown on the plan view will align with the station numbers and locations shown in the profile view;

2.5.9.2.14.(a).4 Plan and profiles views will show:

(a).4.1 Existing and new features such those shown on the site plan but in greater scale;

(a).4.2 Elevation and location of communications ducts and pre-cast

manholes and service vaults and boxes in relation to grade and other existing and proposed Utilities and underground services;

(a).4.3 The number of degrees associated with each manufactured and offset conduit bend shown in the Design. This information will be identified beside each bend shown in plan and profile views (not in a table format);

(a).4.4 All parallel Utilities and underground services within 3m of the communications ducts;

(a).4.5 Elevation of any Utilities and underground services that cross over and under the communications ducts;

(a).4.6 Drainage connections to storm, building perimeter and Site drainage systems or rock pits for communications ducts, manholes and service vaults and boxes;

(a).4.7 Clearances between existing and new communications ducts and pre-cast manholes and service vaults from retaining walls, buildings, monument signs, landscaping and landscaping structures and other Utilities and underground services.

(a).4.8 Clearances from existing and new pre-cast manholes and service vaults from the curb radius or right of way line of any new vehicular access point, driveway, road, lane or loading bay and parking entrances.

2.5.9.2.14.(a).5 Cross sections of the communication ducts with a horizontal scale of 1:250 and a vertical scale of 1:50.

(a).5.1 Cross sections will include all the information present in the site, plan and profile views and typical details and;

(a).5.2 Will be produced in each instance when Utilities and underground services cross over or under communications ducts or where communications ducts change direction and or elevation.

2.5.9.2.14.(a).6 Typical communications trench details (for each type of trench) showing backfill information (specific materials used for backfill are to be identified. No references to third party standards is permitted), concrete encasement, rebar, duct spacers, placement of warning tape and typical duct bank depth;

2.5.9.2.14.(a).7 Three-dimensional coloured renderings of communications duct banks broken into segments of the same scale used for the plan and profile sheets. These renderings will be produced using utility network modelling software and will show the changes in elevations, horizontal alignment, offsets and manufactured bends and relationship between other existing and proposed Utilities and underground services and structures;

2.5.9.2.14.(a).8 Butterfly drawings for each pre-cast manhole and service vault and box (including those existing manholes impacted by the Work) showing vault size, depth, lid marking and traffic rating. Each butterfly drawing is to have an associated duct schedule that identifies the size and destination of each duct. There will be no more than three butterfly drawings shown per sheet; and

2.5.9.2.14.(a).9 Typical details for pre-cast manholes and service vaults showing plan and elevation views, racking, grounding, sump detail, manhole lid, manhole signage and any special items cast into manhole sections such as pulling eyes.

2.5.9.2(15) The T-series drawings will also include the following information related to Communications scope on the exterior of the building and the Site.

2.5.9.2(15)(a) Locations of Telecommunications Outlets required for systems and devices located on the exterior of the Facility and on the Site; and

2.5.9.2(15)(b) Street light pole and MMU service pedestal details to demonstrate compliance with requirements in this Schedule.

2.5.9.2(16) For each level of the Facility, the following drawings will be provided:

2.5.9.2(16)(a) An overall floor plan at a scale 1:200 identifying the following design elements:

- 2.5.9.2.16.(a).1 The locations of all Communications Rooms and their associated serving zone boundaries;
- 2.5.9.2.16.(a).2 The location and routing of the Communications Pathway System including:
  - (a).2.1 Communications cable tray;
  - (a).2.2 103 mm Hilti speed sleeves (horizontal and riser);
  - (a).2.3 Conduits that are 50 mm or larger (horizontal and riser);
  - (a).2.4 Pull boxes associated with Service Entrance Facilities and backbone Communications Pathway System (with unique identifiers); and
  - (a).2.5 Roof penetration housings.
- 2.5.9.2.16.(a).3 The location and routing of the backbone cabling subsystem;
- 2.5.9.2.16.(a).4 The location and routing of the Telecommunications grounding backbone;
- 2.5.9.2.16.(a).5 Access paths denoting clearances and floor loading capacities for the installation and removal of equipment and materials between the Facility's loading dock and each Communications Room; and
- 2.5.9.2.16.(a).6 Measurements with supporting data for the maximum Permanent Link length of a horizontal cable from the Communications Room to the extremities of a building's interior space and to any remaining boundary lines of the serving zone. Provide the supporting data associated with these measurements so they can be validated by the Authority.

2.5.9.2(16)(b) An overall floor plan at a scale 1:200 identifying the following design elements:

- 2.5.9.2.16.(b).1 The locations of all Communications Rooms and their associated serving zone boundaries;
- 2.5.9.2.16.(b).2 The boundary of each cell associated with Category 6A cabling grid that will be provided for the IM/IT Wi-Fi Network where each cell is identified on the floor plan with a colour in a checkerboard pattern;
- 2.5.9.2.16.(b).3 The location of the Telecommunications Outlet at the centre of each cell, and
- 2.5.9.2.16.(b).4 The location of each access point identified in the Authority's Design of the IM/IT Wi-Fi Network.

2.5.9.2(16)(c) A minimum of two enlarged drawings per floor that cover roughly an equivalent floor area. These enlarged drawings will be at a scale of 1:100 and will identify the following design elements:

- 2.5.9.2.16.(c).1 The locations of all Communications Rooms and their associated serving zone boundaries;
- 2.5.9.2.16.(c).2 The locations of all Telecommunications Outlets, CATV Outlets, AV wall boxes and floor boxes;
- 2.5.9.2.16.(c).3 The type and quantity of cables terminated in each Telecommunications Outlet, CATV Outlet, AV wall box and floor box;
- 2.5.9.2.16.(c).4 Detailed graphical scaled representation of furniture (including systems furniture and Millwork); and
- 2.5.9.2.16.(c).5 Detailed graphical scaled representation and labelling of:
  - (c).5.1 Authority provided clinical and IM/IT Equipment connected to the IM/IT Data, Wi-Fi and Voice Networks;
  - (c).5.2 Equipment, panels, devices and components associated with Division 27 systems regardless of Design responsibility with the exception of the Public Address and Nurse Call Systems (as these will be shown on separate drawings); and
  - (c).5.3 Equipment, panels, devices and components associated with all other systems in the Agreement that connect to the IM/IT Data, Wi-Fi and Voice Networks.

2.5.9.2(16)(d) A minimum of two enlarged drawings per floor that cover roughly an equivalent floor area. These enlarged drawings will be at a scale of 1:100 and will identify the following design elements:

- 2.5.9.2.16.(d).1 The locations of all Communications Rooms and their associated serving zone boundaries;
- 2.5.9.2.16.(d).2 The locations of all Telecommunications Outlets associated with the Facility PA System and localized paging systems;
- 2.5.9.2.16.(d).3 The type and quantity of cables terminated in each Telecommunications Outlet;
- 2.5.9.2.16.(d).4 The locations of all PA and localized paging speakers where each speaker is labelled in accordance with Authority standards,

2.5.9.2.16.(d).5 The locations of all end of line resistors and microphones;

2.5.9.2.16.(d).6 All components associated with the Facility PA system will be uniquely identified from components associated with localized paging systems;

2.5.9.2.16.(d).7 Each PA speaker will be colour coded based on the amplifier and channel it is connected to in order to inform how the system will be wired and to demonstrate compliance with alternating wiring requirements detailed in this Schedule;

2.5.9.2.16.(d).8 Detailed graphical scaled representation of furniture (including systems furniture and Millwork); and

2.5.9.2.16.(d).9 Detailed graphical scaled representation and labelling of equipment, devices and components that are part of the Facility PA system and localized paging systems.

2.5.9.2(16)(e) A minimum of two enlarged drawings per floor that cover roughly an equivalent floor area. These enlarged drawings will be at a scale of 1:100 and will identify the following design elements:

2.5.9.2.16.(e).1 The locations of all Communications Rooms and their associated serving zone boundaries;

2.5.9.2.16.(e).2 The locations of all Telecommunications Outlets associated with the nurse call system;

2.5.9.2.16.(e).3 Detailed graphical scaled representation of furniture (including systems furniture and Millwork); and

2.5.9.2.16.(e).4 Detailed graphical scaled representation and labelling of equipment, devices and components that are part of the nurse call system.

2.5.9.2(17) Elevations in a 1:50 scale will be provided for each medical boom and for the wall (including the headwall system) at the head of each Patient Bed. These elevations are to include:

2.5.9.2(17)(a) A detailed scaled graphical representation of each TO located at the correct elevation in coordination with other services; and

2.5.9.2(17)(b) Detailed scaled graphical representation and labelling of Authority and Design-Builder provided equipment, devices and components connected to the IM/IT Data, Wi-Fi and Voice Networks and Patient Physiological Monitoring network.

2.5.9.2(17)(c) These elevations will be used to record as-built information relating to the Horizontal Cabling Subsystem terminating on medical booms and the walls (and headwalls) behind Patient beds.

2.5.9.2(18) Stairwell elevations will include the locations of:

2.5.9.2(18)(a) Wall and ceiling Telecommunications Outlets (denoting the serving zone each outlet is associated with);

2.5.9.2(18)(b) Transmitters, Wi-Fi and cellular access points antennas, Digital Wayfinding location and RTLS devices; and

2.5.9.2(18)(c) Public Address speakers (floor plan requirements related to speaker labelling and colour coding will also apply to stairwell elevations).

2.5.9.2(19) For each individual Communications Room in the Facility, a layout drawing will be provided that includes:

2.5.9.2(19)(a) Plan views, reflected ceiling plans and interior wall elevations in a scale not less than 1:50;

2.5.9.2(19)(b) A three-dimensional coloured rendering of the room and the components, materials and equipment that reside in it;

2.5.9.2(19)(c) The outlines of the interior partitions in relation to the structural framework complete with finishing details such as plywood backboards;

2.5.9.2(19)(d) The location of doors and door swings;

2.5.9.2(19)(e) The location, sizes and elevation of all components, materials and equipment including:

- 2.5.9.2.19.(e).1 Equipment racks;
- 2.5.9.2.19.(e).2 Server cabinets;
- 2.5.9.2.19.(e).3 Vertical cable managers;
- 2.5.9.2.19.(e).4 Vertical ePDUs;
- 2.5.9.2.19.(e).5 Plywood (elevations will show the outline of the plywood);
- 2.5.9.2.19.(e).6 Telecommunications ground busbar (TGB/TMGB);
- 2.5.9.2.19.(e).7 Angle brackets / cantruss structure to support wire management rings;
- 2.5.9.2.19.(e).8 Wall mount panels associated with Division 27 systems;
- 2.5.9.2.19.(e).9 Gigabix termination blocks;

2.5.9.2.19.(e).10 Cable surge protectors;
2.5.9.2.19.(e).11 Communications Pathway System – vertical and horizontal cable tray, sleeves and conduits (50 mm or larger). This includes ganging plates and cast-in-place sleeves;
2.5.9.2.19.(e).12 Cable tray drop outs and waterfall fittings;
2.5.9.2.19.(e).13 Telecommunications Outlets;
2.5.9.2.19.(e).14 Wi-Fi access points and, where applicable, external antennas;
2.5.9.2.19.(e).15 DAS cellular access points and passive antennas;
2.5.9.2.19.(e).16 Locating transmitters, antennas and beacons; and
2.5.9.2.19.(e).17 Public Address speakers.

2.5.9.2(19)(f) Wall space allocation for CATV and DAS equipment;

2.5.9.2(19)(g) Identification of wall space for future use;

2.5.9.2(19)(h) Identification of floor space for future equipment racks, server cabinets and cable management;

2.5.9.2(19)(i) Server cabinet and wall mount panel door swings indicated; and

2.5.9.2(19)(j) Maintenance and operational clearances.

2.5.9.2(20) ERDSs will be provided for each Communications Room:

2.5.9.2(20)(a) A separate ERDS booklet will be generated for each Communications Room that will be separate from the Communications Room layout drawings identified in Section 2.5.9.2(19).

2.5.9.2(20)(b) General requirements for ERDS are as follows:
2.5.9.2.20.(b).1 Graphic representation of plan view, reflected ceiling plan view, and all interior elevation views in a 1:50 scale;
2.5.9.2.20.(b).2 All disciplines properly coordinated with no Soft Clashes and Hard Clashes (refer to Appendix 1U [BIM Requirements] for definitions), including all clinical equipment, IM/IT end use devices and network equipment and equipment supplied by the Design-Builder;
2.5.9.2.20.(b).3 A 3D rendering (axonometric) of the room showing all components, materials and equipment that reside in it;

2.5.9.2.20.(b).4 A legend identifying each component, material item and piece of equipment shown; and

2.5.9.2.20.(b).5 An equipment schedule in the form of a table listing the equipment and components to be installed in the room. The schedule will be broken into two categories – Design-Builder provided and Authority provided. Each item will be quantified and given a brief description and a location (e.g. rack or wall mounted)

2.5.9.2(20)(c) The ERDS booklet provided for each Communications Room will:

2.5.9.2.20.(c).1 Include a Room Data Sheet (RDS) which is a textual summary that records the architectural, mechanical, electrical, and communications requirements and services to be provided in the Communications Room;

2.5.9.2.20.(c).2 Include a coloured photometric map;

2.5.9.2.20.(c).3 Identify the location, sizes and elevations of all components, materials and equipment noted in Section 2.5.9.2(19) drawn to scale;

2.5.9.2.20.(c).4 Identify using the correct scale the location, sizes and elevation of all components, materials and equipment related to other disciplines that will occupy space within each Communications Room. This includes the following:

- (c).4.1 Door dimensions;
- (c).4.2 Humidistats and thermostats;
- (c).4.3 Mechanical equipment, louvres, diffuser; grilles and ducts;
- (c).4.4 Sprinkler piping and sprinkler heads;
- (c).4.5 Drip trays and shields;
- (c).4.6 Electrical conduits and sleeves (50 mm or larger) and cable tray;
- (c).4.7 Electrical panels;
- (c).4.8 Electrical outlets (including twist lock receptacles situated above equipment racks and server cabinets). Annotations will be provided indicating the branch the outlet is connected to and whether the outlet is surface mounted or recessed into the wall;
- (c).4.9 Dimmer switches;
- (c).4.10 Lighting fixtures;
- (c).4.11 Occupancy sensors;
- (c).4.12 Clock system equipment;

(c).4.13 Fire alarm speakers and devices;
(c).4.14 Smoke detectors;
(c).4.15 Wall mount panels associated with all Division 28 systems – access control, intrusion, wireless Staff and fixed duress and other;
(c).4.16 Power supply enclosures;
(c).4.17 Card readers;
(c).4.18 IPVS cameras;
(c).4.19 Keypads;
(c).4.20 Motion or vacancy detectors;
(c).4.21 Location transmitters, antennas and beacons associated with Division 28 systems; and
(c).4.22 All other passive and active wall mount equipment associated with any system that is permitted to be installed in a Communications Room (regardless of whether the equipment is supplied by the Design-Builder or the Authority).

2.5.9.2.20.(c).5 Include a calculation of unused or spare wall space expressed as a percentage of total useable wall space. This calculation will not consider unusable wall space or wall space above 2700 mm in elevation. Unused or spare wall space will be shaded so that it can be easily identified and correlated to the calculations provided.

2.5.9.2(21) For each equipment rack and server cabinet installed in the Facility, an elevation drawing will be provided that includes:

2.5.9.2(21)(a) The Communication Room ID where the equipment rack or server cabinet is located;

2.5.9.2(21)(b) Equipment rack or server cabinet identifier;

2.5.9.2(21)(c) A rack unit scale placed adjacent to the equipment rack or server cabinet shown on the elevation drawing. The rack unit scale will start with one (1) at the top and end with forty-four (44) or forty-eight (48) at the bottom depending on height of the equipment rack or server cabinet;

2.5.9.2(21)(d) To scale graphic representation of the following components:

2.5.9.2.21.(d).1 Equipment rack or server cabinet;
2.5.9.2.21.(d).2 Vertical and horizontal cable managers;

2.5.9.2.21.(d).3 Fiber and copper patch panels;
2.5.9.2.21.(d).4 Shelves, blanking plates and other hardware;
2.5.9.2.21.(d).5 Horizontal ePDUs;
2.5.9.2.21.(d).6 All other passive and active rack mount equipment associated with any system that is permitted to be installed in a Communications Room (regardless of whether the equipment is supplied by the Design-Builder or the Authority); and
2.5.9.2.21.(d).7 Unassigned space in the equipment rack or server cabinet.

2.5.9.2(21)(e) An equipment schedule in table format that provides the make, model, description and location (expressed in rack units occupied of each item installed in the equipment rack or server cabinet; and

2.5.9.2(21)(f) A calculation of unused rack space expressed as a percentage of total rack space available in a given equipment rack or server cabinet.

2.5.9.2(22) Structured Cabling Labelling Details

2.5.9.2(22)(a) Diagrams detailing the labelling requirements for the Structured Cabling system in the Facility. This includes the following components:

2.5.9.2.22.(a).1 Communications Rooms;
2.5.9.2.22.(a).2 Equipment racks;
2.5.9.2.22.(a).3 Server cabinets;
2.5.9.2.22.(a).4 Copper patch panels;
2.5.9.2.22.(a).5 Fiber patch panels;
2.5.9.2.22.(a).6 Fiber cassettes;
2.5.9.2.22.(a).7 Category 6A cabling and patch cords;
2.5.9.2.22.(a).8 Coaxial cables;
2.5.9.2.22.(a).9 Category 3 multi-conductor cable;
2.5.9.2.22.(a).10 Multimode fiber cable;
2.5.9.2.22.(a).11 Single mode fiber cable;
2.5.9.2.22.(a).12 Powered fiber cable systems;
2.5.9.2.22.(a).13 Fiber patch cords;
2.5.9.2.22.(a).14 Gigabix components;
2.5.9.2.22.(a).15 Wireless equipment enclosures;
2.5.9.2.22.(a).16 Faceplates;
2.5.9.2.22.(a).17 Outlets (all types); and
2.5.9.2.22.(a).18 Related components such as access hatches, ceiling grid, etc.

2.5.9.2(23) The Telecommunications bonding and grounding riser diagram will include:

2.5.9.2(23)(a) The entire Telecommunications grounding system in the Facility from the main electrical ground busbar to each Communications Room including:

- 2.5.9.2.23.(a).1 The sizing of the Telecommunications bonding backbone and its interconnection to Telecommunications ground busbars and to the main electrical ground busbar;
- 2.5.9.2.23.(a).2 The locations of the Telecommunications ground busbars (where the make, model number and the label associated with each busbar is correctly identified as per the requirements in PHSA Communications Infrastructure Standards and Specifications;
- 2.5.9.2.23.(a).3 Communications Rooms;
- 2.5.9.2.23.(a).4 Elevations for each floor in the Facility;
- 2.5.9.2.23.(a).5 The location of the main electrical ground busbar; and
- 2.5.9.2.23.(a).6 The locations of connectors.

2.5.9.2(23)(b) Typical grounding details and instructions related to bonding specific items including:

- 2.5.9.2.23.(b).1 Communications Pathway Systems;
- 2.5.9.2.23.(b).2 Static dissipative floor coverings (in Communications Rooms);
- 2.5.9.2.23.(b).3 Equipment racks;
- 2.5.9.2.23.(b).4 Server cabinets;
- 2.5.9.2.23.(b).5 Electrical panels (in Communications Rooms);
- 2.5.9.2.23.(b).6 Exposed steel structure (in Communications Rooms);
- 2.5.9.2.23.(b).7 Armoured cable jackets or shields; and
- 2.5.9.2.23.(b).8 Cable surge protectors.

2.5.9.2(24) The backbone Communications Pathway System riser diagram will include:

2.5.9.2(24)(a) Service Entrance Facility (interior portion);

2.5.9.2(24)(b) Communications cable tray on each floor of the Facility (noting size);

2.5.9.2(24)(c) Horizontal and vertical riser sleeves (noting size and quantity);

2.5.9.2(24)(d) Location and size of pull boxes (connected to the Service Entrance Facility and the backbone Communications Pathway System with unique identifiers);

2.5.9.2(24)(e) Communications Rooms;

2.5.9.2(24)(f) Elevations for each floor in the Facility; and

2.5.9.2(24)(g) Typical labelling and identification details for all components of the system.

2.5.9.2(25) Three-dimensional coloured rendering of the backbone Communications Pathway System will be provided identifying the information noted in the section above with the exception of the typical labelling and identification details.

2.5.9.2(26) The backbone cabling riser diagram will include:

2.5.9.2(26)(a) Point to point routing of intra-building copper and fiber cables;

2.5.9.2.26.(a).1 Routing of the cables to follow the backbone Communications Pathway System, but the backbone Communications Pathway System will not be shown; and

2.5.9.2.26.(a).2 The intra-building copper and fiber cables will be shown on different drawings.

2.5.9.2(26)(b) The strand or copper pair count of each cable installed (each type of cable and pair count will be identified using different colours);

2.5.9.2(26)(c) Cross connect locations (include rack IDs);

2.5.9.2(26)(d) Communications Rooms; and

2.5.9.2(26)(e) Elevations for each floor in the Facility.

2.5.9.2(27) The public address block diagram will include:

2.5.9.2(27)(a) Point to point wiring details (including the type of wiring) between speakers and amplifiers showing amplifier and channel assignment per speaker;

2.5.9.2(27)(b) Speaker counts by type and by floor;

2.5.9.2(27)(c) Communications Rooms;

2.5.9.2(27)(d) Elevations and reflected ceiling plans for each floor in the Facility;

2.5.9.2(27)(e) Equipment locations (include room and area name and architectural room number);

2.5.9.2(27)(f) Equipment pictures complete with make and model numbers. Correlate equipment pictures with drawing symbols;

2.5.9.2(27)(g) Physical and logical connections or interfaces to other systems as needed for integration. This includes systems listed in Division 25, 26, 27, and 28. The diagram is to detail all new wiring and active and passive equipment involved in these connections;

2.5.9.2(27)(h) Elevation drawings for public address system equipment racks; and

2.5.9.2(27)(i) Typical labelling and identification details for all components of the system.

2.5.9.2(28) For each individual Multimedia Room in the Facility, a layout drawing will be provided that includes:

2.5.9.2(28)(a) Plan views, reflected ceiling plans and interior wall elevations in a scale not less than 1:50;

2.5.9.2(28)(b) A three-dimensional coloured rendering of the room and the components, materials and equipment that reside in it;

2.5.9.2(28)(c) The outlines of the interior partitions in relation to the structural framework complete with finishing details such as plywood backboards;

2.5.9.2(28)(d) The location, sizes and elevation of all components, materials and equipment including:

- 2.5.9.2.28.(d).1 Cameras;
- 2.5.9.2.28.(d).2 Microphones;
- 2.5.9.2.28.(d).3 Speakers (those used for AV, multimedia and Public Address);
- 2.5.9.2.28.(d).4 Ultra HD digital display monitors;
- 2.5.9.2.28.(d).5 Touch panels, key pads and other user interfaces,
- 2.5.9.2.28.(d).6 Telecommunications Outlets, CATV Outlets, AV wall boxes and source connection panels;
- 2.5.9.2.28.(d).7 Floor boxes;
- 2.5.9.2.28.(d).8 Wi-Fi access points and, where applicable, external antennas;
- 2.5.9.2.28.(d).9 DAS cellular access points and passive antennas; and
- 2.5.9.2.28.(d).10 Location transmitters, antennas and beacons.

2.5.9.2(28)(e) An AV conduit riser diagram detailing all AV conduit sizes, junction boxes (including number of gangs), their interconnection to floor boxes, backboxes and location in floor slab, room, plenum and ceiling spaces.

2.5.9.2(28)(f) The drawings for the Command Centre will demonstrate viewing angles and sightlines for multiple seated and standing viewers to the central DVLED video wall.

2.5.9.2(28)(g) The drawings for Type 1, 2, 5A and 6 Multimedia Rooms will demonstrate that the locations and quantities of floor boxes illustrated in the Design provides sufficient and convenient under-table connections to accommodate the various different furniture configurations required by the Authority either when the room is divided by its operable partition or combined into one space;

2.5.9.2(28)(h) Clinical Education Source Camera field of view and viewing angles will be shown on drawings to verify coverage and usability.

2.5.9.2(28)(i) Cross-sections showing vertical viewing angles to monitors and cameras.

2.5.9.2(29) ERDSs will be provided for each Multimedia Room.

2.5.9.2(29)(a) A separate ERDS booklet will be generated for each Multimedia Room that will be separate from the Multimedia Room layout drawings identified in Section 2.5.9.2(28).

2.5.9.2(29)(b) General requirements for ERDS are as follows:

2.5.9.2.29.(b).1 Graphic representation of plan view, reflected ceiling plan view, and all interior elevation views in a 1:50 scale;

2.5.9.2.29.(b).2 All disciplines properly coordinated with no Hard Clashes or Soft Clashes, including all clinical equipment, IM/IT end use devices and equipment supplied by the Design-Builder;

2.5.9.2.29.(b).3 A 3D rendering (axonometric) of the room showing all components, materials and equipment that reside in it;

2.5.9.2.29.(b).4 A legend identifying each component, material item and piece of equipment shown; and

2.5.9.2.29.(b).5 An equipment schedule in the form of a table listing the equipment and components to be installed in the room. The schedule will be broken into two categories – Design-Builder provided and Authority provided. Each item will be quantified and given a brief description and a location (e.g. rack or wall mounted)

2.5.9.2(29)(c) The ERDS booklet provided for each Multimedia Room will:

2.5.9.2.29.(c).1 Include a Room Data Sheet (RDS) which is a textual summary that records the architectural, mechanical, electrical, and communications requirements and services to be provided in the Multimedia Room as identified in this Schedule;

2.5.9.2.29.(c).2 Include a photometric map;

2.5.9.2.29.(c).3 Identify the location, sizes and elevations of all components, materials and equipment noted in Section 2.5.9.2(28) drawn to scale; and

2.5.9.2.29.(c).4 Identify using the correct scale the location, sizes and elevation of all components, materials and equipment related to other disciplines that will occupy space within each Multimedia Room. This includes the following:

(c).4.1 Furniture and Millwork layout;
(c).4.2 Window blinds;
(c).4.3 Magnetic whiteboards and other fixtures;
(c).4.4 Wall and ceiling backing;
(c).4.5 Wall and ceiling acoustic treatments;
(c).4.6 Humidistats and thermostats;
(c).4.7 Mechanical equipment, louvres, diffusers and grilles;
(c).4.8 Sprinkler heads;
(c).4.9 Electrical outlets;
(c).4.10 Lighting fixtures and controls;
(c).4.11 Occupancy sensors;
(c).4.12 Clocks;
(c).4.13 Fire alarm speakers and devices;
(c).4.14 Smoke detectors;
(c).4.15 Card readers;
(c).4.16 IPVS cameras;
(c).4.17 Keypads;
(c).4.18 Motion detectors; and

(c).4.19 Location transmitters, antennas and beacons associated with Division 28 systems.

2.5.9.2(30) AV and multimedia system block diagrams will be generated in accordance with AVIXA project documentation standards and will include:

2.5.9.2(30)(a) Interconnections of AV and multimedia equipment.

2.5.9.2(30)(b) Signal path of audio, video, control and data signals including source, signal processing, signal distribution, presentation, recording and storage (where required), monitoring and control.

2.5.9.2.30.(b).1 Inputs and outputs will be clearly labelled; and

2.5.9.2.30.(b).2 Signal source and destination will be clearly delineated.

2.5.9.2(30)(c) Make and model of equipment supplied by Design-Builder.

2.5.9.2(30)(d) Power distribution where POE power is required for AV devices.

2.5.9.2(30)(e) LAN networks to be utilized such as a private AV or control LAN, the Authority's network and any interconnection with other systems such as life safety, lighting, HVAC and BMS systems.

2.5.9.2(31) For Crestron touch panels, provide:

2.5.9.2(31)(a) Coloured screen shots of each page of the user interface associated with Type 1, 2, 3, 5A and 6 Multimedia Rooms illustrating the proposed graphic layouts; and

2.5.9.2(31)(b) Interactive software mock-up of the UI to confirm navigation and flow in the simulation lab in accordance with Section 2.7.9.2(1)(a).

2.5.9.2(32) Digital Wayfinding details will be produced for each terminal device in the Facility which will include:

2.5.9.2(32)(a) Renderings of each device type that will convey compliance with requirements and overall design intent that will be used as a basis of procurement of equipment and any required fabrication; and

2.5.9.2(32)(b) The renderings will address:

2.5.9.2.32.(b).1 Colours and shapes to demonstrate compliance with Authority branding and Project themes;

2.5.9.2.32.(b).2 Functional, spatial and material considerations as noted in Section 7.8.16;

2.5.9.2.32.(b).3 Serviceability elements, such as locking, latching or supporting mechanisms; and

2.5.9.2.32.(b).4 The locations, sizes and elevation of all components, materials and equipment contained within the digital Wayfinding terminal device such as:

(b).4.1 Cameras or other counting sensors;
(b).4.2 Speakers;
(b).4.3 Ultra HD digital display monitors;
(b).4.4 Mounts;
(b).4.5 Enclosures;
(b).4.6 Touch overlays or curtains;
(b).4.7 PCs or digital signage players;
(b).4.8 User interface devices;
(b).4.9 Telecommunications Outlets, CATV Outlets, AV wall boxes and source connection panels;
(b).4.10 Floor boxes;
(b).4.11 Location transmitters, antennas and beacons; and
(b).4.12 NFC, QR Codes, or other off device means of interaction.

2.5.9.2(33) Digital Wayfinding details will be produced for the entire Wayfinding system which include:

2.5.9.2(33)(a) Journey maps for each major user group;

2.5.9.2(33)(b) Floor plan views showing all terminal devices, locations and positioning technology and infrastructure;

2.5.9.2(33)(c) Coloured screen shots of each page of the user interface for both terminal devices and the mobile application; and

2.5.9.2(33)(d) Interactive software mock-up of the UI for both terminal devices and the mobile application to confirm and test navigation and flow. This software mock-up will be provided in the simulation lab in accordance with Section 2.7.9.2(1)(a).

2.5.9.2(34) Digital Signage and CATV details will be produced for each location identified in Schedule 1 – Statement of Requirements

regardless of whether the screen or display monitor will be installed or not. These details will include:

2.5.9.2(34)(a) Side and front elevations showing:

2.5.9.2.34.(a).1 Screen size, orientation and elevation suitable for location and intended use;

2.5.9.2.34.(a).2 Location and elevation of electrical outlets and Telecommunications Outlets;

2.5.9.2.34.(a).3 Wall backing;

2.5.9.2.34.(a).4 Wall cavity details (where required) showing dimensions, space allocation for equipment such as screens, mounting brackets and media players; thermal management or venting and backing; and

2.5.9.2.34.(a).5 Wall enclosure details (where required) showing dimensions, space allocation for equipment such as screens, mounting brackets and media players; thermal management or venting, backing and access panels.

2.5.9.2(34)(b) Unobstructed horizontal and vertical viewing angles to demonstrate that the content can be easily viewable in a manner that aligns to the functional need (i.e., the need to make decisions based on information on the display or the need to do more analytical decision making based on minute details displayed on the screen); and

2.5.9.2(34)(c) Closest and farthest viewing distances.

2.5.9.2(35) Patient Physiological Monitoring drawings will include:

2.5.9.2(35)(a) Floorplans with the identification and coordination of specific elements of the Patient Physiological Monitoring System on the construction drawings; and

2.5.9.2(35)(b) Reflected ceiling plans for each floor in the Facility where the Patient Physiological Monitoring system will be installed.

2.5.9.2(36) Nurse Call drawings will include:

2.5.9.2(36)(a) Floorplans showing zoning, and locations and types of all devices, panels and equipment to be installed as part of the Nurse Call System;

2.5.9.2(36)(b) Reflected ceiling plans for each floor in the Facility;

2.5.9.2(36)(c) Elevations and device placement for typical rooms including all inpatient rooms, Care Team Stations, ensuite bathrooms, Multimedia Rooms, and operating suites;

2.5.9.2(36)(d) Complete wiring details illustrating how each device will connect back to the main panels, cabinets, and/or patch panels (including tie in to Fire Alarm System) and the cable type to be used for each connection;

2.5.9.2(36)(e) Network interface with other systems; and

2.5.9.2(36)(f) Wiring and block diagram showing the integration with all systems requiring integration.

2.5.9.2(37) RTLS drawings will include:

2.5.9.2(37)(a) System or functional block/line diagrams;

2.5.9.2(37)(b) Plans indicating equipment, and/or component locations, cable routes, and other installation information;

2.5.9.2(37)(c) Coverage plans;

2.5.9.2(37)(d) Equipment and/or wall / rack elevations, showing equipment layout, space requirements and integration with other systems;

2.5.9.2(37)(e) Installation details for equipment and other components unique to RTLS, and other information that depicts the intended installation; and

2.5.9.2(37)(f) Other documentation as set out in Section 7.8.24.

2.5.9.3 Specifications

2.5.9.3(1) Iterations of the Division 27 specification will be included as part each Design submission. At Schematic Design 30% complete, the minimum the Authority will accept is a list of the sections associated with the Division 27 specification that will form a table of contents for the digital manual included in the 100% submission. For all other Design Stages, the Division 27 specifications are to be developed and elaborated in accordance with the percentage of completeness associated with each Design stage. A roadmap detailing the development of the Division 27 specifications will be provided to the Authority by the Design-Builder to ensure expectations are aligned through Design process.

2.5.9.3(2) The Division 27 specifications will be written, reviewed and stamped or certified by the RCDD employed by the Design-Builder. Given the importance of specifications relative to drawings, no one without an active RCDD certification will be permitted to be involved in the writing and overall development of the Division 27 specifications.

2.5.9.3(3) The RCDD will be expected to develop Division 27 specifications specific to this Project.

2.5.9.3(4) The RCDD can leverage, where appropriate and applicable, the PHSA Communications Infrastructure Standards and Specifications for guidance in the development of the Division 27 specifications for this Project. However, this does not permit the RCDD to copy content in whole or in part from the PHSA Communications Infrastructure Standards and Specifications or from any other schedule, sub-schedule, appendix or attachments associated with the Design- Build agreement to create the Division 27 specifications for this Project without first obtaining permission from the Authority. If permission is to be granted, it will be done in each instance where the RCDD wishes to copy content from any schedule, sub-schedule, appendix or attachments associated with the Design- Build Agreement.

2.5.9.3(5) As part of the IFC submission, the Division 27 specification will be presented to the Authority in a digital manual organized into sections where each section covers one or more elements of the Project. Requirements for digital manual is as follows:

- 2.5.9.3(5)(a) The files making up the Manual will be arranged in a folder structure;
- 2.5.9.3(5)(b) All items in the Table of Contents will have “hypertext links” within the document;
- 2.5.9.3(5)(c) All digital content will be PDF versions, text searchable bookmarked contents; and
- 2.5.9.3(5)(d) Manual (typically less than 100 Mb) will be presented in one document.

2.5.9.3(6) The sections of the Division 27 specification cannot standalone. They will function and be coordinated with other sections that are part of the Division 27 specification and with sections belonging to the other divisions associated with the overall specification for the Project.

2.5.9.3(7) Each section of the Division 27 specification will be broken into three parts – Part 1 General, Part 2 Products, Part 3 Execution and Part 4 Operations:

2.5.9.3(7)(a) Part 1 General: Describes administrative and procedural requirements, quality control and assurance requirements, references and identifies the codes and standards that the materials, equipment, systems, software and applications will be provided in accordance with:

2.5.9.3.7.(a).1 Part 2 Products: Describes each item of material and equipment, system, software and application to be used in the Division 27 scope of work for the Project;

2.5.9.3.7.(a).2 Part 3 Execution: Describes the method of installation, testing, Commissioning and documenting for each item of material and equipment, system, software and application that is part of the Division 27 scope of work for the Project; and

2.5.9.3.7.(a).3 Part 4 Operations: Describe the sequence of operations for each system as a stand-alone and integrated system including a detailed step by step guide to bring the systems back online in the event of a malfunction. Note these can be provided as an appendix for each system.

2.5.9.3(8) The requirements described in a part of a specific section will not duplicate statements that are made in:

2.5.9.3(8)(a) Other parts of the same section;

2.5.9.3(8)(b) Other sections of the Division 27 specification; and

2.5.9.3(8)(c) Sections belonging to the other divisions associated with the overall specification for the Project.

2.5.9.3(9) In the case where a limited number of manufacturers or vendors are deemed acceptable by the Authority for specific materials, equipment, systems, software and applications, the Division 27 specification will either:

2.5.9.3(9)(a) Identify the specific material, equipment, system, software and application by name and model or part number that has been prescribed by the Authority in the Design-Build Agreement and detail the information associated with its method of installation, testing, Commissioning and documentation;

2.5.9.3(9)(b) Identify the material, equipment, system, software and application by name and model or part number

that has been granted reviewed status by the Authority through a formal shop drawing submission and detail the information associated with its method of installation, testing, Commissioning and documentation; and

2.5.9.3(9)(c) Accurately describe the characteristics and performance criteria and the information associated with the method of installation, testing, Commissioning and documentation of each acceptable product option prescribed in the Design-Build Agreement.

2.5.9.4 Additional Design Requirements and Submittals

2.5.9.4(1) In Communications and Multimedia Rooms of same or similar dimensions and layout, the location and elevation of equipment and room controls will be represented consistently wherever possible in the Design.

2.5.9.4(2) Any post-IFC changes or modifications made to Reviewed Drawings and Specifications that do not result in any adjustments to the Contract Price and Contract Time will be issued as a site or supplemental instructions.

2.5.9.4(3) An inventory of Category 6A Data Drops will be produced for the Facility. This inventory will be provided in an Excel spreadsheet with a tab for each Communications Room and a summary tab that provides the totals for the Facility. The inventory of Category 6A Data Drops will be Included as part of each Design submission from Design Development 30% complete through to Issued for Construction 100% complete including the as-built Record Documentation:

2.5.9.4(3)(a) The inventory is used by the Authority primarily to determine port counts, cross connect requirements and switch quantities;

2.5.9.4(3)(b) The inventory will only capture the Category 6A Data Drops that will or are intended to physically connect to Authority provided network equipment in the Facility;

2.5.9.4(3)(c) Each tab of the spreadsheet (with the exception of the summary tab) will identify the following:

2.5.9.4.3.(c).1 The level of the Facility;

2.5.9.4.3.(c).2 The drawing number where the Data Drops are shown; and

2.5.9.4.3.(c).3 The room or areas name and corresponding architectural room number where the Data Drop is terminated in an outlet. The rooms identified will only be those that exist within the serving zone boundary of the Communications Room.

2.5.9.4(3)(d) Also, on each tab, the count of Data Drops will be broken down into categories that include;

2.5.9.4.3.(d).1 General-purpose Telecommunications Outlets, CATV Outlets, AV wall boxes and floor boxes. This category will be broken down further into types of general-purpose outlets based on Data Drop count;

2.5.9.4.3.(d).2 Security (Division 28) systems broken down by specific devices and or equipment such as IPVS; access control panels, intrusion panels, wireless Staff and fixed duress devices, Patient wandering and infant protection devices, fire alarm panels, etc.;

2.5.9.4.3.(d).3 AV and multimedia system broken down by specific devices and or equipment such as touch panels, cameras, display monitors, VC, audio system components, signal processors, digital signage, and any other components that connect to the Authority' network;

2.5.9.4.3.(d).4 Intercommunications systems broken down by specific devices and or equipment such door stations, master stations, etc.;

2.5.9.4.3.(d).5 Wireless Telecommunications Outlets broken down by Wi-Fi, DAS, etc.;

2.5.9.4.3.(d).6 Clinical equipment systems broken down by specific devices and or equipment such as physiological monitors, central stations, Telemetry antennas, etc.;

2.5.9.4.3.(d).7 Other Division 27 systems such as RTLS , Public Address and Nurse Call; and

2.5.9.4.3.(d).8 Other systems and devices such as BMS, lighting control, parking meters, elevators, SNMP management ports on UPS units, etc.

2.5.9.4(3)(e) The Authority will provide a sample of the inventory spreadsheet and will work with the Design-Builder prior to the 60% submission to refine the format of the spreadsheet to be specific for this Project.

2.5.9.4(4) Any single line drawings produced for systems specified in the Design-Build Agreement will identify:

2.5.9.4(4)(a) The specific rooms or areas where network switches and equipment, servers and workstations provided by the Design-Builder will be physically located; and

2.5.9.4(4)(b) A requirement to physically and or logically connect network switches and equipment, servers and workstations provided by the Design-Builder to any of the Authority's IM/IT networks.

2.5.9.4(5) Cable fill calculations for communications cable tray and 103 mm conduits and sleeves will be included as part of each Design submission from Design Development 30% complete through to Issued for Construction 100% complete including the as-built Record Documentation. The calculation will include:

2.5.9.4(5)(a) The maximum cable fill based on the cable sizes that will be installed; and

2.5.9.4(5)(b) Spare capacity provided in the cable tray, conduit or sleeve.

2.5.9.4(6) The reflected ceiling plans provided in the architectural drawing package will show all ceiling mounted communications devices and equipment:

2.5.9.4(6)(a) Identify using the correct scale all ceiling mounted communications devices and equipment. This includes:

- 2.5.9.4.6.(a).1 Wi-Fi access points and, where applicable, external antennas;
- 2.5.9.4.6.(a).2 Telemetry antennas;
- 2.5.9.4.6.(a).3 DAS cellular access points and passive antennas;
- 2.5.9.4.6.(a).4 RTLS transmitters, antennas and beacons;
- 2.5.9.4.6.(a).5 Antenna enclosures;
- 2.5.9.4.6.(a).6 Ceiling hatches required to access pull boxes or Telecommunication Outlets;
- 2.5.9.4.6.(a).7 Ceiling mounted Telecommunications Outlets;
- 2.5.9.4.6.(a).8 Speakers associated with Public Address, Fire Alarm, AV and multimedia systems;
- 2.5.9.4.6.(a).9 Nurse call zone and dome lights;
- 2.5.9.4.6.(a).10 Patient Wandering, Intrusion Detection, and Overdose Notification lights;
- 2.5.9.4.6.(a).11 Microphones;
- 2.5.9.4.6.(a).12 IPVS and Clinical Observation
- 2.5.9.4.6.(a).13 Cameras; and
- 2.5.9.4.6.(a).14 Ceiling mounts for displays.

2.5.9.4(6)(b) Identify any ceiling tiles that will be kept free and clear of any devices in order to provide access to pull boxes associated with the Service Entrance Facility, backbone Communications Pathway System or the rooftop Communications Pathway System;

2.5.9.4(6)(c) Unique symbols will be used on the reflected ceiling plans to denote which communications system the communications device or equipment belongs to. For example, fire alarm, public address and multimedia of AV speakers will each be given a unique symbol to differentiate them from one another. The same practice will be employed as it pertains to different wireless systems;

2.5.9.4(6)(d) With each Design Submittal, mark-ups of the reflected ceiling plans will be provided by the Design-Builder to the Authority identifying where there are physical conflicts:

2.5.9.4.6.(d).1 Between access points, antennas, transmitters and beacons associated with different Authority provided wireless systems; and

2.5.9.4.6.(d).2 Between access points, antennas, transmitters and beacons associated with Authority provided wireless systems and other ceiling elements such as lighting fixtures and devices, cameras and security devices, speakers, microphones, nurse call devices, smoke detectors, enclosures and access panels; outlets, projectors. Motorized screens; grills, diffusers; sprinklers; bulkheads and other structural or ceiling features.

2.5.9.4(7) Architectural Equipment Plan and Elevation drawings will include:

2.5.9.4(7)(a) Detailed graphical scaled representation of furniture (including systems furniture and Millwork); and

2.5.9.4(7)(b) Detailed graphical scaled representation and labelling of:

2.5.9.4.7.(b).1 Authority provided clinical and IM/IT Equipment connected to the IM/IT Data, Wi-Fi and Voice Networks; and

2.5.9.4.7.(b).2 Equipment, panels, devices and components associated with Division 27 systems regardless of Design responsibility.

2.5.9.4(7)(c) Labels will be co-located with each piece of equipment, device and component and not identified in a legend.

2.5.9.4(7)(d) All wall elevations will show the locations of Telecommunications and electrical outlets associated with the equipment noted in the above clause.

2.5.9.4(8) Architectural millwork details will include:

2.5.9.4(8)(a) All the elements identified in Section 7.8.8.6;

2.5.9.4(8)(b) The locations and elevations of electrical outlets and TOs; and

2.5.9.4(8)(c) Access panels required to access Communications Pathways Systems concealed inside millwork.

2.5.9.4(9) CPPS Documentation Requirements:

2.5.9.4(9)(a) The Design-Builder will provide the following Submittal requirements:

- 2.5.9.4.9.(a).1 Video scoping of the manhole drains;
- 2.5.9.4.9.(a).2 Concrete test results;
- 2.5.9.4.9.(a).3 Compaction test results;
- 2.5.9.4.9.(a).4 Asphalt test results;
- 2.5.9.4.9.(a).5 Mandrel test results;
- 2.5.9.4.9.(a).6 GPS data;
- 2.5.9.4.9.(a).7 Weekly progress reports with photos (Refer to Section 2.5.9.5(7) for the requirements relating to photographs and redline updates reflecting the progress of construction.

2.5.9.4(10) The Design-Builder will submit to the Authority the following:

2.5.9.4(10)(a) RCDD for the person(s) responsible for the Division 27 drawings and specifications;

2.5.9.4(10)(b) A letter of approval or other certification from the manufacturer indicating that its contractor (and their personnel) is a manufacturer certified installer of the cabling systems and equipment required for the Division 27 scope of work;

2.5.9.4(10)(c) Manufacturers’ instructions for storage, handling, protection, examination, preparation, operation, maintenance, and installation of all products;

2.5.9.4(10)(d) All applicable Material Safety Data Sheets;

2.5.9.4(10)(e) All factory test information of cables prior to installation of the product;

2.5.9.4(10)(f) A complete test plan and procedures for all cabling as per the latest TIA standards;

2.5.9.4(10)(g) Test results for all cabling as per PHSA Communications Infrastructure Standards and Specifications;

2.5.9.4(10)(h) Cabling information as per Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] and TR spreadsheet (refer to Section 7.8.11 for further details;

2.5.9.4(10)(i) Calibration reports for all equipment used to test cabling;

2.5.9.4(10)(j) Training plans for all Division 27 systems;

2.5.9.4(10)(k) Acoustical simulation documentation for the Public Address system to demonstrate compliance during the design deployment phase;

2.5.9.4(10)(l) Proposed labeling materials and nomenclature; and

2.5.9.4(10)(m) All other Submittals as specified in the Agreement.

2.5.9.5 Shop Drawings

2.5.9.5(1) The Design-Builder can make changes to materials, equipment and other components specified in the Design through the submittal of shop drawings as long as the changes are compliant with the Agreement and do not:

2.5.9.5(1)(a) Alter the manufacturer or vendor and product line specified in the Design; and

2.5.9.5(1)(b) Introduce a significant alteration to Reviewed Drawings and or Specifications.

2.5.9.5(2) Before the installation of any product, material or equipment associated with Division 27 scope of work, the Design-Builder will submit shop drawings and product data sheets to the Authority for review.

2.5.9.5(3) Each shop drawing Submittal will have a separate table of contents. Each product, material and equipment item in the shop drawing Submittal will be identified in the table of contents. The table of contents will also identify the manufacturer, make and model number of each product, material and equipment item.

2.5.9.5(4) Individual shop drawings and product data sheets included in a shop drawing Submittal will be marked or highlighted to show which products, materials and equipment and associated options are applicable for review.

2.5.9.5(5) Shop drawing and product data submitted for this Project will include the following:

2.5.9.5(5)(a) Telecommunications Grounding and Bonding System:

- 2.5.9.5.5.(a).1 Busbars;
- 2.5.9.5.5.(a).2 Grounding Conductors; and
- 2.5.9.5.5.(a).3 Connecting devices such as pressure connectors, lugs, clamps, etc.

2.5.9.5(5)(b) Communications Pathway System:

- 2.5.9.5.5.(b).1 Cable tray;
- 2.5.9.5.5.(b).2 Conduit;
- 2.5.9.5.5.(b).3 Hilti speed sleeves and firestopping products and systems;
- 2.5.9.5.5.(b).4 Surface Raceway systems;
- 2.5.9.5.5.(b).5 Pull boxes;
- 2.5.9.5.5.(b).6 Outlet boxes;
- 2.5.9.5.5.(b).7 Access hatches;
- 2.5.9.5.5.(b).8 Cable tray drop outs, waterfall fittings and miscellaneous hardware;
- 2.5.9.5.5.(b).9 Cable management components for Millwork;
- 2.5.9.5.5.(b).10 Mule tape and pull rope;
- 2.5.9.5.5.(b).11 Roof penetration vaults or doghouses; and
- 2.5.9.5.5.(b).12 Non-penetrative support and step over systems for the rooftop of the Facility.

2.5.9.5(5)(c) Racks and Cabinets:

- 2.5.9.5.5.(c).1 Four post open relay racks;
- 2.5.9.5.5.(c).2 Server cabinets (including internal accessories);
- 2.5.9.5.5.(c).3 Vertical and horizontal cable management;
- 2.5.9.5.5.(c).4 Cable slack management spools;
- 2.5.9.5.5.(c).5 Vertical and horizontal ePDUs;
- 2.5.9.5.5.(c).6 Rack mounted blanking plates, shelves; and
- 2.5.9.5.5.(c).7 Miscellaneous hardware.

2.5.9.5(5)(d) CPPS:

- 2.5.9.5.5.(d).1 Rebar;
- 2.5.9.5.5.(d).2 Sieve analysis for granular materials;
- 2.5.9.5.5.(d).3 PVC duct, manufactured bends, fittings, connectors and end caps;
- 2.5.9.5.5.(d).4 Duct spacers;
- 2.5.9.5.5.(d).5 Duct plugs;

2.5.9.5.5.(d).6 Mule tape;
2.5.9.5.5.(d).7 Warning tape;
2.5.9.5.5.(d).8 Manholes, service vaults, service boxes;
2.5.9.5.5.(d).9 Signage;
2.5.9.5.5.(d).10 Risers, grade rings and lids;
2.5.9.5.5.(d).11 Sump; and
2.5.9.5.5.(d).12 Hardware and racking.

2.5.9.5(5)(e) Copper Twisted Pair Cabling:
2.5.9.5.5.(e).1 Category 3 multi-conductor backbone cable;
2.5.9.5.5.(e).2 Category 6A cabling;
2.5.9.5.5.(e).3 Patch panels;
2.5.9.5.5.(e).4 Patch cords;
2.5.9.5.5.(e).5 Cable surge protectors;
2.5.9.5.5.(e).6 Gigabix components;
2.5.9.5.5.(e).7 Cross connect wire; and
2.5.9.5.5.(e).8 Outlets and jacks.

2.5.9.5(5)(f) Fiber Cabling:
2.5.9.5.5.(f).1 Multimode;
2.5.9.5.5.(f).2 Single mode;
2.5.9.5.5.(f).3 Pre-term fiber trunk cables;
2.5.9.5.5.(f).4 Powered fiber cable systems;
2.5.9.5.5.(f).5 Patch panels;
2.5.9.5.5.(f).6 Splice Cassettes;
2.5.9.5.5.(f).7 Pigtails;
2.5.9.5.5.(f).8 Patch cords; and
2.5.9.5.5.(f).9 Wire management rings.

2.5.9.5(5)(g) Coaxial Cabling:
2.5.9.5.5.(g).1 RG6 and RG11 cables required for the CATV system;
2.5.9.5.5.(g).2 Backboxes, faceplates, connectors, adapters, and inserts required for CATV Outlets; and
2.5.9.5.5.(g).3 Coaxial cables required for the DAS system.

2.5.9.5(5)(h) Outlets:
2.5.9.5.5.(h).1 Floor boxes;
2.5.9.5.5.(h).2 Surface mount boxes;
2.5.9.5.5.(h).3 Faceplates; and
2.5.9.5.5.(h).4 Dust covers and blank inserts.

2.5.9.5(5)(i) Wireless equipment enclosures, vanity skins and covers and specialized mounts and brackets;

2.5.9.5(5)(j) Labelling materials and nomenclature for all Division 27 systems and equipment provided by the Design-Builder;

2.5.9.5(5)(k) Multimedia and Digital Wayfinding:

- 2.5.9.5.5.(k).1 Cables and wiring;
- 2.5.9.5.5.(k).2 Anchors and fasteners;
- 2.5.9.5.5.(k).3 Display monitors;
- 2.5.9.5.5.(k).4 Terminal Devices;
- 2.5.9.5.5.(k).5 Wayfinding positioning technology and infrastructure;
- 2.5.9.5.5.(k).6 Mounts, brackets and related hardware and materials required to mount AV and multimedia components to walls and ceilings;
- 2.5.9.5.5.(k).7 AV wall boxes and source connection plates;
- 2.5.9.5.5.(k).8 Keypads
- 2.5.9.5.5.(k).9 Touch panels and related componentry;
- 2.5.9.5.5.(k).10 Speakers;
- 2.5.9.5.5.(k).11 Backboxes, enclosures and miscellaneous hardware;
- 2.5.9.5.5.(k).12 VC hardware and software
- 2.5.9.5.5.(k).13 Cameras;
- 2.5.9.5.5.(k).14 Microphones and microphone controllers;
- 2.5.9.5.5.(k).15 Video controllers;
- 2.5.9.5.5.(k).16 Switching and signal processing equipment;
- 2.5.9.5.5.(k).17 Remote controls;
- 2.5.9.5.5.(k).18 Speciality AV furniture; and
- 2.5.9.5.5.(k).19 Crestron Coloured Screen Shots.

2.5.9.5(5)(l) Public address system:

- 2.5.9.5.5.(l).1 Speaker wiring;
- 2.5.9.5.5.(l).2 Speakers;
- 2.5.9.5.5.(l).3 Backboxes, enclosures and miscellaneous hardware;
- 2.5.9.5.5.(l).4 Amplifiers;
- 2.5.9.5.5.(l).5 Microphone; and
- 2.5.9.5.5.(l).6 Components required to integrate the public address system in the Facility with other systems within the Facility.

2.5.9.5(5)(m) Nurse Call system:

- 2.5.9.5.5.(m).1 UTP cabling and other system wiring;
- 2.5.9.5.5.(m).2 System devices;
- 2.5.9.5.5.(m).3 Components; and
- 2.5.9.5.5.(m).4 Equipment.

2.5.9.5(5)(n) RTLS

- 2.5.9.5.5.(n).1 Cables and wiring;
- 2.5.9.5.5.(n).2 Tag testing stations;
- 2.5.9.5.5.(n).3 Sensors, beacons and readers;
- 2.5.9.5.5.(n).4 Hardware; and
- 2.5.9.5.5.(n).5 Software.

2.5.9.5(5)(o) Location Engine Hardware and Software.

2.5.9.5(6) Record Documentation:

2.5.9.5(6)(a) Record Documentation will be:

2.5.9.5.6.(a).1 Stamped or certified by the RCDD; and

2.5.9.5.6.(a).2 Complete, legible and reproducible with a revision log, titled and dated.

2.5.9.5(6)(b) The Record Documentation that will be provided for the project will include the following:

2.5.9.5.6.(b).1 Floor plans complete with jack IDs;

2.5.9.5.6.(b).2 Fire-stop design;

2.5.9.5.6.(b).3 Equipment rack and server cabinet elevations;

2.5.9.5.6.(b).4 Riser diagrams;

2.5.9.5.6.(b).5 System block diagrams;

2.5.9.5.6.(b).6 Isometric drawings;

2.5.9.5.6.(b).7 Copper and fiber test results (including factory test results for all pre-term product);

2.5.9.5.6.(b).8 360-degree JPEG photographs of Communications Rooms in digital format embedded onto 1:50 construction floor plan PDFs for each photo location. Provide text description of each photo. Multiple 360 photographs will be taken to clearly document all wall, cable tray and rack elevations. Minimum camera quality acceptance: Ricoh Theta V;

2.5.9.5.6.(b).9 CPPS requirements as per Appendix 1G [Campus Perimeter Pathway System Technical Specifications];

2.5.9.5.6.(b).10 Bill of materials with quantities, model numbers and serial numbers;

2.5.9.5.6.(b).11 Manufacturer and user manuals, preventative maintenance plans and schedules for all installed components, data sheets, shop drawings and Submittals for equipment, products and materials used;

2.5.9.5.6.(b).12 Manufacturer representatives and telephone numbers;

2.5.9.5.6.(b).13 All passwords including module passwords and configuration settings for equipment provided by the Design-Builder;

2.5.9.5.6.(b).14 Uncompiled source code including module source code and Include Directive file;

2.5.9.5.6.(b).15 Un-rasterized source and high-resolution files for touch panels;

2.5.9.5.6.(b).16 Engineer's certification of seismic installation of equipment racks, server cabinets and cable tray, digital signage, AV equipment and digital Wayfinding terminal devices;

2.5.9.5.6.(b).17 Excel spreadsheets and other databases and inventories as required under the Design-Build Agreement such as those prescribed in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications]; and

2.5.9.5.6.(b).18 Names, addresses, phone numbers and facsimile numbers of the Design-Builder, Design-Builder's RCDD, sub-contractors and suppliers used on the Project together with a specification reference of the portion of the Work they undertook.

2.5.9.5(7) Maintenance Manual:

2.5.9.5(7)(a) The Maintenance or O&M manual containing the Project as-built information will consist of:

2.5.9.5.7.(a).1 Two sets of legible, reproducible as-built drawings on 24 X 36-inch, white paper, in a soft cover binder will be provided.

2.5.9.5.7.(a).2 Three (3) USB memory keys of as-built drawings. As-built drawings are to be provided:

(a).2.1 AutoCAD (bind all x-Ref files)

(a).2.2 PDF (where all files are combined into a single document)

2.5.9.5.7.(a).3 Maintenance Manual in a hard back D-ring commercial binder.

(a).3.1 Maintenance Manual will be in a suitably labelled, hard back, D-Ring type, commercial binders, each complete with an index and tabbed title sheets for each section. All binder pages will have self-adhesive reinforcing rings at each binder ring.

(a).3.2 All maintenance manual data will be printed on 8 1/2" x 11" heavy bond, indexed, tabbed, punched and bound in the binders. Drawings will be printed on 11" x 17". Each manual will have a title sheet which is labelled "Operation & Maintenance Manual", and will list the Project name, Contractor's name, date submitted, and a Table of

Contents for each volume. If a manual exceeds 75 mm in thickness, provide additional manuals as required.

2.5.9.5.7.(a).4 Digital Maintenance Manual on a separate USB Memory Key. Requirements for Digital Maintenance Manuals are as follows:

(a).4.1 The files making up the Manual will be arranged in a folder structure;

(a).4.2 All items in the Table of Contents will have “hypertext links” within the document;

(a).4.3 All digital content will be PDF versions, text searchable bookmarked contents; and

(a).4.4 Manual (typically less than 100 Mb) will be presented in one document.

2.5.9.5.7.(a).5 Construction Pictures:

(a).5.1 Labelled so it is clear as to the location, the component being photographed and the date the picture was taken. Where required, include directional information;

(a).5.2 Clear and detailed. Pictures that are out of focus, poorly lit, under or over exposed or have motion blur will not be accepted;

(a).5.3 Pictures are to capture the component from the front, side, back and when its is open and closed ; and

(a).5.4 Pictures are to be saved on a USB Key as well as included in the Maintenance Manual with a photo index.

2.5.9.5.7.(a).6 Documentation will be complete, legible and reproducible.

2.5.9.5.7.(a).7 Documentation will have a revision log and be titled and dated.

2.5.10 Electronic Safety and Security System Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
Legends, drawing list, key plans	X	X	X	X	X	X
Location, Site - plans, and details	X	X	X	X	X	X
Security Systems Overall Floor plans (IPVS, Access Control, Intercom, Intrusion Detection, Fixed Panic Duress, Overdose Notification, Patient Wandering, Intercommunications).	-	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Communications Room Layouts and Elevations	X	X	X	X	X	X
Patient Wandering Reflected Ceiling Plans	-	X	X	X	X	X
Patient Wandering Riser and System Diagrams	X	X	X	X	X	X
Fire Alarm Overall Reflected Ceiling Plans	X	X	X	X	X	X
Fire Alarm Riser and System Diagrams	X	X	X	X	X	X
IPVS Riser and System Diagrams	X	X	X	X	X	X
IPVS Camera FOV Floor plans	-	-	X	X	X	X
Access Control Riser and System Diagrams	X	X	X	X	X	X
Intercommunications Riser and System Diagrams	X	X	X	X	X	X
Intrusion Detection Riser and System Diagrams	X	X	X	X	X	X
Overdose Notification Riser and System Diagrams	X	X	X	X	X	X
Fixed Panic Duress Riser and System Diagrams	X	X	X	X	X	X
Wireless Staff Panic Duress Reflected Ceiling Plans	-	X	X	X	X	X
Public Emergency Stations Riser and System Diagrams	X	X	X	X	X	X
Basis of Design	X	X	X	X	X	X
Integration engine narrative, integration diagrams and sequence of operations for each system as a stand-alone and integrated system	-	-	X	X	X	X
Standard Operating Procedures narrative and scenario examples for each system in editable spreadsheet format	-	-	X	X	X	X
*BIM Models **						
Electronic Safety and Security System Information Model	X	X	X	X	X	X
COBie Dataset	X	X	X	X	X	X
Bill of Materials Spreadsheet Tables						
Electronic Security (Division 28) All Systems	-	X	X	X	X	-

2.5.10.1 The term “Documents” refers to Submittals, technical manuals, supporting materials, warranties and Design-Builder produced technical drawings, details and illustrations that are to be provided by the Design-Builder to the Authority pursuant to this Schedule.

2.5.10.2 Electronic Safety and Security documents will include:

2.5.10.2(1) Sections in sufficient detail to fully describe each material and each item of equipment to be used for each system, including manufacturers, materials, assembly, functions, features and performance requirements;

2.5.10.2(2) The method of installation, testing, Commissioning and documenting for each material, piece of equipment, system, and interface; and

2.5.10.2(3) Identification of the codes and standards that the materials, equipment and systems will be provided in accordance with.

2.5.10.3 The term “Drawings” refers to the graphic and pictorial portion of the contract documents showing the design location and dimensions of the services, generally including plans, elevations, sections, details, schedules and diagrams.

2.5.10.4 Electronic Safety and Security (Division 28) drawings will be identified as “ESS” series drawings in the approved Construction drawings, separated from “E” (electrical) drawings.

2.5.10.5 Construction Drawings

2.5.10.5(1) The Authority’s Construction Standard Drawings (C-STD) and details can be referenced in PHSA Communications Infrastructure Standards and Specifications.

2.5.10.5(2) The drawings will use industry standard symbols and legends. Refer to PHSA Communications Infrastructure Standards and Specifications for the Authority-approved symbols.

2.5.10.6 Floor Layouts and Site Plans will indicate:

2.5.10.6(1) Locations, quantity and types of all devices, Components and equipment required for the Electronic Security Systems;

2.5.10.6(2) Security zoning (interior and exterior);

2.5.10.6(3) Locations, quantity and sizes of all cable tray, risers, junction boxes and pull boxes;

2.5.10.6(4) Location of head-end equipment and storage;

2.5.10.6(5) Overall system riser wiring diagram identifying control units, circuits, terminations, terminal numbers, conductors and Raceways;

2.5.10.6(6) Detailed elevation drawings of equipment installed in racks and cabinets. Elevation drawings will include vertical and horizontal wire managers, fiber and copper patch panels, hardware such as shelves and all active equipment regardless of the supplier;

2.5.10.6(7) Control layout, including interconnections between Electronic Security Systems as well as the Authority's Network;

2.5.10.6(8) Typical electrified door hardware diagrams, indicating hardware devices, conduit, controllers, junction boxes and the responsibility of various trades to ensure operability; and

2.5.10.6(9) Camera field of view drawings will include the viewing angle of the camera and a visual indication of where the resolution changes from identification to observation pixel density.

2.5.10.7 Schematic drawings will be provided for the following elements:

2.5.10.7(1) Inter-building and intra-building connections of Electronic Security Systems identifying quantity and sizes of conduits, trays and sleeves.

2.5.10.8 Shop Drawings

2.5.10.8(1) The Design-Builder will provide shop drawings in accordance with Section 2.5.3.9.

2.5.10.8(2) Provide shop drawings and bill of material data for all materials including each system controller, cable, device and user peripherals for items listed in Section 2.5.3.9(9).

2.5.10.9 Maintenance Manuals

2.5.10.9(1) The Design-Builder will provide maintenance manuals as outlined in Section 2.5.4.20.

2.5.10.10 Record Documentation

2.5.10.10(1) The Design-Builder will supply a Record Documentation package in accordance with Section 2.5.3.13.

2.5.11 Landscape Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Drawing Content						
Keyplan, Showing Overall Site Design	X	X	X	X	X	X
Layout Plans	X	X	X	X	X	X
Grading Plans	X	X	X	X	X	X
Planting Plans	-	X	X	X	X	X
Planting Plans with Utility Overlay	-	-	X	X	X	X
Planting Plans with Sun/Shade Overlay	-	X	X	X	X	X
Irrigation Plans	-	X	X	X	X	X
Detail Enlargement Plans	-	X	X	X	X	X
Construction Details, Sections and Elevations	-	X	X	X	X	X
Site Furnishings Details, Catalog Sheets	-	X	X	X	X	X
Specifications						
Landscape Table of Contents	X	X	X	X	X	-

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record Documentation
Landscape Site Grading	-	X	X	X	X	-
Softscape	-	X	X	X	X	-
Hardscape, also Coordinate with other Disciplines	-	X	X	X	X	-
Irrigation	-	X	X	X	X	-
Site Furnishings	-	X	X	X	X	-
Landscape Maintenance	-	X	X	X	X	-
Sample Board/Presentation						
Update Conceptual Design Presentation Drawings	-	X	-	-	-	-
Colour Board(s) Illustrating Plant Material	-	X	-	-	X	-
Colour Board(s) Illustrating Hardscape and Site Furnishings	-	X	-	-	X	-

2.5.11.1 Plans and Schedules will contain the following:

2.5.11.1(1) Outline of the Facility showing all perimeter doors and windows;

2.5.11.1(2) Hardscape layout and surface treatment;

2.5.11.1(3) Soft landscape treatment (trees, hedges, planting beds, vines, lawn etc.), including vegetation within public road right-of-way;

2.5.11.1(4) Tree retention, removal, and replacement plan if applicable, showing preliminary civil site grading design;

2.5.11.1(5) All landscape structures (fences, trellis, arbours, retaining walls, lighting etc.);

2.5.11.1(6) Location and size of landscape elements at the following locations:

2.5.11.1(6)(a) Public art, where applicable;

2.5.11.1(6)(b) Plaza;

2.5.11.1(6)(c) Wellness Walkway;

2.5.11.1(6)(d) Secure Outdoor Spaces; and

2.5.11.1(6)(e) Exterior Emergency Generator Building Enclosure.

2.5.11.1(7) Location of garbage enclosure and all other surface Utility structures;

2.5.11.1(8) Preliminary grading information sufficient to determine ramps, special treatment or provisions for retaining elements;

2.5.11.1(9) A sun/shade study for the courtyards and Secure Outdoor Spaces;

2.5.11.1(10) A design key plan at a 1:500 scale complete with enlargement plans of all courtyards, amenity areas and roof gardens;

2.5.11.1(10)(a) Garden and Secure Outdoor Space enlargement plans; and

2.5.11.1(10)(b) A preliminary sign location plan, with draft message schedule of sign content and working scales sufficient to determine the suitability of the sign and its message.

2.5.11.1(11) Irrigation and planting design. Standard details will be incorporated, with site specific details underway;

2.5.11.1(12) Water conservation and irrigation plan prepared by a qualified professional inclusive of a hydro zone plan, landscape water conservation irrigation report (landscape water budget) and an irrigation Design;

2.5.11.1(13) A preliminary plant list of trees, shrubs, perennials and ground covers including quantities, botanical and common names, planting sizes, and on centre spacing;

2.5.11.1(14) Location and species of boulevard trees and preliminary Construction drawings;

2.5.11.1(15) Location, material and preliminary Construction details of all landscape elements and structures including garbage enclosure;

2.5.11.1(16) Location, material, graphic standards and preliminary Construction details of all exterior signage with revised schedule of sign content;

2.5.11.1(17) Key Plan at 1:500 scale showing the overall site design plan and integration with the streetscape;

2.5.11.1(18) Separate enlargement plans to be at 1:100 or 1:200 scale including Layout Plans, Grading Plan, Planting Plans, and Irrigation Plans illustrating all exterior spaces and referenced to the key plan;

2.5.11.1(19) All landscape Construction plans will be sealed and signed by a Registered Landscape Architect with current membership in the British Columbia Society of Landscape Architects;

2.5.11.1(20) BCSLA landscape schedules by a Landscape Architect registered in British Columbia to be supplied as required at each stage of development;

2.5.11.1(21) Installation of the landscape will be supervised and approved by the Design-Builder’s BCSLA registered landscape architect;

2.5.11.1(22) All drawings and supplemental material(s) for irrigation systems will be stamped and signed by a Certified Irrigation Designer (CID) - Commercial. This certification will be issued by the Irrigation Association (IA). The certified designer will be in good standing with the association;

2.5.11.1(23) All elevations and surface drainage to be coordinated with the project design of the other disciplines. Prepare sections to illustrate the landscape integration with all exterior structures.

2.5.11.1(24) North arrow will be included;

2.5.11.1(25) Include the legal description and site and property line zoning, including bearings and dimensions. If the site has a municipal address, include it in the plan;

2.5.11.1(26) Include Utility locations, legal easements, Rights-of-Way, etc.; and

2.5.11.1(27) Include curb lines, sidewalks, Utility poles, fences, and any other boundary conditions.

2.5.11.2 Layout Plan[s] to be a separate plan and include the following, at a minimum:

2.5.11.2(1) Outline the extents of all types of hard surface treatments and dimensions as required to facilitate Construction;

2.5.11.2(2) Reference all Construction details to Layout plans;

2.5.11.2(3) Layout Plans to include all exterior features of other disciplines such as lighting, retaining walls, signage, architectural columns and Utility infrastructure Components; and

2.5.11.2(4) Show the location of proposed structures and features.

2.5.11.3 Planting Plan[s] to be a separate plan and include the following, at a minimum:

2.5.11.3(1) Plans to outline all surface treatments including seed or sodded areas, groundcovers, extent and type of mulches or other surface treatments;

2.5.11.3(2) Outline erosion control treatment where required;

2.5.11.3(3) Major items associated with “Layout” but not including dimensions, i.e. walkways, roads, curbs, hard surface areas, other structures, natural areas;

2.5.11.3(4) Outline of planting beds, plant species and material with crowns at 2/3 maximum size;

2.5.11.3(5) Proposed contours in soft landscape areas;

2.5.11.3(6) Utilities and Rights-of-Way; and

2.5.11.3(7) Include a plant list identifying species (botanical and common name), quantities, sizes, habit, spacing, and specific remarks as required.

2.5.11.4 Grading Plan[s] to be a separate plan and include the following, at a minimum:

2.5.11.4(1) A plan for each area is required to identify all gradients on pedestrian hard surface areas and landscape areas;

2.5.11.4(2) All retaining walls, constructed slopes, planters and structures to be clearly identified and referenced on the Landscape Grading Plan, complete with top and bottom elevations;

2.5.11.4(3) Surface drainage requirements and proposed elevations to be coordinated with other disciplines;

2.5.11.4(4) Major items associated with layout but not including dimensions, i.e. walkways, roads, curbs and other structures;

2.5.11.4(5) Existing contours and proposed contours at 0.5 m contour intervals, and at 0.25 m intervals in detail areas;

2.5.11.4(6) All slopes. Show top and bottom of slope spot elevations for all hard surface slopes over 2%.

2.5.11.4(7) All grades in Geodetic measure and tied to the nearest A.S.C.M. benchmark. A.S.C.M. benchmark number to be indicated on plan;

2.5.11.4(8) Elevations at each break point (top and toe of slope);

2.5.11.4(9) Label property lines and show spot elevations;

2.5.11.4(10) Catch basin rim and invert elevations where required;

2.5.11.4(11) Manhole rim elevations;

2.5.11.4(12) Top of wall, top of curb, and finished floor elevations as required;

2.5.11.4(13) Surrounding grade information affecting Site development;

2.5.11.4(14) Label all concrete gutters and drainage structures; and

2.5.11.4(15) Show all trap lows with their 1:100 inundation area, emergency spill routes and other surface drainage requirements.

2.5.11.5 Irrigation Plan[s] will include:

2.5.11.5(1) Major items associated with Layout Plan (but not including dimensions), such as walkways, structures, fences, play fields, roads, curbs, and natural areas;

2.5.11.5(2) Toned back major items of planting and grading plans;

2.5.11.5(3) Proposed contours at 0.5 m intervals;

2.5.11.5(4) Locations of all lines, sprinkler heads, valves, drains, sleeves, electrical drop-offs, 100 volt wire, 110 volt conduit, and electrical controllers, dimensional from adjacent property lines;

2.5.11.5(5) Demonstrate that the irrigation system is designed so that sprinkler heads do not spray on to hard surfacing or buildings;

2.5.11.5(6) Indicate whether the system will be trenched or “plowed in” and whether the system will be gravity drained, blown out, or a combination;

2.5.11.5(7) Coordinate water services with mechanical and ensure stub out is accessible to landscape areas. Lateral irrigation lines to be set back a minimum of 0.5 m from property lines;

2.5.11.5(8) Include a schedule of materials/products describing sizes, manufacturers and model numbers, pipe fitting method, performance standards, and sources of said materials/products. Approval of the list of materials/products is required prior to the placing of formal orders for them;

2.5.11.5(9) Ensure that the water window time period is justified by vandalism problems and horticultural requirements;

2.5.11.5(10) Coordinate water service pipe size with mechanical and ensure it delivers sufficient service for this size site and indicate static water pressure on the plan; and

2.5.11.5(11) Complete an Irrigation Scheduling Chart to ensure that the irrigation design will function effectively within the practical water window.

2.5.11.6 Construction Details will contain the following, at a minimum:

2.5.11.6(1) Provide Construction details, sections and elevations of all exterior site design elements referenced to the appropriate enlargement plan;

2.5.11.6(2) Provide sections for Construction details of all planting and structures over a roof slab. Coordinate drainage with other disciplines;

2.5.11.6(3) Prepare sections to illustrate the landscape integration with all exterior structures;

2.5.11.6(4) Provide model number and cut sheet for all catalog items. Provide installation details for all elements on all specified surfaces; and

2.5.11.6(5) Prepare a maintenance plan and one (1) year schedule outlining the levels of maintenance required to establish the proposed landscapes.

2.5.11.7 Landscape Drawing Coordination

2.5.11.7(1) To improve and inform the site design; coordinate the drawings with other disciplines at all Submittal stages. Coordination includes:

2.5.11.7(1)(a) Civil: Coordination on impacts to the site design for rainwater management requirements. Coordinate all planting and structures with the location of deep and shallow underground Utilities. Provide a drawing showing the overlay of all Utilities with the planting plans;

2.5.11.7(1)(b) Mechanical: Coordinate to ensure all landscape areas including roof areas have access to water for irrigation and maintenance. Coordinate drainage requirements for all exterior spaces including roof areas;

2.5.11.7(1)(c) Electrical: Coordinate all electrical requirements for all exterior spaces. Coordinate street lighting and site lighting requirements. Lighting to be incorporated on landscape design. Planting setback from lighting to be in accordance with applicable City Standard;

2.5.11.7(1)(d) Structural: Coordinate requirements for all structures at-grade and on roof slabs; and

2.5.11.7(1)(e) Wayfinding: Coordinate requirements and locations for all signage and Wayfinding elements.

2.5.11.8 Maintenance Manuals

2.5.11.8(1) The Design-Builder will provide maintenance manuals as outlined in Section 2.5.4.20.

2.5.11.8(2) The Design-Builder will provide Standard Operating Procedure for annual landscape management for softscape and hardscape.

2.5.11.9 Record Documentation

2.5.11.9(1) The Design-Builder will supply a Record Documentation package in accordance with Section 2.5.3.13.

2.5.12 LEED Documentation

2.5.12.1 The 30% Phase Submittal will include:

2.5.12.1(1) An annotated LEED Project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the Project approach to achieve the credit and any risks identified; and

2.5.12.1(2) A narrative describing the integrative process outcomes related to the LEED prerequisite and credit associated with Integrative process (if this credit is pursued).

2.5.12.2 The 50% Phase Submittal will include an updated annotated LEED project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the project approach to achieve the credit and any risks identified.

2.5.12.3 The 70% Phase Submittal will include an updated annotated LEED project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the project approach to achieve the credit and any risks identified.

2.5.12.4 The 90% Phase Submittal will include an updated annotated LEED project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the project approach to achieve the credit and any risks identified.

2.5.12.5 The 100% Phase Submittal will include:

2.5.12.5(1) An updated annotated LEED project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the project approach to achieve the credit and any risks identified; and

2.5.12.5(2) A complete electronic copy of all submission documentation submitted for the Design Stage LEED review submitted to the LEED reviewer. In addition, provide a copy of the LEED Review file as well as written description of the team’s approach to address any items raised by the LEED reviewer.

2.5.12.6 During construction, provide a summary LEED report outlining the status of each of the targeted credits every six months.

2.5.12.7 Upon completion of the Project, to the Authority's satisfaction, the Design-Builder will submit an electronic copy of all LEED certification submissions, including the final updated Project checklist, all supporting credit documentation, and copies of the LEED Review file.

2.5.13 Energy

2.5.13.1 Refer to Schedule 5 [Energy Guarantee] and Section 2.5.7.9(3) for Submittal requirements associated with Energy Modelling.

2.5.14 Asset Management Documentation

2.5.14.1 Design-Builder will deliver Asset Management documentation as outlined in Schedule 1 – Statement of Requirements and Appendix 1V [Asset Management Requirements] in accordance with the schedule outlined in Appendix 1V [Asset Management Requirements] for the following items:

2.5.14.1(1) Submission Coordination Plan;

2.5.14.1(2) Handover Plan;

2.5.14.1(3) Asset Renewal Expenditure Forecast;

2.5.14.1(4) Operating Cost Estimate;

2.5.14.1(5) Services Procurement Information;

2.5.14.1(6) Spare Parts & Materials Inventory;

2.5.14.1(7) Warranties;

2.5.14.1(8) Facilities Manual;

2.5.14.1(9) Asset Identification and Labelling; and

2.5.14.1(10) 360 Photos.

2.5.14.2 Asset Management Documentation is to be separately submitted from the Design and Construction submissions and the Design-Builder will manage these submissions separately by their Facilities Maintenance Advisor, working with designated personnel from the Authority’s Facilities Maintenance and Operation (FMO) team.

2.5.15 Commissioning Documentation

2.5.15.1 The 30% Phase Submittal will include:

2.5.15.1(1) Basis of Design Report;

2.5.15.1(2) OPR and Basis of Design Review from the CxP;

2.5.15.1(3) Outline of the Commissioning Plan;

2.5.15.1(4) Project specific Commissioning responsibilities and responsible parties for each major Building System and sub system in accordance with Appendix 1L [Commissioning Roles and Responsibilities]; and

2.5.15.1(5) Confirmation that the CxP is for the Commissioning of each of those Building Systems and sub systems from design phase to start-up testing, and Functional Testing.

2.5.15.2 The 50% Phase Submittal will include:

2.5.15.2(1) Basis of Design Report (updated for 50% design);

2.5.15.2(2) Basis of Design Review from the CxP;

2.5.15.2(3) CxP Commissioning review of the 50% design for all systems included in the Commissioning process;

2.5.15.2(4) Draft of the Division 1 Commissioning Specifications and confirmation that mechanical, electrical, communications, electronic safety & security, vertical transportation, and architectural specifications have been reviewed for consistency with the project Commissioning requirements;

2.5.15.2(5) Draft of the Commissioning Plan, including:

2.5.15.2(5)(a) Draft content for all sections;

2.5.15.2(5)(b) Draft commissioning process tracking tool, including preliminary systems and equipment list;

2.5.15.2(5)(c) Sample verification checklists and test procedures;

2.5.15.2(5)(d) Requirements for systems operations manuals;

2.5.15.2(5)(e) Operational training requirements;

2.5.15.2(5)(f) The proposed number of training sessions per system; and

2.5.15.2(5)(g) Details on proposed format for training plans and a proposed framework for development, submission, and review of training plans, and outline of the proposed process for scheduling of training.

2.5.15.3 The 70% Phase Submittal will include:

2.5.15.3(1) Basis of Design Report (updated for 70% design);

2.5.15.3(2) Basis of Design Review from the CxP;

2.5.15.3(3) CxP Commissioning review of the 70% design for all systems included in the Commissioning process, including summary of resolution of issues identified in the 50% design review;

2.5.15.3(4) Updated draft of the Commissioning Plan with progressive development of all sections;

2.5.15.3(5) Updated commissioning process tracking tool, including updated systems and equipment list; and

2.5.15.3(6) Updated verification checklists and test procedures.

2.5.15.4 The 90% Phase Submittal will include:

2.5.15.4(1) Basis of Design Report (updated for 90% design);

2.5.15.4(2) Basis of Design Review from the CxP;

2.5.15.4(3) Commissioning review of the 90% Design and Construction documents for all systems included in the Commissioning process, including back-check of outstanding items from the 50% Design and Construction Documents review;

2.5.15.4(4) Updated draft of the Commissioning Plan with progressive development of all sections;

2.5.15.4(5) Updated verification checklists and test procedures. At this stage the commissioning process tracking tool will include the complete list of systems and the majority of equipment, and draft checklists and functional test plans will be provided for the majority of equipment and systems.

2.5.15.5 The 100% Phase Submittal will include:

2.5.15.5(1) Basis of Design Report (updated for 100% design);

2.5.15.5(2) Basis of Design Review from the CxP;

2.5.15.5(3) Report from the CxP clarifying how all issues identified in the Commissioning design reviews have been resolved and the next steps for any remaining issues;

2.5.15.5(4) Updated Commissioning Plan that includes a Commissioning schedule identifying Commissioning milestones, precedent activities and durations of Commissioning tasks;

2.5.15.5(5) Updated verification checklists and test procedures. At this stage draft checklists, functional test plans, and integration test plans will be provided for all equipment and systems; and

2.5.15.5(6) Complete list of all proposed training sessions and detailed plan for development of all training plans.

2.5.15.6 Construction and Occupancy Phase Submittals

2.5.15.6(1) Provide a copy of each CxP shop drawing review report within one week of report completion.

2.5.15.6(2) Provide regular updates of Commissioning schedule and advance notice of timing for all Commissioning meetings.

2.5.15.6(3) Provide regular updates to the Commissioning Plan based on actual equipment and approved control shop drawings and sequences of operation.

2.5.15.6(4) Provide finalized pre-functional check sheets 6 months in advance of pre-functional checks and completed versions within 2 weeks of pre-functional checks being completed for individual equipment or systems.

2.5.15.6(5) Provide finalized installation check sheets 6 months in advance of installation checks and completed versions within 2 weeks of installation checks being completed for individual equipment or systems.

2.5.15.6(6) Provide finalized start-up check sheets 6 months in advance of start-up checks and completed versions within 2 weeks of start-up checks being completed for individual equipment or systems.

2.5.15.6(7) Provide copies of functional and integrated test procedures at least 2 months in advance of functional and integrated testing for each system for Authority review and approval.

2.5.15.6(8) CxP will review all commissioning documentation for completeness, and for compliance with the Schedule 1 and project specifications prior to submission to the Authority. CxP will identify status of associated deliverables as appropriate in Cx process tracking tools, and capture follow-up actions in the commissioning issues log.

2.5.15.6(9) Provide completed functional and integrated test reporting within two (2) weeks of each system's completion.

2.5.15.6(10) Provide copies of Commissioning meeting minutes.

2.5.15.6(11) Provide regularly updated Commissioning issues logs and confirmation detailing how issues have been resolved.

2.5.15.6(12) Provide finalized training session agenda and training plan materials to the Authority at least six (6) months prior to the proposed training dates.

2.5.15.7 Fire Safety Plans

2.5.15.7(1) The Design-Builder will retain a professional fire safety consultant. The professional fire safety consultant will provide fire safety plans and all related documentation as required by the AHJ and coordinate in further consultation with the Authority to ensure such documentation meets all applicable Authority standards for Fire Safety Plans and related documentation.

2.5.15.8 Security and Safety

2.5.15.8(1) This Design Narrative will be prepared by a security lead who possess an active Certified Healthcare Protection Administrator (CHPA) Designation from the International Association of Healthcare Safety and Security, and it will be provided at all Design Stages. It will include:

2.5.15.8(1)(a) Building design features that will mitigate risks and vulnerabilities to people, property, the Authority, and the surrounding community;

2.5.15.8(1)(b) Security design principles and key strategy elements;

2.5.15.8(1)(c) CAP Index Report for the site and the surrounding community;

2.5.15.8(1)(d) CPTED principles and their application to site and landscape design;

2.5.15.8(1)(e) Day and night time operation with a narrative of security devices (for example, cameras, card readers, locking devices, alarms, parking garage (underground parking), elevator control, contained use spaces, exterior parking areas, grounds, and site);

2.5.15.8(1)(f) Building design features that will minimize the need for Security Staff,

2.5.15.8(1)(g) Authority’s engagement in the security plan; and

2.5.15.8(1)(h) Security system monitoring and recording.

2.6 Mock-up and In-Situ Prototype Rooms

2.6.1 The purpose of the mock-ups is for the Design-Builder to demonstrate functionality of the Design to the Authority for their approval before proceeding with Construction activities.

2.6.2 The Design-Builder will:

2.6.2.1 at its cost and as part of the review process described in Schedule 2 [Review Procedure], provide and make available to the Authority for review the mock-ups and in-situ prototype rooms described in this Section;

2.6.2.2 ensure mock-up viewing and simulation sessions are held weekdays, evenings and on weekends to accommodate the availability of the Authority's various user participants;

2.6.2.3 provide coordination and support to the Authority who will test the functionality of the spaces through 'live' simulations in the mock-ups;

2.6.2.4 update all Design documentation to reflect the mock-up and in-situ prototype rooms, and any input from the Authority, including User Consultation Groups, and will submit all such updated Design documentation to the Authority for review under Schedule 2 [Review Procedure];

2.6.2.5 incorporate the Authority's feedback and requested changes into the mock-ups resulting from the review process described in Schedule 2 [Review Procedure]; and

2.6.2.6 provide a location in the City, close to the Facility, for the mock-ups that is acceptable to the Authority. In-situ prototype rooms will be provided in the Facility and be made available to the Authority for review at the appropriate stages of Construction.

2.6.3 The mock-up location will include a minimum 60 NSM, dedicated meeting room designed and equipped for twenty (20) users for the Authority's use in facilitating the mock-up review process with their users. The meeting space will be complete with all Building Systems such as wired and wireless computer networking infrastructure designed for high-bandwidth and low-latency.

2.6.4 The timing of the Construction and review of these mock-ups and in-situ prototype rooms to be such that any adjustment to the Design can be accommodated without additional cost to the Authority or delay to the Project. The fully constructed mock-up room space will remain available to the Authority for twenty-four (24) months.

2.6.5 Provide the hardware, software and supporting services to facilitate 3D design visualization and virtual reality mock-ups. The mock-up space will include one (1) fixed performance VR-ready workstation with two fixed, large format viewing displays in addition to the workstation operator display.

2.6.6 The Design-Builder will include dates on the Submittal Schedule for Construction of and for the Authority's review of mock-ups and in-situ prototype rooms. The time periods for the Authority review and comments on Submittals set out in Schedule 2 [Review Procedure] will apply to mock-ups.

2.6.7 For any alternate design solutions proposed by the Design-Builder, provide room mock-ups, as required by the Authority to demonstration full functionality and equivalent or better performance of the space to that specified within the Agreement. Alternate design solutions requiring mock-up demonstrations and Authority approval include deviations from

the NSM, clearances, proportions and other similar requirements as set out in the Agreement.

2.6.8 Mock-ups will accurately reflect the design of the room such that the Authority can experience all features and conduct their reviews, including performing functional simulations, and make design decisions.

2.6.9 Equipment and furniture will be actual pieces or replicas but will accurately represent the actual physical dimensions. In the case of actual pieces, the Design-Builder will coordinate with the Authority to source the actual Equipment. The Design-Builder will bear the cost for transport of Equipment to and from the mock-up location.

2.6.10 Mock-ups will incorporate features included in the design of the room which are required to demonstrate its functionality to the Authority such as the following:

2.6.10.1 Millwork;

2.6.10.2 Specialty casework;

2.6.10.3 Doors, windows and other similar openings or glazing;

2.6.10.4 Headwalls;

2.6.10.5 Services such as electrical and mechanical fixtures and fittings;

2.6.10.6 Controls;

2.6.10.7 Video display walls, where applicable;

2.6.10.8 Systems furniture; and

2.6.10.9 Equipment and furniture including all waste management containers such as for biomedical and recycling.

2.6.11 Paper Mock-Ups

2.6.11.1 Provide 1:1 scale mock-ups using either paper floor plans adhered to the floor or tape markings on the floor. In addition, provide partial height cardboard walls to demonstrate sense of space and for those mock-ups that involve clusters of rooms or departments, they will demonstrate the spatial relationships, interconnections and flows.

2.6.11.2 Provide cardboard to represent fixed elements such as columns, tubs and sinks so that users can experience the proposed clearances and movement around these items.

2.6.11.3 To the extent practical, include key features as set out in Section 2.6.10 within the paper mock-up as required to demonstrate the room’s functionality including their location, size and clearances.

2.6.12 Virtual Reality Mock-Ups

2.6.12.1 Provide virtual reality mock-ups that allow users to experience being within the room (or Component where applicable) to visualize the physical features, proportions, circulation, surrounding views to adjacent spaces and Line of Sight, where required.

2.6.12.2 To the extent practical, include key features as set out in Section 2.6.10 within the virtual reality mock-up as required to demonstrate the room's functionality including their location, size and clearances.

2.6.13 Fully Constructed Mock-Ups

2.6.13.1 Provide fully constructed mock-ups with all actual materials, dimensions and finishes included in the design of the room or space and the key features set out in Section 2.6.10.

2.6.13.2 The fully constructed mock-ups will allow the Authority to test and approve the placement of fixtures and fittings, room controls and other key features before the Construction.

2.6.13.3 The Design-Builder will include mock-ups of each type of headwall (vertical or horizontal), consoles, ceiling columns, booms, telescoping booms, etc. proposed for use in the Facility.

2.6.14 In-Situ Prototypes Mock-Ups

2.6.14.1 The in-situ prototypes mock-ups will be constructed within their final location within the Facility and incorporate all Authority comments from previous mock-ups and/or Design reviews.

2.6.14.2 The in-situ prototypes mock-ups will allow the Authority to review and approve the final placement of fixtures and fittings, room controls and other key features before the Construction of the remaining rooms, where multiples of one type exist.

2.6.14.3 The Design-Builder will construct working mock-ups (at appropriate heights) of hand hygiene sinks and scrub sinks.

2.6.15 Where there are multiples of a room from the list of rooms set out in Section 2.6.16 and 2.6.17, the Authority will determine which exact room(s) from the Design-Builder's floor plan to be constructed for the purposes of the mock-up.

2.6.16 Mock-ups of the following CH rooms will be provided:

Ref No.	Room Description	Paper	Virtual Reality	Fully Constructed	In-Situ Prototype Rooms
B1.01, B1.03 and B1.07	Patient Room - Private (with smart room features) complete with Ensuite - Patient Room and Alcove – Observation.	x		x	Prototype
B3.01, B3.02 and B3.06	Patient Room – Private – HAU complete with Alcove – Observation and Ensuite - Patient Room – HAU			x	Prototype

Ref No.	Room Description	Paper	Virtual Reality	Fully Constructed	In-Situ Prototype Rooms
B1.10, B2.15, B3.13,	Care Team Station		x		
C3.02	Anteroom - Trauma	x			
C3.10 and C3.11	Exam/Treatment Room – AIR and Ensuite - AIR			x	
C1.08	Patient Check-In - ED			x	
C-Emergency	Line of Sight from C3.22 Care Team Station, C4.18 Care Team Station and C5.02 Care Team Station		x		
D2.05	Operating Room			x	x
D2.04	Operating Room - Isolation	x			Prototype
D2.03	Anteroom - Isolation OR	x			
D6.01	Stretcher Bay - ACU - 2 bays side by side	x			x
D2.15	Lab Specimen Prep Room	x			
D3.02	Procedure Room - Endoscopic	x		x	x
E-Lab	Laboratory (Sub-Components E1-E6)	Cluster(s) of key space /room relationships	x		
F5.11	Control Room - CT	x			
F5.10	Guided Interventional Room - CT	x			
P	MDR		x		
R	Pharmacy Services		x		
U6.01	Workroom - Command Centre	X (video wall to be constructed of plywood to demonstrate Line of Sight)	x		
A3.03, C3.16, C4.12, C5.07, E8.07	Exam/Treatment Room	x			
A4.01, B1.12,B2.16,B3.15,C3.25,C4.21,D6.13, G1.16	Medication Room	x			
B2.17, C5.06	Medication Room - Small	x			
B3.10, D1.05, F2.08, F3.05	Consult Room	x			

2.6.17 Mock-ups of the following CC rooms will be provided:

Ref No.	Room Description	Paper	Virtual Reality	Fully Constructed	In-Situ Prototype Rooms
G1.03	Exam Room	x		x	
G1.04	Exam Room - Bariatric	x			
G1.02, I1.01 and M2.02	Patient Check In		x (views into adjacent spaces from all three spaces)	x	

Ref No.	Room Description	Paper	Virtual Reality	Fully Constructed	In-Situ Prototype Rooms
I2.02, L2.10	Care Team Station		x		
I2.01	Workroom – Medication		x		
J3.02	Dispensing Counter		x (views into adjacent spaces)	x	
K3.07	Exam Room – Patient Fitting	x			
L1.05	Control Room – Treatment Bunker	x		x	
M2.23	Control Room – PET/CT		x		
T2.01.01	Reception – Cancer Centre		x (views into adjacent spaces)	x	
L2.19	Ultrasound Procedure Room – TRUS	x			

2.7 Requirements During Construction

2.7.1 Site Power During Construction

2.7.1.1 The Design-Builder is responsible for all power necessary for the performance of the Construction.

2.7.2 Site Access During Construction

2.7.2.1 The Design-Builder will provide security and facilities as required to protect the Work from unauthorized entry, vandalism or theft; refer to Section 28 Access to and Use of Site of the Agreement.

2.7.2.2 Equipment access and positioning, material storage, stockpiling, or unauthorized filling are not permitted anywhere within the GVS&DD SRW unless otherwise authorized by GVS&DD.

2.7.2.3 Provide GVS&DD continued access to their existing sewer mains, facilities and appurtenances during the Construction including all maintenance holes. The Design-Builder will provide allowance for this requirement in their Work Plan to be reviewed and approved by GVS&DD in advance of any Work. Maintenance holes will not be buried at any time during the Construction or upon restoration of the Site.

2.7.2.4 The Design-Builder will notify (a minimum 30 days prior) and coordinate the scheduled closures of 180th and James Hill Drive with Coast Mountain Bus Company / TransLink to ensure they can provide uninterrupted service to the existing bus stop located on the east side 180th Street north of James Hill Drive.

2.7.3 Infection Control and Control of Dust and Noxious Odours

2.7.3.1 The Design-Builder will:

2.7.3.1(1) ensure all diesel equipment will have exhaust purifier scrubbers that comply with all regulations pertaining to concentrations of Carbon Monoxide (CO), Hydrocarbons (HC) and Particulate Matter (PM) exhaust pollutants. The Design-Builder will include appropriate meters to test concentration levels on the Site, as will be required by the Authority from time-to-time;

2.7.3.1(2) clean all adjacent structures, roadways, pathways, and other areas directly affected by the Construction at regular intervals to the satisfaction of the Authority to prevent buildup of dirt and dust caused by the Construction and maintain them in the same condition as found and determined by the pre-condition surveys; and

2.7.3.1(3) without limiting the Design-Builder's obligation under the Section above:

2.7.3.1(3)(a) comply with CSA Z317.13 Infection Control during Construction, Renovation or Maintenance of Healthcare Facilities, at all times during the Construction period and post Substantial Completion;

2.7.3.1(3)(b) submit the Infection Prevention and Control Management Plan to the Authority for review and approval and implement prior to commencing any Work;

2.7.3.1(3)(c) ensure every individual who performs Work at the Site is appropriately infection prevention and control trained in either the CSA Group course(s) or alternative as approved by the Authority;

2.7.3.1(3)(d) retain an Infection Control Practitioner to:

2.7.3.1.3.(d).1 Develop the Infection Prevention and Control Management Plan;

2.7.3.1.3.(d).2 Perform infection prevention and control training;

2.7.3.1.3.(d).3 Assist with regular site inspections of relevant Work areas;

2.7.3.1.3.(d).4 Perform regular audits on the implemented infection control risk management system and related protocols, processes and documents;

2.7.3.1.3.(d).5 Assist with monitoring compliance with relevant/applicable sections of the CSA Standard Z317.13-17;

2.7.3.1.3.(d).6 Assist with developing required infection prevention and control procedures, method statements, checklist, records etc., as required; and

2.7.3.1.3.(d).7 Perform air monitoring as required.

2.7.3.1(3)(e) perform and record, with internal, trained personnel, minimum daily inspections of all areas including any areas which may be occupied by the Authority prior to Substantial Completion Date where Construction is occurring, to monitor compliance with CSA Z317.13 on a daily basis during Construction and undertake prompt corrective actions where infection risks have been identified;

2.7.3.1(3)(f) have additional work area inspections performed by the Design-Builder's retained contractors or subcontractors;

2.7.3.1(3)(g) submit to the Authority a monthly Infection Prevention and Control Statistics Performance Report on no later than the 5th business day of the following month, that:

2.7.3.1.3.(g).1 outlines the steps undertaken by the Design-Builder to comply with CSA Standard Z317.13;

2.7.3.1.3.(g).2 confirms the Design-Builder's compliance with CSA Standard Z317.13; and

2.7.3.1.3.(g).3 briefly details non-conformances and corrective actions undertaken to rectify the issue(s).

2.7.3.1(3)(h) perform a final construction clean meeting the requirements set out in CSA Z317.13 prior to Substantial Completion. The Design-Builder will ensure that areas receive a final construction clean upon completion of all deficiency work such that all spaces are available to the Authority for their intended use;

2.7.3.1(3)(i) submit the inspection form(s) and a final summary report to the Authority for review, prior to Substantial Completion; and

2.7.3.1(3)(j) participate in Multidisciplinary team (MDT) meetings regularly and on MDT members request to discuss Infection Control Risk Assessment (ICRA) and disclose any and all changes and problems with preventative measures during scope of this Project.

2.7.4 Demolition and Related Work

2.7.4.1 Basic Requirements

2.7.4.1(1) The Design-Builder is responsible for the demolition of the following:

2.7.4.1(1)(a) All structures, roads, curbs, parking areas, walkways, landscaping and any other Site improvements;

2.7.4.1(1)(b) All Utility terminations and cap offs prior to demolition;

2.7.4.1(1)(c) Existing sub-surface elements such as foundations, slabs, pits, sumps, pipes, cables, ducts and underground tanks including related piping;

2.7.4.1(1)(d) Existing Utilities; and

2.7.4.1(1)(e) All demolition that is necessary, above ground and sub surface, for the Construction.

2.7.4.1(2) The Design-Builder acknowledges and agrees:

2.7.4.1(2)(a) it has received and reviewed a copy of the Geotechnical Reports and Environmental Reports; refer to Section 30 Conditions at Site/Disclosed Data of the Agreement.

2.7.4.1(3) The Design-Builder will:

2.7.4.1(3)(a) take all precautions so that no transmission of Contaminants and noxious fumes interfere or contaminate the Site and surrounding neighbourhood;

2.7.4.1(3)(b) be responsible for management, removal, abatement, containment and disposal of any underground storage tanks and any underground piping and appurtenances;

2.7.4.1(3)(c) complete the management, removal, abatement, containment and disposal of all Contaminants prior to demolition;

2.7.4.1(3)(d)	prior to performing demolition work, submit a report on the protective measures in place to the Authority;
2.7.4.1(3)(e)	conform to applicable codes for demolition of structures and provide for the safety of adjacent structures, the erection and maintenance of temporary barriers and security devices;
2.7.4.1(3)(f)	obtain City and Authority approvals required to undertake a demolition;
2.7.4.1(3)(g)	ensure demolition work does not interfere with, or prevent the Site and neighbouring buildings from operating normally;
2.7.4.1(3)(h)	provide perimeter screen and safety walls to ensure safety and protection of people and objects outside of the demolition area; provide overhead protection from falling debris;
2.7.4.1(3)(i)	schedule hours of operation and plan the traffic flow required for demolition in accordance with the Phasing Plan;
2.7.4.1(3)(j)	be responsible for ensuring that fire safety will always be in force during demolition;
2.7.4.1(3)(k)	implement a pest control management plan for related areas before, during and post demolition;
2.7.4.1(3)(l)	perform demolition work in accordance with LEED requirements including construction and demolition waste management (including reporting) and construction activity pollution prevention;
2.7.4.1(3)(m)	provide dust control at all times:
2.7.4.1(3)(n)	spray demolition area with water once demolition of structure begins;
2.7.4.1(3)(o)	manage water runoff through the Site;
2.7.4.1(3)(p)	protect all storm drains that could be affected by the demolition work;
2.7.4.1(3)(q)	perform work in accordance with the Surrey Noise Control Bylaw 7044;

2.7.4.1(3)(r) secure demolition site 24/7; obtain Authority's approval of the Design-Builder's Security Plan prior to commencing work;

2.7.4.1(3)(s) conform to applicable regulatory procedures, including WorkSafe BC regulations, during all phases of the demolition and when discovering hazardous or contaminated materials;

2.7.4.1(3)(t) remove of all demolition materials from the site safely and legally;

2.7.4.1(3)(u) disconnect, cap, plug or divert as required existing Utilities;

2.7.4.1(3)(v) accurately record actual locations of capped Utilities, subsurface obstructions and/or conditions; and

2.7.4.1(3)(w) be responsible for landfill tipping fees.

2.7.5 Waste Management – Hazardous and Non-Hazardous

2.7.5.1 The Design-Builder will:

2.7.5.1(1) Comply with territorial and municipal Standards with respect to waste management programs on construction sites;

2.7.5.1(2) Manage waste generated from the Site in accordance with City Standards;

2.7.5.1(3) Take an active role in implementing environmentally sound business practices and producing goods and services that lessen the burden on the environment in production, use and final disposition. Implement reduction, reuse and recycling strategies and the use of environmentally sound products;

2.7.5.1(4) For the removal and disposal of special waste and hazardous waste, the Design-Builder will only retain contractors pre-approved by the Authority. Removal and disposal of all other special waste and hazardous waste will be by trained personnel or a specialty contractor, as retained by the Design-Builder;

2.7.5.1(5) Designate an area or areas for location of bins and source separation of materials. Keep the area(s) clean and organized. If co-mingled bins are to be used, ensure that Off-Site sorting company will remain committed to a required waste diversion rate and meets LEED requirements;

2.7.5.1(6) Provide monthly construction and demolition waste disposal reporting including a breakdown of recycled materials and landfill diversion rate;

2.7.5.1(7) Store and dispose of hazardous waste materials in a manner that is in full accordance with all applicable federal and City requirements and standards;

2.7.5.1(8) Implement waste reduction by reducing or eliminating excessive packaging practices; and

2.7.5.1(9) Use, where appropriate, combination of packaging materials such as re-usable containers, blanket wrap or cushioning material provided that all reasonable requirements of materials handling, transportation and storage are observed.

2.7.6 Demonstration Period

2.7.6.1 Prior to commencement of the CC Equipment Commissioning activities as set out in Section 5.6.21 and Substantial Completion, the Design-Builder will demonstrate to the Authority a fully operational Facility including the Energy Centre which provides all services as set out in this Agreement for a minimum uninterrupted period of thirty (30) days.

2.7.6.2 During the thirty (30) day demonstration period, the Authority acknowledges the Design-Builder has not yet reached Substantial Completion and therefore some Work will remain. Cooperate with the Authority regarding the remaining Work such that it is reviewed and approved by the Authority and deemed non-detrimental to the demonstration period prior to commencing. Provide reasonable advanced notice to the Authority of their required review and approval, and enough time for the rectification of any items by the Design-Builder prior to the demonstration period.

2.7.6.3 The Design-Builder will ensure that the Phasing Plan allows for an adequate Commissioning and stabilization period for the Energy Centre. The duration of the Commissioning and stabilization period will be no less than six (6) full months prior to the thirty (30) day demonstration period.

2.7.6.4 Prior to Substantial Completion, the Design-Builder will act as the licensed operator of the plant with the Authority shadowing as part of the training and familiarization program. The Design-Builder will coordinate training schedules with the Authority.

2.7.6.5 Prior to commencement of the demonstration period described in Section 2.7.6.2, the following general conditions will be met:

2.7.6.5(1) Mechanical and electrical plant and associated Building Systems required to service the Facility will be installed, Commissioned, and performing in accordance with the requirements set out in the Agreement;

2.7.6.5(2) The Authority will be trained and equipped with required documentation to operate and maintain the completed Energy Centre; and

2.7.6.5(3) All the Authority's wired and wireless Information Technology (IT) and communications infrastructure required to Commission the Energy Centre and integrate it to the Site as well as enable the Facility Management Staff to operate the Energy Centre will be installed, Commissioned, and performing in accordance with the Authority's Project Requirements and specifications.

2.7.7 Energy Centre

2.7.7.1 The specific list of conditions required to provide an operational Energy Centre are dependent on the specifics of the final Energy Centre design and require input from multiple stakeholders. The Design-Builder and the Authority will work collaboratively to define the specific list of conditions and develop the associated implementation plans and schedules by the completion of the Design and Construction Documents process. Iterative plans, schedules, and associated details will be provided to the Authority for review by the Design-Builder as part of each formal Design and Construction Documents Submittal, starting with the 30% Design and Construction Documents Submittal.

2.7.8 Authority Site Trailer

2.7.8.1 Provide the Authority with a 24 by 60-foot Site trailer/office for the Authority's use for the duration of the Construction Period. The Authority will be responsible for furniture, fixtures, and equipment fit-out for the site trailer/office. The Design-Builder will provide the following to accommodate an anticipated occupancy of 5 to 10 Staff:

2.7.8.1(1) Four (4) offices;

2.7.8.1(2) Meeting space to accommodate eight (8) people;

2.7.8.1(3) Open area for cubicles;

2.7.8.1(4) One (1) 2-piece washroom dedicated for the Authority's use;

2.7.8.1(5) A kitchenette;

2.7.8.1(6) Heating and air conditioning; and

2.7.8.1(7) Electrical and telecommunications services.

2.7.8.2 Provide the Authority with ten (10) parking stalls adjacent to their site trailer dedicated for Authority use only, complete with exterior lighting.

2.7.9 Simulation Lab

2.7.9.1 General Requirements

2.7.9.1(1) Provide a trailer or temporary structure on the Site to be used as a dedicated simulation lab. The trailer or temporary structure that houses the simulation lab will be:

2.7.9.1(1)(a) Sized to meet the spatial requirements stated herein;

2.7.9.1(1)(b) Be an extension or addition to the Authority's Site Trailer as described in Section 2.7.8; or

2.7.9.1(1)(c) A separate trailer or structure located adjacent to and accessible from the Authority's Site Trailer;

2.7.9.1(1)(d) Provided with access ramps and door opening widths as required to support the delivery of Equipment and other devices to be moved in and out of the building.

2.7.9.1(2) The Design-Builder will:

2.7.9.1(2)(a) Have the simulation lab ready and available for use by all parties fifteen (15) months prior to commencement of Phase 3 commissioning within the Facility and Site as determined by the Design and Construction Schedule;

2.7.9.1(2)(b) Demonstrate within the simulation lab in accordance with its purpose as stated herein, the operation, functionality and integration of all systems as set out in this Agreement six (6) months prior to commencement of any form of Commissioning of the systems in the Facility as determined by the Design and Construction Schedule; and

2.7.9.1(2)(c) Maintain the simulation lab and the associated test or "sandbox" environments for each system and system integration in an operational state until all production systems are fully functioning (including their integrations) in the Facility as per the requirements in this Agreement and in a manner acceptable by the Authority acting reasonably.

2.7.9.1(3) The Design-Builder will be fully responsible for the operation and maintenance of all facets of the simulation lab throughout its lifespan and will provide the Authority full access at all times to the simulation lab to perform its scope of work.

2.7.9.2 Purpose and Benefit

2.7.9.2(1) The simulation lab will replicate the networks and systems specified in this Agreement in a secure isolated test or “sandbox” environment including, those networks that fall under the Authority’s responsibility, at a scale required for:

2.7.9.2(1)(a) The Design-Builder to, in accordance with the timeframe, fulfill the following prior to the commencement of Commissioning in the Facility:

2.7.9.2.1.(a).1 Configure, program, test, optimize, and integrate the systems defined in the Agreement;

2.7.9.2.1.(a).2 Conduct all manner of upgrades (firmware, software, etc.) and to validate that these upgrades have no impacts on functionality and performance of a system and its integration with other systems; and

2.7.9.2.1.(a).3 Demonstrate the functionality of each specific system and system integration for the purpose of obtaining input into the specific workings of a system from users and to identify and resolve problems which may materialize during Commissioning.

2.7.9.2(1)(b) Authority will:

2.7.9.2.1.(b).1 Replicate the networks and systems that it is responsible for under the Agreement for the purpose of integrating with systems provided by the Design-Builder. This includes, where necessary, the provision of any specific Equipment and network elements (such as core switches, firewalls, servers, etc.) in the simulation lab that may be needed to test and demonstrate system and or system integration; and

2.7.9.2.1.(b).2 Stage, configure and test its networks and systems prior to deployment in the Facility.

2.7.9.2(2) The simulation lab and the test or “sandbox” environments it will house, is intended to benefit both the Design-Builder and the Authority by providing a reliable and versatile means through which to:

2.7.9.2(2)(a) Validate at an early stage in the process that the solutions being provided are being developed properly and in compliance with the Agreement;

2.7.9.2(2)(b) Perform quality assurance early where problems can be identified and resolved outside of the critical path of the Commissioning process;

2.7.9.2(2)(c) Improve collaboration through interactive demonstration and collection and actioning of feedback from users;

2.7.9.2(2)(d) Minimize risk when deploying and Commissioning systems in the Facility;

2.7.9.2(2)(e) Conduct end user training; and

2.7.9.2(2)(f) Informing on-going operations and support.

2.7.9.3 Spatial Requirements

2.7.9.3(1) Provide a room within the simulation lab to accommodate five (5) equipment racks three (3) of which will be allocated for Authority use only. This room will be minimum of 3.7 m wide x 6.0 m in length. The Design and Construction of this space, including the specification and fit out of the equipment racks, will be in accordance with Section 7.8.9 unless noted otherwise.

2.7.9.3(2) Provide two (2) ‘caged off’ storage spaces each having a minimum area of 10 NSM that are each independently secured and accessible by gates complete with card reader access control.

2.7.9.3(3) Provide a standing height, test bench for testing and demonstration of systems, associated Equipment and components. Minimum test bench size will be 7.0 m L x 1.0 m W or as otherwise required to suit the testing requirements. Test benches will be suitable designed complete with plastic laminate surfaces, with necessary power and data integrated within the work surface.

2.7.9.3(4) Provide space to accommodate training activities complete with workstations, furniture and seating for up to twelve (12) people.

2.7.9.3(5) Provide space for a mock-up of specific technology such as digital wayfinding and smart room technology, smart bed, nurse call, bedside Equipment, digital “My Stay” and CCI boards and other components, as required.

2.7.9.3(6) Provide one (1) 2-piece washroom dedicated for the Authority’s use.

2.7.9.3(7) Provide static dissipative vinyl sheet flooring throughout.

2.7.9.3(8) Provide fire rated plywood on walls for mounting Equipment and devices.

2.7.9.4 Mechanical Requirements

2.7.9.4(1) Provide all required HVAC, air filtration and positive air pressurization to ensure the interior environment is suitable for the Equipment and components installed in the space.

2.7.9.4(2) Once construction is complete, and throughout it's operation, the simulation lab will meet all air quality requirements as set out in Section 7.8.9.8. Perform regular routine air quality testing to ensure compliance.

2.7.9.4(3) Provide a dry sprinkler system throughout to protect Equipment and devices located in the simulation lab as it will eventually be deployed in the Facility.

2.7.9.4(4) For additional Division 25 requirements, refer to Section 7.6.3.37(4).

2.7.9.5 Electrical Requirements

2.7.9.5(1) Provide all required utility power to the simulation lab along with, lighting, grounding and bonding systems.

2.7.9.5(2) The simulation lab will be used to test the lighting control system and the lighting fixtures to be used in the Facility. The lighting fixtures within the simulation lab will replicate those used in the Facility which will eventually be turned over to the Authority as spare parts, refer to Appendix 1Y [Spare Parts and Extra Stock Materials].

2.7.9.5(3) Provide a UPS system to support specific Equipment and other systems to avoid loss of configuration and/or programming in the event of a power outage.

2.7.9.6 Communications Requirements

2.7.9.6(1) Construct the portion of the CPPS along with a temporary extension to the simulation lab necessary to enable the Authority to supply telecommunications service into the simulation lab.

2.7.9.6(2) Provide the following:

2.7.9.6(2)(a) Communications Pathways in the simulation lab in accordance with Section 7.8.8 for distribution of cabling;

2.7.9.6(2)(b) Structured Cabling to connect to test benches and systems and Equipment located in the room; and

2.7.9.6(2)(c) Fiber and copper patch cords, as required.

2.7.9.7 Security

2.7.9.7(1) The simulation lab will be complete with card reader access control on all exterior doors, interior doors as specified and be complete with an IPVS in accordance with Sections 7.9.4 and 7.9.9.

2.7.9.7(2) Provide all required exterior lighting for safety and security; refer to Section 7.7.14.2(2).

2.7.10 Survey and Monitoring

2.7.10.1 The Design-Builder will:

2.7.10.1(1) prior to start of any Construction, complete a pre-condition / pre-construction survey of the existing property, infrastructure, surfaces, sidewalks, landscaping and roadways, including all underground services and installations, in a form and detail satisfactory to the Authority, acting reasonably, which will include field observations and photographs of existing conditions, with spot elevations by a British Columbia Land Surveyor (BCLS) registered surveyor at locations that will be accessible throughout and following Construction for on-going settlement monitoring, and deliver a copy of the pre-condition / pre-construction survey report to the Authority; and

2.7.10.1(2) conduct post-construction surveys of the spot elevations at regular intervals throughout the Construction to determine on-going long-term settlement effects and deliver monitoring surveys to the Authority in a form and detail satisfactory to the Authority.

2.7.10.2 Provide monitoring of all locations to be further determined in consultation with the Authority through the Schedule 2 [Review Procedure] with limitations on settlement. The Design-Builder will appoint a registered British Columbia Land Surveyor to carry out the settlement monitoring.

2.7.11 Environmental

2.7.11.1 All Construction will meet the requirements of the City including:

2.7.11.1(1) Sensitive Ecosystem Development Permit; and

2.7.11.1(2) Construction Environmental Management Plan prepared by Keystone Environmental.

2.7.11.2 The Design-Builder will provide a Qualified Environmental Professional to complete the required monitoring and compliance tracking as identified in the Construction Environmental Management Plan.

2.7.11.3 The Design-Builder will comply with the requirements as set out in the Water Sustainability Act including the “Change Approval for Work in And About a Stream”.

2.8 Move In

2.8.1 The Design-Builder will coordinate with the Authority, the date for the move of Staff and Patients to the Facility. The exact timing and sequencing of this phase will involve coordination with the Authority.

2.8.2 As soon as reasonably practicable, but in any event no later than 180 days in advance of Substantial Completion, the Design-Builder will deliver a Move In schedule in respect of the Facility. It will indicate the anticipated dates when such areas will become available for occupation by the Authority to facilitate and permit the Authority to progressively take up occupation in an efficient manner.

2.8.3 The Authority will advise the Design-Builder of any key or significant moves or Move In requirements, and the Design-Builder will, as reasonably possible, accommodate the Authority's requirements and requests.

2.8.4 The Design-Builder will accommodate and assist the Authority to hold any open house and public announcements requested by the Ministry or relevant parties that may be required prior to Substantial Completion or Move In.

2.9 Phased Construction

2.9.1 Energy Centre

2.9.1.1 Refer to Section 2.7.7 for Energy Centre requirements including:

2.9.1.1(1) Commissioning and stabilization; and

2.9.1.1(2) demonstration period.

2.9.2 Communications Infrastructure

2.9.2.1 Network Ready Date is the earliest date as determined by the Design and Construction Schedule where the Authority network (IM/IT Data, Wi-Fi and Voice Networks and DAS) and or its telecommunications carriers' networks is required to be functioning to support the commencement of any form of Phase 3 system and equipment Commissioning (regardless of which party is responsible for the system and equipment) within the Facility and Site including:

2.9.2.1(1) The establishment of remote access to a specific system or piece of equipment; and/or

2.9.2.1(2) The testing and validation of the integration between systems and or equipment.

2.9.2.2 Campus Perimeter Pathway System (CPPS)

2.9.2.2(1) The CPPS will be completed with no deficiencies one (1) year in advance of the Network Ready Date.

2.9.2.2(2) This completion timeframe is needed to provide sufficient time for the Authority and telecommunications carriers to install and Commission the outside plant fibre and copper and deliver telecommunication services to the Facility. See Sections 7.8.6 and 7.8.8 and Appendix 1G [Campus Perimeter Pathway System Technical Specifications] for further details.

2.9.2.3 Communications Rooms

2.9.2.3(1) Communications Rooms will be provided in an Equipment ready state in the timeframe specified in this section in order to allow:

2.9.2.3(1)(a) The Authority to install, configure and Commission the core elements of the IM/IT data, Wi-Fi, voice and DAS networks and provide the connectivity required to activate, integrate and Commission Authority and Design-Builder provided systems and equipment in sufficient time to achieve Substantial Completion of the Facility;

2.9.2.3(1)(b) Telecommunication carriers to install, configure and Commission the telecommunications services required by the core elements of the IM/IT data, Wi-Fi, voice and DAS networks and to connect the Facility to the broader healthcare network; and

2.9.2.3(1)(c) Installation of Design-Builder provided network equipment and servers in a clean environment that is equipped in accordance with the requirements in this Agreement.

2.9.2.3(2) The Design-Builder is to refer to Section 7.8.11 for the conditions that constitute an Equipment ready state for all types of Communications Rooms in the Facility.

2.9.2.3(3) Equipment Ready Timeframes

2.9.2.3(3)(a) The MER, Entrance Facility Room and Antenna Headend Equipment Room (refer to Section 7.8.9) for further details) will be provided to the Authority in an Equipment ready state six (6) months in advance of the Network Ready Date.

2.9.2.3(3)(b) All Telecommunications Rooms (refer to Section 7.8.9 for further details) will be provided to the Authority in an Equipment ready state four (4) months in advance of the of the Network Ready Date.

2.9.2.4 DAS

2.9.2.4(1) The Design-Builder will complete all of its commitments relative to the delivery of the DAS system as set out in Section 7.8.22 six (6) months in advance of Substantial Completion of the Facility.

2.9.2.4(2) This completion timeframe is needed to provide sufficient time for the Authority to complete the work required to meet the requirements of the City of Surrey Public Safety Radio Building Amplification System Bylaw.

PART 3. DESIGN PRINCIPLES AND OBJECTIVES

3.1 Design Objectives

3.1.1 The Authority has the following Design Objectives for the Project:

3.1.1.1 Design, Health and Wellness:

3.1.1.1(1) Provide a progressive Facility at the forefront of technology, innovation and sustainability. Integrate virtual health innovation, increased clinical capacity, and personalized access to care for Patients and families;

3.1.1.1(2) Provide a progressive Facility that includes smart technology, as specified within this Schedule, which enables automation and predict outcomes by gathering and analyzing timely/actionable data driven intelligence to inform decision-making;

3.1.1.1(3) Provide an inclusive Design that is welcoming, accessible and intuitive for a multicultural population of Patients, families and Staff;

3.1.1.1(4) Provide a Design that promotes the health and wellness of Patients, visitors and Staff through features that incorporate elements of nature into the indoor environment, including natural finishes and textures, appropriate use of colour, and windows for natural daylight and views of nature;

3.1.1.1(5) The Design of the Facility will include partnership with local Indigenous peoples and the Nations on whose territories the Facility is located to create culturally appropriate physical environments that visibly include Indigenous artwork, signage and territorial acknowledgement throughout the Facility;

3.1.1.1(6) Provide a Design that incorporates positive enhancements into the built environment, such as art and opportunities to participate in traditional Indigenous healing practices;

3.1.1.1(7) Provide a Design which expressly facilitates the physical activities of Staff and Patients and increases their safety, efficiency and general well-being;

3.1.1.1(8) Provide a Design that integrates architecture, interior design and artwork to support Wayfinding throughout the Facility; and

3.1.1.1(9) Provide a Design that facilitates the best use of infection prevention and control principles.

3.1.1.2 Energy Conservation and Greenhouse Gas Reduction

3.1.1.2(1) Provide full electrification of the Facility for a 100% reduction in On-Site GHG emissions.

3.1.1.3 Flexibility and Adaptability

3.1.1.3(1) Provide a Design that enables the Authority to deliver ongoing clinical excellence through integrated flexible Building Systems;

3.1.1.3(2) Provide a Design that maximizes long-term adaptability for service delivery to maintain a high level of space utilization; and

3.1.1.3(3) Clearly organize Patient, public, Staff and service flows within the Facility and demonstrate how these will connect to the Future Expansion.

3.1.1.4 Collaboration

3.1.1.4(1) Provide a Design that optimizes opportunities for collaboration between Patients, care providers, learners and researchers;

3.1.1.4(2) Provide a Design that includes workplaces designed to enable innovative and collaborative methods of working that incorporate new and emerging technologies, accommodate diverse working styles and optimize flexibility and space utilization; and

3.1.1.4(3) Provide an environment that supports best practices, excellence and innovation in the delivery of safe, high quality health care and where Staff, care providers and others will work together collaboratively in promoting Patient health and wellness.

3.1.1.5 Technology

3.1.1.5(1) Provide a Design that enables the Authority's use of technology to improve cost effectiveness, integrate services, and achieve better health outcomes. The Facility infrastructure will enable current and emerging technology to support care, learning, and innovation;

3.1.1.5(2) Provide technologies that are supported by long-standing local vendors and are easily and cost effectively adaptable to changes in workflow and evolving technologies;

3.1.1.5(3) Provide a Design that supports the role of technology in enhancing Patients' experience of receiving and taking an active role in their treatment and care; and

3.1.1.5(4) Provide a Design where technology is planned in parallel with the clinical and other Facility operational work processes to support efficient operations so that Staff can communicate easily, supplies and equipment are readily available, and information is accessible.

3.1.1.6 Wayfinding

3.1.1.6(1) Provide a drawing package for the proposed signage based on the requirements in the OCP DP 1.1. Guidelines #181-182, 186-239.

3.1.1.6(2) Provide a Design that creates an intuitive Wayfinding experience that simplifies flows for all Patients, visitors and Staff;

3.1.1.6(3) Provide a multi-modal Design that eases Patient, visitor and Staff Wayfinding through the integration of static signage, digital and interactive elements, and human elements;

3.1.1.6(4) Provide signage and other environmental graphics as part of the Design that are simple, legible and intuitive and consider visitors' cognitive, visual or mobility impairments;

3.1.1.6(5) Provide a Design that allows ease of access for Patients and Staff both within the Facility and to and from the surrounding public transit, drop-off and parking areas; and

3.1.1.6(6) Provide a Design that locates vertical circulation elements such as stairs and elevators to promote their usage through intuitive, visible and accessible placement.

3.1.1.7 Person- and Family-Centred Design

3.1.1.7(1) Provide a Design that supports and facilitates Person- and Family-Centred Care;

3.1.1.7(2) Provide a Design that will support excellence and innovation in the delivery of safe, quality health care; and

3.1.1.7(3) Incorporate Person- and Family-Centred Care and elder-friendly design concepts to improve the Patient and family experience and enhance Patient safety.

3.1.1.8 Safety

3.1.1.8(1) Provide a Design that creates a welcoming environment for the community of users and includes private treatment spaces in balance with non-clinical use spaces that offer comfort and relaxation;

3.1.1.8(2) Provide a Design in accordance with CPTED principles, having regard for theft, mischief, homelessness and vandalism to mitigate potential adverse events;

3.1.1.8(3) Provide a Design that controls hazards to Staff, Patients and visitors through Building Systems, finishes and design layout; and

3.1.1.8(4) Separation of flows in the circulation system between public, Patient and materials distribution is a desired outcome.

3.1.1.9 Asset Management

3.1.1.9(1) Provide a Design that maximizes reliability while minimizing total lifecycle costs through effective and efficient design, material selection and maintainability.

3.1.1.9(2) Provide documentation and resources, including BIM models, equipment tagging, training, operating manuals, sequence of operations, drawings and other information as required in Appendix 1V [Asset Management Requirements] to the Authority. The intent is to enable efficient and effective management, maintenance and operations of the Facility to minimize risk and costs while maximizing reliability, efficiency, utility and value to the Authority over its life.

3.1.1.9(3) Provide a Facility Maintenance Advisor who will help develop and coordinate all Asset Management requirements to meet the requirements of Schedule 1 – Statement of Requirements and Appendix 1V [Asset Management Requirements].

3.1.1.9(4) The Facility Maintenance Advisor will work directly with the Authority to coordinate and provide all necessary deliverables.

3.1.1.9(5) Incorporate efficiencies and innovations that may allow integration of systems to minimize long-term operation and maintenance costs for the Authority.

3.1.1.9(6) Minimize the need for the Authority to undertake work that causes disruption to occupants and business continuity.

3.1.1.9(7) Provide interior and exterior design that supports the Authority’s goal to prevent, reduce, repurpose and recycle waste.

3.1.1.9(8) Use Value Engineering / Life Cycle Costing to minimize overall capital and operating costs for the life of the Facility by designing to enable efficient and economical maintenance, repair and replacement of infrastructure.

3.1.1.9(9) Provide information necessary to establish critical spares and ensure space is available to maintain the spares.

3.1.1.9(10) Minimize the Authority’s response time to acquire specialized maintenance, repair and replacement services for critical infrastructure and equipment through design of equipment and infrastructure that have local service capabilities.

3.1.1.10 Seismically Isolated Building Structure

3.1.1.10(1) The Facility, except for certain areas as agreed by the Authority such as the radiation treatment vaults, Cyclotron / Radiopharmaceutical areas, Energy Centre, and canopies, will be a Seismically Isolated Building Structure designed to mitigate the seismic conditions of the Site and allow the Facility to have three (3) levels of underground parking; refer to Section 5.12.14 for additional requirements.

3.1.1.10(2) The Seismically Isolated Building Structure will consist of durable, low-maintenance materials and systems that a prudent government organization responsible for operating an acute care hospital and cancer centre building would receive with a traditional non-Seismically Isolated Building Structure.

3.1.1.10(3) The Seismically Isolated Building Structure will consist of systems and components such as:

3.1.1.10(3)(a) structural moat wall (permanent perimeter retaining wall) complete with waterproofing admixture (such as Xypex or Kryton) and watertight slip joints;

3.1.1.10(3)(b) seismic gaps, moats or spacings between the structural moat wall and components such the underground parking exterior walls, loading dock and concrete slabs;

3.1.1.10(3)(c) exterior walls and concrete slabs which comprise the underground parking structure;

3.1.1.10(3)(d) bearing pad, expansion joints, and similar assemblies designed to accommodate seismic movement; and

3.1.1.10(3)(e) all Building Services within, crossing or otherwise associated with the above noted systems.

3.1.1.10(4) The structural moat wall (perimeter retaining wall) will be designed such that the tie back anchors will not negatively impact the Future Expansion of the Facility.

3.1.1.10(5) The perimeter walls of the underground parking structure will consist of durable, low-maintenance materials such as:

3.1.1.10(5)(a) full height (slab to slab) cast-in-place concrete;

3.1.1.10(5)(b) cast-in-place concrete upstands to an appropriate height to protect against vehicle impacts with CMU block above; or

3.1.1.10(5)(c) alternative as approved by the Authority.

3.1.1.10(6) The Seismically Isolated Building Structure will:

3.1.1.10(6)(a) Meet the applicable requirements of this Agreement such as:

3.1.1.10.6.(a).1 Safety and security requirements as set out in Section 3.1.1.8 Safety;

3.1.1.10.6.(a).2 Asset management requirements as set out in Section 3.1.1.9 Asset Management;

3.1.1.10.6.(a).3 Durability requirements as set out in Section 3.8 Durability and Design Service Life;

3.1.1.10.6.(a).4 Post-disaster and flood mitigation requirements as set out in Section 5.2 Post-disaster;

3.1.1.10.6.(a).5 Resist hydrostatic pressure to mitigate water ingress as set out in Section 5.7.2 Building Envelope; and

3.1.1.10.6.(a).6 Minimizing the need for the Authority to undertake maintenance, particularly that requires special safe work procedures as set out in Section 5.1 Adaptability, Flexibility and Maintainability.

3.2 Evidence-Based Design

3.2.1 In undertaking the Design of the Facility, the Design-Builder will apply EBD methodologies to achieve the Project Design Objectives. EBD means that decisions about the Design of the Facility will be based on credible research, information derived from comparable projects, and information about the Authority’s operations. The goal of EBD is to deliver measurable improvements, for example, in the Authority’s associated Patient clinical outcomes, workflow outcomes, productivity, economic and sustainable performance, and Patient satisfaction.

3.2.2 The Design-Builder will provide EBD documentation for the Authority's use to consider, implement, teach, and incorporate into the clinical evaluation of the Project.

3.3 Lean Health Care

3.3.1 Lean Health Care means the application of lean operating principles to health care delivery to reduce the amount of time spent on unnecessary activities, reduce defects in the production of goods or provision of services and promote a framework of continuous process improvement.

3.3.2 The Design-Builder will leverage and review the seven (7) Lean Health Care flows of health services, Information, Patient, Providers, Medications, Supplies, Process Engineering, Equipment, through key Design and operational Cx stages of the Project.

3.3.3 The Design-Builder will design the Facility to:

3.3.3.1 facilitate the delivery of efficient and effective workflows and processes;

3.3.3.2 eliminate waste during the Construction of the Facility;

3.3.3.3 facilitate achievement of the Authority's zero waste target to increase waste diversion rates at all new health care construction projects to 100% by 2030;

3.3.3.4 recognize the value to the Authority of Lean Health Care, or equivalent methodologies, in supporting the delivery of Authority activities and accordingly allow the findings from such methodologies to play a key role in influencing design decisions to support the delivery of services within the Facility;

3.3.3.5 include safe, efficient and ergonomic design features throughout all spaces that specifically facilitate the physical activities of Staff and Patients, including appropriate Millwork, handrails, lighting, x-y gantry ceiling lift devices, and Patient assist or equipment manoeuvring space; and

3.3.3.6 serve as an integrated workplace by providing physical environments that:

3.3.3.6(1) support innovative and collaborative methods of working, such as a team approach to care, family centred rounds, and team huddles and daily management systems;

3.3.3.6(2) incorporate the Authority's new and emerging technologies;

3.3.3.6(3) incorporate clinical research into daily methods of working; and

3.3.3.6(4) respond to diverse work styles, such as hoteling and job-sharing, and optimize flexibility and space utilization.

3.3.4 Accordingly, the Design-Builder will design workspaces to:

3.3.4.1 include modular and generic rooms and spaces;

3.3.4.2 include standardized and flexible spaces; co-location options, space-saving strategies, and layouts, specialty casework and systems furniture that facilitate change;

3.3.4.3 provide floor layouts that accommodate teams as well as individuals, and that support mobile Staff who require flexibility and use portable technology;

3.3.4.4 accommodate program, service and equipment changes in the future with minimized impact to Utility infrastructure and to the Facility, including downtime; and

3.3.4.5 use digital Wayfinding to help people find and explain current events in spaces with changing purpose and function.

3.4 Healing Environment

3.4.1 The Design-Builder will design the Facility:

3.4.1.1 to enable the Authority to provide Person- and Family-Centred Care;

3.4.1.2 to provide a safe, healing and wellness-promoting environment for Patients and their families. The environment will be welcoming for the community of users and provide areas for relaxation and stress reduction;

3.4.1.3 to promote cultural safety, reconciliation, healing and wellness for Indigenous Patients and their families, in fulfillment of the Authority's Declaration of Commitment to Cultural Safety and Humility;

3.4.1.4 to provide Patients with control over their environment by giving them access to information, navigational tools, and environmental preferences through the use of technology;

3.4.1.5 to include elements that have been proven to create a therapeutic and low-stress environment;

3.4.1.6 to create a comfortable, functional environment for Staff, Patients and visitors by including features designed to support Patients of all ages and their families;

3.4.1.7 to include design elements that create acoustical comfort, minimize annoyance from noise-producing sources, maximize natural daylight, provide high-quality lighting and lighting control, and use natural materials, colours and lighting colour ranges that are therapeutic;

3.4.1.8 to prevent food odors from permeating areas where Cancer Centre Patients will be congregating, waiting or receiving treatment;

3.4.1.9 to comprise healthy interiors that reduce Patient, Staff and visitor exposure to chemicals of concern. Provide materials that are non-toxic to humans and the environment, that is, avoid those products for which there is credible evidence showing that chemicals off-gas or migrate out from the finished product and become airborne such as materials listed in the “Six Classes Of Harmful Chemicals” from the Green Science Policy Institute;

3.4.1.10 to include design elements that maximize human connection to the outdoors, interaction with nature and views of the exterior environment, including:

3.4.1.10(1) utilizing view corridors;

3.4.1.10(2) situating the Facility to benefit from views of public spaces and natural and landscaped views; and

3.4.1.10(3) minimizing negative visuals such as views to parkades or parking lots, blocked views and unwanted shadows.

3.4.1.11 to ensure that no materials are used on the interior of the Facility that are detrimental to human health, such as latex containing materials; refer to Fraser Health Reducing Natural Rubber Latex Exposure.

3.5 Standardization

3.5.1 The Design-Builder will apply principles of standardization in the Design and Construction of the Facility, including the following:

3.5.1.1 Room configurations will allow for flexibility in use over time;

3.5.1.2 Recurring Rooms will be standardized within the Facility; refer to Section 3.1.1.2 Appendix 1A [Clinical Specifications and Functional Space Requirements];

3.5.1.3 Service spaces and pathways will be stacked vertically, including Floor Electrical Rooms (FERs), mechanical shafts, system risers and Communications Rooms, to achieve service core efficiencies;

3.5.1.4 Floor plates for Inpatient Units will be designed similarly with Recurring Rooms stacked vertically;

3.5.1.5 Variations in standardization will not impact clinical operations;

3.5.1.6 Recurring Rooms will be same handed wherever possible. Refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] for additional requirements;

3.5.1.7 Mirrored room layouts will be considered standardized for all Patient Rooms, Medical Imaging rooms with shared Control-Imaging rooms between them; and

3.5.1.8 Equipment components will use consistent consumables for optimized supply chain management.

3.5.2 By implementing the principles of standardization, the Design-Builder will:

3.5.2.1 promote Patient and Staff familiarity with the layout, design, and systems between areas and from floor-to-floor; and

3.5.2.2 promote a reduction or minimization of Patient injuries and Staff errors.

3.6 Sustainability

3.6.1 The Design-Builder will achieve LEED credits as set out in the Agreement.

3.6.2 Use the standards and guidelines listed in Section 2.4 Standards as references in undertaking the sustainable Design and Construction initiatives. The selection of LEED credits outlined in this Agreement incorporates feedback from the Low Carbon Resilience and Environmental Sustainability Guidelines for Health-care New Construction which has been listed in Section 2.4 for reference purposes only.

3.6.3 The Design-Builder will utilize the two-stage LEED review process (design stage and construction stage) for LEED certification.

3.6.4 In addition to obtaining LEED Gold certification for the Facility, the Design-Builder will:

3.6.4.1 meet the applicable requirements of the City of Surrey;

3.6.4.2 design the Facility by employing systems thinking and applying design methods, building materials, operational practices, energy, climate and Life Cycle considerations that promote environmental quality, social and health benefits and economic vitality throughout the Construction including by minimizing the Authority's operating costs (for example, in relation to Utilities); and

3.6.4.3 implement best practices for health facility sustainability and resilience, which by extension positively impact health service delivery and ultimately human health and wellness.

3.6.5 The Design-Builder will Design the Facility:

3.6.5.1 to give priority to efficient use of water and material resources, protection of health and indoor environmental quality;

3.6.5.2 to promote and ensure accessibility to active and clean transportation methods such as walking, biking, transit and electric vehicles;

3.6.5.3 to reduce air, water and soil pollution related to construction materials, furnishings and finishes;

3.6.5.4 to take advantage of efficiencies and innovations achieved through integration of systems and scheduling of climate resilience measures in accordance with Facility half-life and full-life to minimize operational and lifecycle costs for the Authority (for example in relation to Utilities);

3.6.5.5 to take advantage of alternative sources of energy such as passive solar and opportunities for waste heat recovery; and

3.6.5.6 to apply a total systems approach to minimize energy consumption and incorporate energy consumption management techniques that are targeted to stabilize and optimize energy flows.

3.6.5.7 Provide sustainable street tree planting using current best management practices. Provide continuous tree trench planting details where possible in street boulevards and in hard surface courtyard conditions.

3.6.5.8 Maximize the amount of landscape areas on the Site and minimize the number of impervious surfaces to increase the natural absorption rate of storm water.

3.6.5.9 Provide a combination of pervious paving, absorbent landscaping and infiltration reservoirs to meet the storm water management requirements of this Schedule.

3.7 Climate Resilience

3.7.1 This Section will be read in conjunction with Section 3.6 Sustainability, Section 5.5.6.1 Commissioning (LEED + Z8001 Framework) and Schedule 5 [Energy Guarantee] with the intent to optimize synergies with sustainability, low carbon and energy efficiency strategies. These include aligning with health and wellbeing objectives and leverage strategically LEED credits to amplify low carbon and climate resilient strategies.

3.7.2 The Design-Builder will apply, refine as needed, and document in an Excel worksheet the Resilient Design Objectives and Resilient Design Strategies featured in the Design at each major Submittal stage (i.e. 30%, 50%, 70%, 90% and 100%). The worksheet will address the requirements set out in Section 3.7.6 and others set out in this Agreement. The objectives and strategies will be derived from the "Climate Resilience Guidelines for BC Health Facility Planning and Design (December 2020, v1.1).

3.7.3 The Design-Builder will submit a plan for transferring key documentation and information related to climate risk and resilience to the Commissioning Authority and Commissioning Provider at the 90% and 100% Submittal stages, per guidance in the Climate Resilience Guidelines.

3.7.4 The Design-Builder will ensure that standard operating procedures developed for FMO align with seasonal readiness plans and protocols developed for the Authority.

3.7.5 The Design-Builder will apply the following climate resilience guiding principles and practices to the design of all major components and Building Systems, and key disciplines including mechanical, electrical, civil, structural, and landscaping: Major components and Building Systems are listed in Section 3.8.2 Design Life Table that are vulnerable to climate hazards as identified in the NSHBCCC Pinna Resilience Workshop Final Report and the NSHCC Climate Resilience Design Brief Recommendations.

3.7.6 Utilize the most up-to-date, high-quality, downscaled climate science data that is publicly-available for all climate hazards identified in the NSHBCCC Pinna Resilience Workshop Final Report and the NSHCC Climate Resilience Design Brief Recommendations, completed in partial fulfillment of LEED pilot credit IPpc98 as relevant to the Site and the community it serves from Substantial Completion Date to Facility end-life to inform Design and Construction. These include:

3.7.6.1 future climate projections data downscaled from AR6 (IPCC Sixth Assessment Report);

3.7.6.2 intensity duration frequency (IDF) curves for the site and all access roads;

3.7.6.3 wind and wildfire projections (i.e. smoke, ground level ozone);

3.7.6.4 flood management plans developed by the City, and flood risk assessments completed for the Lower Mainland;

3.7.6.5 climate risk management strategies developed for critical infrastructure serving the Facility, including dikes on the Nicomekl and Serpentine rivers, and utilities (i.e. power, telecommunications, water, sewage, roads); and

3.7.6.6 "extreme" extreme events including heat domes, wildfire smoke in the Pacific Northwest region.

3.7.7 Ensure future climate projections inform decision making for (i) key Design elements including orientation, exposure, building envelope and materials; and, (ii) major components and Building Systems are listed in Section 3.8.2 Design Life Table and as listed in PART 7, in terms of initial selection and renewal strategies with a view to

developing adaptation pathways for Facility half-life and end-life. Submit a narrative and drawings at each major Submittal stage that demonstrate how future climate projections have informed decision making and development of standard operating procedures.

3.7.8 Specify climate change-related assumptions and risk thresholds that underpin the proposed Design and Construction with reference to the NSHCC Resilience Workshop Final Report and the NSHCC Hazard and Risk Assessment Worksheet and Design Brief.

3.7.9 Prioritize visual and physical access to green spaces for health and climate change co-benefits by incorporating green space into the Facility per Greening Strategies for Co-Benefits.

3.7.10 Integrate green and grey infrastructure to reduce extreme flood and heat risks On-Site and Off-Site.

3.8 Durability and Design Service Life

3.8.1 The design service life of the Facility will be 50 years starting at the date of Substantial Completion. Table 1 in Section 3.8.2 indicates the Design Life, in years, of major building components and systems as set out in CSA S478:19. The indicated timeframes in Table 1 and Table 2 are to be used as a guideline for quality required for the durability to provide the design lives.

3.8.2 Design Life Table 1, Structural and Architectural

Design Life Table 1			
Component / System	**Material(s)**	**Design Life Years**	**Maintenance**
SITE			
Hardscaping - pavings and curbs	concrete and asphalt	20-30	repair/replacement
Landscaping - plantings	vegetation	15-25	remediation
Furnishings and signage		10-20	repair/replacement
STRUCTURE			
Structural moat wall	reinforced concrete and tied back anchors	100	
Below grade parking and foundation substructures	reinforced concrete	100	
Above grade structures	reinforced concrete and structural steel	100	
Auxiliary	Steel	50-100	
ENVIRONMENTAL SEPARATION			
Below grade waterproofing	bituminous	50	
Traffic topping		20-30	repair/replacement
Air barrier		50	
Façade claddings		50-100	
Fenestration	aluminum and glass	50	repair
Exterior entrances and doors		20	replacement
Exposed roof covering	SBS mod bit	25	resurfacing

Design Life Table 1			
Component / System	**Material(s)**	**Design Life Years**	**Maintenance**
Protected membrane roofing	rubberized asphalt	50	
CONVEYING EQUIPMENT (outside scope of CSA S478)			
Elevators		25	replacement
Pneumatic tube system		50 tubing 10-25 accessories	replacement
INTERIOR FINISHES			
Sheet flooring		20-30	repair/replacement
Resinous flooring		20-30	repair/replacement
Wall panels		20-30	repair/replacement
Wall finish coatings		15-25	refinishing
Ceiling finish coatings		20-30	refinishing
Prefinished ceilings		50	
DOORS, HARDWARE & FURNISHINGS			
Doors		25-50	repair/replacement
Door hardware		10-20	replacement
Casework		15-25	replacement
Window shades		20	replacement

3.8.3 Design service life Table 2, Mechanical, Electrical, Communications, Safety and Security

Design Life Table 2	
System / Component	**Design Life Years**
MECHANICAL	
Sprinkler system	50
Plumbing	50
Plumbing fixtures	15-25
Air handling units	30
Boilers hydronic (high mass)	25
Boilers steam (high mass)	25
Chillers water cooled - centrifugal	25
Heat recovery screw chillers – water cooled	15-20
Low temperature heat recovery - centrifugal	25
Cooling towers	25
Domestic storage tanks	25
Fans – general use	20
Fans – lab (high plume, dilution)	20

Design Life Table 2	
System / Component	**Design Life Years**
Heat exchangers	25
Hydronic pumps centrifugal heating	20
Hydronic pumps centrifugal cooling	20
Hydronic pumps domestic water	20
Medical gases (medical air)	25
Medical gases (instrumentation air)	25
Medical gases (vacuum systems)	25
Lab – nitrogen generation system	25
Anesthesia gas scavenging system	25
BMS controls	10
Flow balancing valves, domestic water	15
Isolation valves over 4” (gear operated butterfly valves)	20
Control valves pressure independent PICCV (modulating)	15
Control valves pressure independent PICCV (2-position)	15
Control valves pressure independent PICCV (3-position)	15
Variable frequency drives	25
RO water generation systems – non dialysis	25
ELECTRICAL	
High voltage switchgear and service entrance equipment	40
Emergency generators	30
Dry type transformers	30
Low voltage switchgear	40
Automatic transfer switch	30
UPS system	20
UPS batteries	10
Power distribution and panels	30
Light fixtures and controls	20
Exterior lighting	20
Fire alarm system	30
COMMUNICATIONS, SAFETY & SECURITY	
Nurse call system	15
IP video surveillance/security	10
Patient wandering	10
Wireless Staff duress	10
Fixed duress	10
Access control	15
Intrusion detection	10
Structured Cabling	25
Multimedia	10
Public address	15

Design Life Table 2	
System / Component	**Design Life Years**
Intercommunications	15

3.9 Adaptability and Flexibility

3.9.1 The Design and Construction of the Facility will be in accordance with the following principles:

3.9.1.1 The Facility will accommodate the rapid cycle of innovation and change to support development and implementation of new clinical and non-clinical work processes and technological change; and

3.9.1.2 The Facility will accommodate program, service and equipment changes in the future with minimized impact to Utility infrastructure and to the Facility.

3.9.2 To support Future Expansion of Components and of capacity as a whole, the Design-Builder will:

3.9.2.1 plan for future growth of Clinical Components by providing floor zoning that allows for expansion of programs or services by, for example, locating administrative and other non-clinical functions adjacent to them; and

3.9.2.2 provide a loose-fit Design to optimize functionality within a given floor area.

3.9.3 Provide infrastructure that incorporates excess systems capacity, includes systems and Components that support Future Expansion with minimized disruption to daily operation and allows for upgrades in Authority technology or technological progression.

3.9.4 Accommodate connections for Staff, Patients and services between the Facility and the Future Expansion.

3.10 Universal Design

3.10.1 Universal Design means the design of products, environments, programs and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design, by following the 7 Principles of Universal Design from the Centre for Excellence in Universal Design.

3.10.2 Universal Design will not exclude assistive devices for groups of Persons with Disabilities where these devices are needed.

3.10.3 The Design-Builder will incorporate the following 7 Principles of Universal Design from the Centre for Excellence in Universal Design into the Design to address barriers to equitable access to health care resulting from cultural and linguistic diversity, gender and gender diversity, and cognitive, functional and physical capability:

3.10.3.1 Equitable use;

3.10.3.2 Flexibility in use;

3.10.3.3 Simple and intuitive;

3.10.3.4 Perceptible information;

3.10.3.5 Tolerance for error;

3.10.3.6 Low physical effort; and

3.10.3.7 Size and space for approach and use.

3.10.4 All accessible washrooms will meet requirements of a Universal washroom as described in CSA B651 Accessible Design for the Built Environment, Section 6.3.1.1 including Figure 47.

3.11 Quality of Daylight

3.11.1 Recognizing the positive health benefits to Patients and Staff, the Design-Builder will provide Quality Daylight for all spaces that require Direct Natural Light.

3.11.2 Provide windows and glazing that account for the shape and use of the room or space. Windowsill height, header height, and window width and glazing will be configured to provide daylight that supports the activities within the specific type of room.

3.11.3 Provide shading devices to control solar heat gain and glare at windows and glazing, as required, in combination with dynamic glazing (electrochromic glass) requirements as set out in this Schedule.

3.11.4 The Facility will include lightwells, clerestory windows, concourses or equivalent type areas and devices as strategies for bringing daylight into the Facility and circulation areas.

3.11.5 Light shelves and interior finishes/treatments such as translucent interior glazing and/or transparent interior glazing with shading devices will be provided to facilitate bringing daylight into the Facility.

3.12 Use of Wood

3.12.1 As contemplated by the Wood First Act (British Columbia), the Design-Builder will incorporate wood products into the Design as permitted by Appendix 1C [Wood First Appropriate Use Matrix]. Wood may be used where indicated as “Appropriate” in Appendix 1C [Wood First Appropriate Use Matrix]. Wood will not be used where indicated as “Inappropriate”.

3.12.2 Consider innovative opportunities to expand the use of wood beyond the applications seen in recent health care projects, including through the incorporation of engineered wood applications.

3.12.3 The term “Alternative Solution” used in this section and in Appendix 1C [Wood First Appropriate Use Matrix] specifically refers to this term as described in the BCBC.

3.13 Quality Environment

3.13.1 Design the Facility so that the Patient, visitor and Staff experience is welcoming, safe, and compassionate. Ensure that common destinations such as the Vestibule - Main Entrance are easily accessible and welcoming to visitors.

3.13.2 Include ergonomic design features throughout all spaces in the Facility that specifically facilitate the physical activities of Staff, and Patients, and of pediatric Patients in the ED, and Main Entrance Lobby, including appropriate Millwork, specialty casework, furniture, active workstations, shelving and storage solutions, lighting, lift devices, and Patient assist or equipment manoeuvring space.

3.13.3 Support the physical, psychological, spiritual, cultural and social health and well-being of the Facility's occupants by providing a healing environment that includes elements that have been proven to create therapeutic, low-stress and comfortable functional environments for Patients, their families, and Staff that are:

3.13.3.1 safe and secure, and be a backdrop for people of varying ages, abilities and cultures;

3.13.3.2 designed to encourage Patients to arrange their space to suit their individual needs;

3.13.3.3 reflective of the Authority's commitment to reconciliation with Indigenous Patients, families and communities; and

3.13.3.4 acknowledging of ethnic diversity.

3.13.4 Design the Facility to include environmentally responsible, resource-efficient and regenerative building concepts in addition to integrating health, wellness, and the human experience, including by:

3.13.4.1 creating sufficient opportunities for human-nature interaction, producing an environment that ties the surrounding landscape and interior environments together;

3.13.4.2 using natural materials, such as wood and stone, as much as possible throughout public areas; and

3.13.4.3 using non-toxic or green chemistry materials. Green chemistry means products and processes that minimize or eliminate the use and generation of hazardous substances. Do not use materials included in the International Living Future Institute's "Red List", wherever possible.

3.13.5 Incorporate into the Design of the Facility a comprehensive and interdisciplinary approach to address the factors of the physical environment that impact the day-to-day health and productivity of the occupants and the interactions between those environmental factors, including by:

3.13.5.1 designing spaces that leverage aesthetics, technology and the environment to ensure the wellbeing and comfort of Patients, families, and Staff;

3.13.5.2 designing the Site and Facility to form a gradual continuum from public to private areas; and

3.13.5.3 including an easily legible configuration for Facility circulation and an indoor Wayfinding and signage system that is simple, intuitive, and fully coordinated.

3.13.6 Design the Facility to create an atmosphere that supports a healthy mental state by employing design elements that mediate between stress and anxiety, and address mental and emotional challenges or trauma, including by:

3.13.6.1 minimizing the potentially intimidating nature of the typical institutional setting for Patients and visitors who may be disoriented or anxious and for younger Patients who may be overwhelmed by the experience;

3.13.6.2 designing highly technical areas to be visually and acoustically isolated; and

3.13.6.3 designing the environment so that Patients, visitors and Staff will perceive it as open and accessible rather than regimented and intimidating.

3.13.7 Design the Facility to significantly reduce the sources of physiological disruption, distraction and irritation to prevent stress and injury and on enhancing acoustic, ergonomic, olfactory and thermal comfort to improve overall comfort, productivity and well-being, including by:

3.13.7.1 providing spaces that are sufficiently adaptable to working, concentration, collaboration and respite, as needed, and that enable individuals to adjust their environments and choose their degree of engagement with others;

3.13.7.2 including features such as sound and music, colour, pattern, air quality, nature and views of nature, and art and aesthetic forms as means for creating an environment that supports and engages Patients and families, but does not negatively impact Staff safety or performance; and

3.13.7.3 enriching the interiors of the Facility with play corners, recreation areas, colourful signage, and artwork to create an environment that is more residential than clinical for the comfort of Patients and their families.

3.13.8 Encompass in the Design of the Facility a wide range of concepts and applications that promote human health, including:

3.13.8.1 construction materials and practices;

3.13.8.2 design features;

3.13.8.3 healthy interiors;

3.13.8.4 VOC reduction;

3.13.8.5 occupant engagement;

3.13.8.6 personal control;

3.13.8.7 indoor environmental quality;

3.13.8.8 limited exterior noise intrusion;

3.13.8.9 reduced interior noise disruption;

3.13.8.10 speech privacy;

3.13.8.11 daylighting;

3.13.8.12 artificial lighting with quality colour rendering abilities;

3.13.8.13 biophilic design;

3.13.8.14 access to potable water; and

3.13.8.15 visual and physical ergonomics.

3.13.9 Provide materials and finishes which meet the following requirements:

3.13.9.1 are non-toxic (not included in the International Living Future Institute's "Red List") and non-allergenic wherever possible;

3.13.9.2 have low VOC emissions so as to minimize adverse impact on indoor air quality; and

3.13.9.3 are non-latex or minimize the use of latex containing materials.

3.13.10 Healthy Entrances

3.13.10.1 Occupants often track harmful Contaminants indoors, including bacteria, heavy metals and lawn and agricultural pesticides, among other toxins. In addition, as occupants walk through entry doors, potentially polluted air can enter the Facility. Both of these modes of introducing outdoor pollutants to the indoor environment highlight the need for measures, including the installation of appropriate materials, which minimize or prevent the introduction of potentially harmful substances into indoor spaces.

3.13.10.2 Provide permanent recessed entrance mats to minimize the introduction of pollutants into indoor air at Facility entrances; refer to Section 5.7.4.1(16).

3.13.11 Drinking Water Requirements

3.13.11.1 The Design of the Facility will promote the consumption of water by making high-quality drinking water easily accessible to occupants.

3.13.11.1(1) Provide filtered, chilled water bottle refill station with integrated water collection at minimum in the following areas:

3.13.11.1(1)(a) One (1) per floor on all floors at-grade and above grade with the exception of mechanical floors located within Public Circulation (or within/near

Public Elevator lobbies) with Convenient Access for all;

3.13.11.1(1)(b) One (1) additional station in T1.02 Main Entrance Lobby;

3.13.11.1(1)(c) One (1) additional station in the V. Meeting and Education Component; and

3.13.11.1(1)(d) Where indicated in the Appendix 1B [Minimum Room Requirements].

3.13.12 Interior Fitness Circulation

3.13.12.1 Provide easily accessible, safe, and visually appealing stairs, entryways, and corridors to encourage intermittent bouts of physical activity and reduce sedentary behaviour.

3.13.12.2 Stair Location

3.13.12.2(1) Locate stairs that can be accessed by the public in an area that is equally as prominent as or more prominent than elevators.

3.13.12.2(2) Ensure stairs are clearly visible from the Main Entrance Lobby.

3.13.12.3 Stair Design

3.13.12.3(1) Implement active design strategies in the stair design such as:

3.13.12.3(1)(a) Installing creative lighting;

3.13.12.3(1)(b) Painting walls with bright colours;

3.13.12.3(1)(c) Incorporating biophilic elements such as with digitally printed wallcoverings and murals;

3.13.12.3(1)(d) Providing daylighting using windows of at least 1 NSM in size; and

3.13.12.3(1)(e) Providing view windows to the outdoors or between spaces within the Facility.

3.13.12.4 Stair Visibility for Public Use

3.13.12.4(1) Increase visibility of non-exit stairs by implementing the following strategies:

3.13.12.4(1)(a) Unenclosed stairs with full-height guardrails;

3.13.12.4(1)(b) Use of glass partitions for stair enclosure; and

3.13.12.4(1)(c) Maximized glazing in stair doors.

3.13.13 Design Aesthetic

3.13.13.1 The incorporation of aesthetically pleasing design elements and artwork into a space can bring a measure of comfort or joy to the occupants, add complexity to the visual field and create a calming environment with the potential to improve occupant mood.

3.13.13.2 To create spaces that are unique and culturally rich, the Design-Builder will include features in the Project that are intended to foster:

3.13.13.2(1) Human delight;

3.13.13.2(2) Celebration of spirit and humanity;

3.13.13.2(3) Celebration of place;

3.13.13.2(4) Acknowledgement and reflection of the Site's history and location on the unceded and traditional homelands of the Coast Salish and Nlaka'pamux Nations (ent-la-capum);

3.13.13.2(5) Celebration of the project vision: "A progressive Facility at the forefront of technology, innovation and sustainability. The New Surrey Hospital and BC Cancer Centre will integrate virtual health innovation, increased clinical capacity, and personalized access to care for Patients and families in one of BC's fastest growing regions" and

3.13.13.2(6) Meaningful integration of public art.

3.13.13.3 Consideration will be given to how signage and Wayfinding Assets are located around artworks, and the two will not visually compete.

3.13.14 Connection with Natural Surroundings

3.13.14.1 The Design-Builder will design the Facility to provide views and images of nature in support of the Authority's intention to help speed healing and recovery time, boost positive feelings and reduce negative ones.

3.13.14.2 The Design-Builder will incorporate design elements into the Facility to nurture the innate human-nature connection with the Facility, as follows:

3.13.14.2(1) Incorporate Indigenous design elements;

3.13.14.2(2) Provide environmental design elements, lighting and space layouts that incorporate nature within the Facility;

3.13.14.2(3) Provide design elements that create place-based relationships to uniquely connect people to the climate, culture and identity of place;

3.13.14.2(4) Incorporate minimally processed materials and elements from nature into the Facility to reflect the local ecology or geology to create a distinct sense of place;

3.13.14.2(5) Provide nature-inspired design elements that enhance the experience of connection to nature through greater diversity and frequency of exposure, as follows:

3.13.14.2(5)(a) use patterns and forms seen in nature to create an environment that encourages:

3.13.14.2.5.(a).1 cognitive performance while helping to reduce stress;

3.13.14.2.5.(a).2 Staff wellbeing; and

3.13.14.2.5.(a).3 promotes Patient healing.

3.13.14.2(5)(b) generate such forms and patterns as symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature; and

3.13.14.2(5)(c) do not overuse forms and patterns that may lead to visual toxicity.

3.13.14.2(6) Provides opportunities as part of the Design for human-nature interactions within the Facility and external to the Facility.

3.14 Education and Learning

3.14.1 The Design-Builder will design the Education and Learning Component to accommodate the requirements of Facility and other learning providers as described in this Schedule and Appendix 1A [Clinical Specifications and Functional Space Requirements].

PART 4. SITE DEVELOPMENT REQUIREMENTS

4.1 General Requirements

4.1.1 The Design-Builder will provide a Design which is well integrated with the surrounding street network as set out in Appendix 1E [Civil Infrastructure Plans].

4.1.2 While a prototype approach to the Design for a health care facility is desirable, tailoring prototypes to the specifics of an existing site is critical for the success of the Design. Accordingly, the Design-Builder will adapt any desirable prototypes to all Site constraints, infrastructure, and unique context.

4.1.3 The Design-Builder will:

4.1.3.1 Facilitate the delivery of clinical and non-clinical support services across the Site including in the Design the provision for efficient physical links from the Facility to Future Expansion;

4.1.3.2 Locate entrances and access points to minimize slopes and promote accessibility;

4.1.3.3 Integrate the Design such that it responds to new and existing public transit routes around the Site and promotes access for those using public transportation systems;

4.1.3.4 Support community access and include a highly visible entry point into the Main Entrance Lobby directly accessible from James Hill Drive and designed with high profile architectural scale and features; and

4.1.3.5 Include the needs of Facility Management in the Design and placement of site services including ease of access and maintenance.

4.2 Master Site Plan

4.2.1 Future Expansion means that the Authority intends to further develop the Lands in the future and requires the Design-Builder to Design the Project to accommodate:

4.2.1.1 Expansion of the Facility to include a future acute health care building to meet the following requirements:

4.2.1.1(1) a minimum of 50,000 (BGSM), excluding underground parking;

4.2.1.1(2) a minimum of one (1) level of underground parking designed to maximize future parking on the Site and connected with a knock-out panel as described in Section 4.4.3.4;

4.2.1.1(3) a minimum of seven (7) twenty-four (24) medical surgical inpatient bed units configured similarly to the Facility with 48 beds per floor and 24 beds per floor and connected with a knock-out panel as described in Section 4.4.3.2; and

4.2.1.1(4) a future Perioperative Component that maximizes the ability to expand the Facility's Perioperative Component in the future and is connected with a knock-out panel as described in Section 4.4.3.3. The Authority also anticipates the Future Expansion to include new Ambulatory Care and Virtual Health services with an area approximately double that which is currently programmed for the Facility.

4.2.1.2 Expansion of the Energy Centre representing a 50% increase in BGSM (i.e. 1.5x the BGSM required for the Facility). Provide space for a future steam boiler and a future chiller to meet the 2080 projected cooling load; and

4.2.1.3 Expansion of the emergency generators and the exterior emergency generator building enclosure to accommodate an increase in generation to 12MVA total load (plus N+1 redundancy).

4.2.2 Provide a Master Site Plan for the Lands in accordance with the master planning requirements, applicable City bylaws and the Site development requirements described in this Schedule which demonstrates the accommodation of the Facility and the Future Expansion.

4.2.3 The Master Site Plan will:

4.2.3.1 Illustrate the Site context and Future Expansion to validate the Facility siting;

4.2.3.2 Preserve and maximize green field areas for development beyond the Future Expansion which will provide the Authority maximum flexibility for how they can utilize the Lands over time;

4.2.3.3 Ensure that each Component of the Facility as described in Section 2.1 Project Overview, is an integrated part of the Site and Future Expansion, facilitating the delivery of clinical and non-clinical support services;

4.2.3.4 Provide the ability for the Authority to complete the physical links between the Facility and the Future Expansion through continuation of the Facility's Back-of-House and Front-of-House corridors without crossings of these flows and with minimal impact to the continuous operation of the Facility.

4.2.3.5 Ensure the connections between the Facility and the Future Expansion are planned to provide for safe and efficient Staff, service and public flows between the two buildings;

4.2.3.6 Provide capped utility connections for the Future Expansion, refer to Appendix 1E [Civil Infrastructure Plans];

4.2.3.7 Demonstrate to the Authority how the Master Plan will be developed including major construction phases, parking and/or relocation (temporary or otherwise) to existing Components;

4.2.3.8 Align with the Authority's Design Objectives as described in Section 3.1;

4.2.3.9 Indicate the access provisions needed for replacing major Equipment required for the Facility, as well as for adding major Equipment at a future date including items as set out in Appendix 1H [Equipment and Furniture] and Appendix 1I [Food Services Equipment List].

4.2.3.10 Include direct and logical pedestrian and vehicular connections between the interface pathways and the Facility entrances and the Future Expansion;

4.2.3.11 Comply with the Wayfinding requirements described in Appendix 1R [Wayfinding Standards and Requirements];

4.2.3.12 Have a strong presence at the intersection of James Hill Drive and 180th Street with a comprehensive, legible public realm;

4.2.3.13 Consider the noise and vibration caused by the surround properties;

4.2.3.14 Reflect the Authority's values and role as the major centre for health in the community;

4.2.3.15 Be a good neighbour, support community access and be respectful of other uses and activities in and around the Site through contextually responsive architecture; and

4.2.3.16 Reflect logical planning principles and demonstrate clarity of all circulation systems such as vehicles (public, emergency and service) and pedestrians.

4.3 Work Area Diagrams

4.3.1 Refer to Appendix 1F [Work Area Diagrams] for approximate boundaries for the Work.

4.3.2 Work Area A (On-Site)

4.3.2.1 The Facility and the Future Expansion will be located within the boundary as defined by Work Area A.

4.3.3 Work Area B (On-Site)

4.3.3.1 The Design-Builder will not have access to Work Area B without the Authority's prior written consent. The Authority may consider Work Area B for the Design-Builder’s Construction lay down area.

4.3.4 Work Area C (Off-Site)

4.3.4.1 The Design-Builder will complete all the Off-Site Work as required by this Agreement.

4.4 Connections to the Energy Centre, Future Expansion and Services

4.4.1 The Design-Builder will design the Facility to maximize opportunities for connections to the Future Expansion and enhance the ability for the Future Expansion and the Facility to function in a cohesive manner.

4.4.2 Connections will be effective, contiguous and integrated to provide for ease of visitor, Staff, and Patient movement and material distribution between the Facility and the Future Expansion.

4.4.3 Provide knock-out panels in exterior walls at each of the following locations such that the Authority can connect to the Future Expansion:

4.4.3.1 Two (2) on the main floor (level 1) of the Facility for Front-of-House and Back-of-House connections;

4.4.3.2 One (1) on a floor level of the Facility which contains Inpatient Units;

4.4.3.3 One (1) on the floor level of the Facility which contains the Perioperative Component; and

4.4.3.4 One (1) on the underground parking level.

4.4.4 The Facility will include all structural provisions required to minimize any future work by the Authority to complete connections between the Facility and the Future Expansion.

4.4.5 Provide connections (both horizontally and vertically) to facilitate efficient Back-of-House travel paths from the Service Entrance and FMO/AM and Components and the Energy Centre for movement of Staff and materials.

4.4.6 For corridor width requirements refer to Section 5.7.4.3 Corridors.

4.4.7 The Design will include the following provisions for Future Expansion:

4.4.7.1 Avoid placing permanent elements that cannot easily be removed in the future by the Authority, within the footprint of the Future Expansion; such as the following:

4.4.7.1(1) Underground utilities as noted in Section 4.4.7.4; this includes all CPPS and third-party underground systems connected to it and all other underground Communications Pathway Systems as noted in Section 7.8.8.8;

4.4.7.1(2) Radiation Treatment vaults and Cyclotron vaults, and the maintenance and crane access to the Cyclotron vaults;

4.4.7.1(3) Emergency generators and generator fuel storage;

4.4.7.1(4) Designated bulk oxygen site; and

4.4.7.1(5) Other similar items, which if removed or relocated, would be detrimental to the continuous operation of the Facility.

4.4.7.2 Consider landscape elements that are easy to remove, easy to relocate and reusable or recyclable in footprint of the Future Expansion;

4.4.7.3 Do not locate Utilities within the footprint of the Future Expansion or in locations deemed by the Authority as detrimental to the future flexibility of the Lands; and

4.4.7.4 Refer to Appendix 1E [Civil Infrastructure Plans] for storm, sanitary and water service provision requirements.

4.5 Site Development

4.5.1 The Design-Builder will:

4.5.1.1 Minimize the impact the Facility has on adjacent neighbours and land uses. Preserve visual privacy and sunlight for adjacent properties and buildings, and include features that will give the Facility an identity consistent with its overall community context;

4.5.1.2 Consider the micro-climatic effects arising from the location and configuration of parking, walkways and buildings on the Site, including effects of Facility entrance orientation on Patient, Staff and visitor comfort and safety;

4.5.1.3 Reinforce the physical relation of the structures to foster a strong sense of place and identity, and to ease vehicular and pedestrian movement into the Site;

4.5.1.4 Label and name parking pick-up and drop-off areas with signage in accordance with Appendix 1R [Wayfinding Standards and Requirements];

4.5.1.5 Mitigate the nearby noise from adjacent roadways and Facility building equipment using appropriate exterior glazing and other acoustic screening; and

4.5.1.6 Create meaningful open spaces for the benefit of diverse Patients, visitors and Staff that provide opportunities for recreation and contribute to an inclusive, healthy community; capitalize on opportunities for outdoor areas of respite and repose to aid in providing a healing environment.

4.6 Pedestrian and Vehicular Connections

4.6.1 The Design-Builder will:

4.6.1.1 Create a high-quality, vibrant, pedestrian-friendly environment that includes connecting the pedestrian sidewalks and bicycle pathways to existing sidewalks, pathways and transit stop adjacent to the Site, and use signage to help connect exterior and interior pathways;

4.6.1.2 Design for the functional separation of uninterrupted routes for ambulance vehicles, visitors, Staff and service vehicles, and to minimize public and service vehicle traffic interference with ambulance vehicle access to the Site;

4.6.1.3 Integrate vehicular circulation with layout of pedestrian walkways and bicycle pathway to provide visible connections, promote safe travel, and to minimize conflict between vehicles and other modes of travel. Ensure pedestrian walkways and bicycle pathways are distinct and separated to ensure safety.

4.6.1.4 Use signage to clearly distinguish between pedestrian and cycle-specific routes and lanes. Design the driveways and layby aisles to provide connections between the surrounding roads and the Facility entrances including the Main Entrance Spaces, Emergency, Patient Transfer areas, Child Care Centre and Energy Centre;

4.6.1.5 Design vehicular service entrances so that they are integrated into the Facility design with minimal visual impact;

4.6.1.6 Provide safe pedestrian crossings that are clearly designated using pavement markings and signage. In areas where a high volume of pedestrian crossings are expected such as at the Main Entrance Covered Drop-Off and Emergency Department Vestibule - Walk-In Entry, provide for changes in surface material (such as from asphalt to enhanced concrete paving, for example);

4.6.1.7 Provide safe access for the mobility impaired (including people with strollers) by providing paths of travel which are a minimum 2.0 m wide unless noted otherwise, to allow for two people walking side by side and someone passing and for wheelchairs or scooters;

4.6.1.8 Provide curb let-downs in appropriate locations to facilitate convenient and Direct Access for Persons with Disabilities. Align curb let-downs to pedestrian crossings and to the Facility entrances;

4.6.1.9 Provide safe pedestrian refuge spaces behind all sidewalk wheelchair ramps;

4.6.1.10 Provide clear, direct pedestrian routes that are unimpeded by parked or moving vehicles;

4.6.1.11 Provide circulation through surface parking areas for pedestrians including:

4.6.1.11(1) Contrasting, durable concrete sidewalk paving treatments where pathways extend through vehicle circulation areas; and

4.6.1.11(2) A hierarchy of primary and secondary pathway systems throughout the site.

4.6.1.12 Provide traffic calming measures including curb bulges and raised crosswalks to minimize roadway pavement width at pedestrian crosswalks.

4.6.2 Sidewalks and pathways will incorporate landscape treatments with trees and benches, lighting (including pedestrian-scale lighting), distinct paving where appropriate to further identify and enhance the pedestrian movement, seamless interfaces across public and private property without using steps or retaining walls as required by the City bylaws, and tactile strips for the visually impaired, wherever required.

4.6.3 All walkways and other paved areas will have positive drainage to shed rainwater quickly to a storm drainage facility.

4.6.4 Flooding/ponding are not permitted On-Site except in designated storm water detention facilities designed with an overflow to a storm system with adequate capacity.

4.7 Public Realm and Open Space

4.7.1 The Design-Builder will:

4.7.1.1 Provide legibility, quality and consistency of the overall treatment of the public realm, including public open space, pedestrian corridors and streets, to achieve a unified and attractive built environment; and

4.7.1.2 Provide a hierarchy of open spaces as follows:

4.7.1.2(1) Public open spaces;

4.7.1.2(2) Private open spaces; and

4.7.1.2(3) Achieve segregation between different open spaces through landscape barriers including hedges and planting that discourage people to walk into/through the hedging, and do not permit hiding or seclusion.

4.8 Outdoor Amenity Areas

4.8.1 General Requirements

4.8.1.1 The outdoor amenity areas described herein will be provided complete with all infrastructure requirements as described in Section 7.7 Electrical (Division 26); Section 7.8 Communications (Division 27), and Section 7.9 Electronic Safety and Security (Division 28).

4.8.2 Plaza

4.8.2.1 Provide an outdoor plaza to meet the following minimum requirements:

4.8.2.1(1) The plaza will have attractive and comfortable spaces for relaxing and socializing. The plaza will be designed as the primary outdoor space for the public and will serve as the main civic gathering space;

4.8.2.1(2) The plaza(s) will be located near the prominent public gathering areas such as the intersection of 180th Street and James Hill Drive across from KPU as well as the main entrance;

4.8.2.1(3) Provide a pedestrian pathway and visual connection between the plaza and the Main Entrance Lobby;

4.8.2.1(4) The size of the plaza(s) will be minimum 1200 NSM and include:

4.8.2.1(4)(a) a variety of fixed seating options to accommodate sixty (60) people including Persons with Disabilities; and

4.8.2.1(4)(b) canopies which provide protection from the elements for approximately one-third (1/3) of the people.

4.8.2.1(5) Landscape planting and paving patterns will create subtle directionality towards the Main Entrance Lobby to the Facility;

4.8.2.1(6) Landscape planting will provide shaded areas for visitors through canopy cover; and

4.8.2.1(7) No water fountain or water features will be permitted.

4.8.3 Wellness Walkway

4.8.3.1 Provide a wellness walkway to meet the following requirements:

4.8.3.1(1) Provide a continuous pathway for pedestrians which extends along the perimeter of Work Area A; refer to Appendix 1F [Work Area Diagrams]. The Wellness Walkway will encompass portions

of Work Area C where it may be in combined with the Off-Site sidewalks along JHD and 180th Street;

4.8.3.1(2) Provide pedestrian connections from the Wellness Walkway to the Plaza and all public entrances to the Facility and Child Care Centre;

4.8.3.1(3) Include Wayfinding elements such as exterior pylons; refer to Appendix 1R [Wayfinding Standards and Requirements];

4.8.3.1(4) Provide shade trees, consistent curb let-downs, and smooth wide sidewalks for wheelchairs, regularly-spaced seating, and points of interest/beauty;

4.8.3.1(5) Provide paving and opportunities for public art at minimum of three (3) locations complete with interpretive signage;

4.8.3.1(6) Provide native plantings and natural systems such as rain gardens in a safe setting accessible to persons of all ages and abilities;

4.8.3.1(7) Provide a variety of seating elements and seating nodes;

4.8.3.1(8) Provide safe and logical pedestrian and bicycle circulation at all the intersections and where the pedestrian and bicycle circulation intersect;

4.8.3.1(9) Create separations between the roadway, bicycle pathway, and pedestrian areas using plantings;

4.8.3.1(10) Provide pedestrian surfacing at crosswalks that is highlighted at all vehicular intersections;

4.8.3.1(11) Provide lighting which is coordinated with the overall Site lighting requirements and landscape features; and

4.8.3.1(12) Provide elements and features that promote Patients' use for physical activity and connection to nature to promote the healing process.

4.9 FMO Maintenance Enclosure

4.9.1 Provide a minimum 280 NSM exterior area enclosed by a minimum 2.4 m high fence with lockable two (2) leaf gate for FMO storage of bobcats, maintenance materials and equipment. Establish area based on equipment and materials storage required by a typical and prudent facility operations requirement in consultation with the Authority. Provide within the enclosure:

4.9.1.1 A concrete pad within the entire exterior enclosed area for storage of equipment and vehicles; and

4.9.1.2 A minimum sixty (60) NSM concrete pad and unconditioned weatherproof enclosure to serve as an exterior flammable storage area for at least the following items:

4.9.1.2(1) One (1) flammable storage container;

4.9.1.2(2) Four (4) pallets for storage;

4.9.1.2(3) Two (2) small dewars; and

4.9.1.2(4) Two (2) 600 mm diameter containers for chemical spill response kits.

4.9.1.3 A back-in area with lockable double panel gate, sized to approximately three (3) LSU parking stalls, for the storage of de-icing supplies, including salt.

4.9.2 Fence enclosure will be constructed of materials consistent with the character of the Facility exterior.

4.9.3 Enclosure will be located with Convenient Access to the FMO/AM Sub-Component and the Energy Centre.

4.9.4 The Authority will consider a below grade enclosure otherwise meeting the requirements of Section 4.9.1 to be acceptable, provided that:

4.9.4.1 A separate enclosure will be located at-grade to accommodate the flammable storage container described in Section 4.9.1.2(1) and the storage of de-icing supplies described in Section 4.9.1.3; and

4.9.4.2 The access requirements set out at Section 4.9.3 are maintained for the below grade enclosure.

4.10 Accessibility Requirements

4.10.1 The Design-Builder will Design the Facility to meet the following requirements:

4.10.1.1 The primary pedestrian systems, public open spaces, primary walkways and all public entrances to the Facility will be accessible for Persons with Disabilities;

4.10.1.2 The pedestrian path of travel between vehicle layby stalls, short-term parking stalls and the Vestibule - Main Entrance and Vestibule - Walk-In Entry will not contain ramps or steps.

4.10.1.3 Access, egress routes, entrances and all exterior courtyards, gardens, patios or similar outdoor spaces will be accessible for persons requiring assistive mobility equipment, including people with strollers;

4.10.1.4 Provide pedestrian surfaces that are suitable for use by wheelchairs, strollers, and small wheeled medical devices. Asphalt, wide expanses of pavers or crushed rock surfaces will not be permitted for outdoor surfaces;

4.10.1.5 Provide leveling strips at the point of access to the Facility to ensure continuous smooth level surfaces for traversing entryways. The leveling strips will be designed for simple adjustment to compensate for Facility settlement, as required;

4.10.1.6 Provide walkways and ramp surfaces that are slip resistant;

4.10.1.7 Ramps will have minimum 1.35 m between handrails to allow two wheelchairs to pass, and provide landings having a minimum length of 1.625 m at the bottom and top of all ramps;

4.10.1.8 Pedestrian walkways and ramps will be separated from vehicles and service areas with a minimum 100 mm high barrier in a colour suitable to distinguish it from paths and grass;

4.10.1.9 Construct exterior stairways with a maximum of 10 risers per flight followed by a landing;

4.10.1.10 The Authority encourages rest areas and seating opportunities be provided a minimum of every 9 m;

4.10.1.11 Design features that segregate circulation, areas and uses for Persons with Disabilities from typical public usage are discouraged, except where required due to reasons of safety or due to space limitations;

4.10.1.12 Provide pedestrian walkways along side underground parking vehicle ramps complete with raised curb and guardrail to protect people from vehicles; and

4.10.1.13 Locate parking stalls for Persons with Disabilities directly adjacent to each entrance and Parking Shuttle Passenger Elevator lobby.

4.11 Exterior Safety and Security

4.11.1 For IP Video Surveillance and access control system requirements at exterior doors; refer to Section 7.9 Electronic Safety and Security (Division 28) and Appendix 1O [Security Operation Matrix].

4.11.2 Exterior spaces including the plaza, wellness walkway and Secure Outdoor Spaces will be designed to eliminate hiding places or areas of obscured vision.

4.11.3 Exterior spaces will have planting, benches and other site elements which are average height of 0.5 m or below to provide clear visibility throughout and a sense of safety.

4.11.4 Exterior planting, benches and other furniture will be safe for Patients, Staff and the Public and will not allow for opportunities of hiding, entrapment or hiding litter or contraband.

4.11.5 Design the Site to meet CPTED principles, having regard for discouraging theft, mischief, vandalism and reducing opportunities for hiding spaces.

4.11.6 Provide lighting to enable 24-hour public and Staff accessibility and safety; refer to Section 7.7.13 Lighting. Lighting for roadways, walkways and parking areas will provide safe

movement of vehicular, bicycle and pedestrian traffic with respect to collisions, personal safety, and building access and egress.

4.11.7 All external foliage will not interfere with exterior camera views and any required external sightlines.

4.11.8 Eliminate entrapment spots and incorporate barriers that permit visual access without loss of privacy which include providing glazing in exterior lobby doors and stairwells.

4.11.9 Promote the visual observation of the Site by the Facility occupants through placement of windows and doors.

4.11.10 Protect the Facility and all Facility entrances from errant vehicles using curbs, decorative bollards and barricades which prevent vehicles from making contact with the building or pedestrian walkways. Bollards and barricades will stop 6800 kg (15,000 lbs) vehicles traveling 32km/h (20 m/hr) or larger vehicle(s) to suit the type of traffic that could reasonably access a particular area of the Facility. Provide set back distances for all parking stalls that protect the Facility entrances. Design of bollards, barricades and set back distances will be as determined in consultation with the Authority.

4.11.11 The Design will protect persons from harm by incorporating landscaping or other passive design barriers, that will deter people from loitering or otherwise gathering along the exterior wall of the Facility directly outside areas such as the Cyclotron Vault and Radiation Treatment Bunker Interior; refer to Section 6.13.1.2 Radiation Shielding System (13 49 00) and Appendix 1H [Equipment and Furniture].

4.12 Community Noise Protection

4.12.1 Design to minimize the noise impact of emergency and service vehicles, and traffic routes to the surrounding community.

4.12.2 Strategically locate and design mechanical and electrical equipment, outside air intake and discharge openings to meet the requirements of Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

4.13 Site Lighting

4.13.1 Provide LED lighting for public outdoor spaces that creates an unobtrusive, human scale lighting concept, with a hierarchy of fixture types designed according to functional and security needs (including CPTED) and reflecting the hierarchy of pedestrian walkways.

4.13.2 Lighting on pedestrian walkways and bicycle paths, including those leading to transit connections, will illuminate the path and spill over to illuminate several metres (minimum 3.0 m) adjacent to the path.

4.13.3 Lighting will be strategically placed as to not disrupt Patient sleep and will be dark-sky compliant.

4.14 Municipal Off-Site Services Infrastructure

4.14.1 The Design-Builder will provide all municipal Off-Site infrastructure, third-party Utility, and roadworks as described in Appendix 1E [Civil Infrastructure Plans]. Refer to Section 7.4.1.1(7) for additional natural gas service requirements.

4.14.2 All Off-Site works required for the Design and Construction of all proposed roadwork infrastructure, water mains, storm sewers, and sanitary sewers, as well as the connection of each service to the municipal systems, will be the responsibility of the Design-Builder including excavation, backfill, and surface restoration.

4.14.3 Notify and obtain authorization from City of Surrey for all Utility service tie-ins prior to connection.

4.14.4 The Design-Builder will follow the Proximal Work Requirements for Metro Vancouver Water and Liquid Waste System Facilities. The Design-Builder will ensure all Utility and vehicle crossings over GVSDD trunk sewer(s) are designed and approved in coordination with Metro Vancouver. The Design-Builder will also be responsible for any additional coordination of Off-Site works with Metro Vancouver, obtaining all required permits from Metro Vancouver, and protecting existing Metro Vancouver infrastructure and access in proximity of the works including the Langley Trunk Sewer and Langley Trunk Sewer No 2 sanitary sewers on 180th Street and along the south property line of the Site.

4.14.5 All applicable materials used in the Construction of the Off-Site civil works will be tested in accordance with and at the frequency specified in the latest version of the City's Supplementary Master Municipal Construction Documents and the MMCD Platinum, such as:

4.14.5.1 Concrete Curb and Sidewalk – Section 03 30 53

4.14.5.1(1) cylinder strength tests every 100sq.m., min. once per day; and

4.14.5.1(2) each test to include 3 samples for 7-day and 28-day tests.

4.14.5.2 Aggregates and Granular Materials – Section 31 05 17

4.14.5.2(1) sieve analysis and proctor testing of each type of material;

4.14.5.2(2) once prior to commencing work; and

4.14.5.2(3) once every 1000 tonnes.

4.14.5.3 Trenches – Section 31 23 01

4.14.5.3(1) compaction density tests every 50 metres of trench; and

4.14.5.3(2) at each location, one test for every 600 mm of fill, evenly spaced, up to 3 vertical tests.

4.14.5.4 Roadway Excavation, Embankment and Compaction – Section 31 24 13

4.14.5.4(1) density test every 250sq.m for each 300 mm lift; and

4.14.5.4(2) proof rolling of all areas with density tests and/or Benkelman beam tests to determine soft areas.

4.14.5.5 Granular Subbase – Section 32 11 16.1

4.14.5.5(1) density test every 150sq.m., min. once per day; and

4.14.5.5(2) tests evenly spaced along the width and length of area.

4.14.5.6 Granular Base – Section 32 11 23

4.14.5.6(1) density test every 150sq.m., min. once per day;

4.14.5.6(2) density tests evenly spaced along the width and length of area;

4.14.5.6(3) proof rolling prior to paving or placement of concrete; and

4.14.5.6(4) Benkelman Beam testing prior to paving.

4.14.5.7 Hot-mix Asphalt – Section 32 12 16

4.14.5.7(1) Marshall tests min. once per day per location for each asphalt type;

4.14.5.7(2) one sample every 75 metres of roadway, randomly selected from each lane, minimum two samples; and

4.14.5.7(3) one sample every 500sq.m. of other paving, minimum three samples.

4.14.5.8 Superpave Asphalt – Section 32 12 17

4.14.5.8(1) Gyratory, moisture content, asphalt content, and percent fracture tests;

4.14.5.8(2) min. once per day every 500 tonnes;

4.14.5.8(3) every 75 metres of roadway, randomly sampled from each lane; and

4.14.5.8(4) every 500sq.m. of other paving, minimum three samples.

4.14.5.9 Topsoil – Section 32 91 21

4.14.5.9(1) analysis of each material prior to commencing work; and

4.14.5.9(2) analysis of two random samples of growing medium in each location just before planting.

4.14.5.10 Watermains – Section 33 11 01

4.14.5.10(1) pressure testing, leakage testing, disinfection, flushing, and water quality testing.

4.14.5.11 Sanitary Sewers – Section 33 30 01

4.14.5.11(1) CCTV testing as per Section 33 01 30.1 for all installed sewers and services of all lengths materials, and diameters, after sewer installation and backfill; and

4.14.5.11(2) Leakage testing including exfiltration or infiltration tests, low pressure air tests, and short term deflection tests as specified depending upon each pipe diameter and material type.

4.14.5.12 Storm Sewers – Section 33 40 01

4.14.5.12(1) CCTV testing as per Section 33 01 30.1 for all installed sewers and services of all lengths materials and diameters, after sewer installation and backfill.

4.14.6 Off-Site infrastructure upgrades described in this section and in Appendix 1E [Civil Infrastructure Plans] are based on the service connection locations as shown and current City standards and requirements, which may be subject to change. Additional Off-Site upgrades triggered by different configurations of service connections will be the responsibility of the Design-Builder. The Design-Builder will coordinate required upgrades to Off-Site infrastructure requirements with the City.

4.14.7 All SRW driveway crossings will be designed by qualified Structural / Geotechnical Engineers to ensure that any imposed settlements are within GVS&DD's allowable settlement tolerances for a concrete sewer pipe. Provide structurally (pile) supported protective bridging as required to comply with GVS&DD tolerances. There will be no net weight gain imposed on the GVS&DD SRW.

4.14.8 Water Main

4.14.8.1 Upgrade existing 200 mm diameter watermain to minimum 300 mm diameter on 180th Street from James Hill Drive to the south end of Site frontage. Existing watermain will be capped, filled, and abandoned once the replacement main is in service.

4.14.8.2 Provide adequately-sized metered service connections to City water mains, including valves, metering and backflow prevention, as described in Appendix 1E [Civil Infrastructure Plans]. Provide two (2) combined domestic and fire water services to connect to On-Site water system looped between both service connections, of which one (1) service will be from 180th Street and one (1) service will be from James Hill Drive.

4.14.8.3 Any existing water service connections and water meters to the Site encountered during Construction will be capped, filled, and abandoned.

4.14.8.4 Full-size water meters on each service connection will be located at the property line in accordance with the Water Meter Design Criteria Manual & Supplementary Specifications.

4.14.8.5 Provide a double check valve assembly backflow preventer on each water service connection at the property line, downstream of the water meter, in accordance with the Surrey Waterworks Cross Connection Control Bylaw. Backflow preventers will be installed such that they remain accessible for maintenance.

4.14.8.6 For each service connection, the water meter and backflow preventer will be installed just inside the property line in a chamber before any branching of the service connection On-Site.

4.14.8.7 Submit to the City water meter and service connection sizing calculations to confirm the size of the combined domestic and fire water services required for the proposed development. The Design-Builder will assess domestic demand and fire-fighting demand to determine On-Site pumping requirements from proposed water connections. In part, the final Facility floor area and height will determine, whether pumping is required and to what extent.

4.14.8.8 The Design-Builder will ensure that City access to municipal fire hydrants is not encumbered at any time. All existing hydrants will remain active during the Construction and temporary construction water will be provided by a new connection to the City's water system that is approved by the City. Design-Builder to review modification and request for approval to connect to existing hydrants with the City.

4.14.8.9 All new water mains to be seismically resilient TR-Xtreme ductile iron pipe or approved equivalent per City specifications. Water system design will follow the requirements of the Water System Seismic Design Standards in the City's Design Criteria Manual including joint restraint and other seismic resilience considerations therein.

4.14.8.10 Water system design will provide corrosion protection on all metallic components of the water system and follow the requirements of Corrosion Protection in the City's Design Criteria Manual including corrosion investigation and the application of exterior zinc-coating on metallic pipes.

4.14.8.11 Provide Off-Site fire hydrants per City spacing and specifications.

4.14.9 Sanitary Sewer

4.14.9.1 Provide two (2) sanitary sewer connections to existing sanitary sewers, of which one (1) connection will be from 180th Street and one (1) connection will be from James Hill Drive as described in Appendix 1E [Civil Infrastructure Plans].

4.14.9.2 Each service connection will be minimum 150mm in diameter and include a manhole inspection chamber at the property line.

4.14.9.3 Any connection made to the City sanitary sewer main within the SRW along 180th Street in the northwest corner of the site is defined by the Surrey Sanitary Sewer Regulation and Charges Bylaw as a “Rear or Side Yard Service Connection”, will follow all applicable requirements therein, and will include a new manhole inspection chamber as required by the City.

4.14.9.4 Any existing sanitary service connections to the Site encountered during construction will be capped, filled, and abandoned.

4.14.9.5 Complete works as required by the City of Surrey to address deficiencies in the existing sanitary sewer systems on James Hill Drive, as described in Appendix 1E [Civil Infrastructure Plans], including:

4.14.9.5(1) Removing and replacing an existing overbuild manhole and reinstalling a sanitary service;

4.14.9.5(2) Removing and replacing deformed segments of three (3) sanitary service connections to the north side of James Hill Drive; and

4.14.9.5(3) Cleaning, flushing and CCTV inspection of a section of sanitary main, including removing and replacing any deficiencies identified.

4.14.9.6 Sanitary sewer design will follow Class 1 requirements of the Sanitary Sewer Seismic Design Standards in the City’s Design Criteria Manual including joint restraint, flexible connections, and other seismic resilience considerations therein.

4.14.9.7 The Design-Builder will undertake corrosion investigation and provide cathodic protection or other corrosion protection method to metallic components of the sanitary system.

4.14.10 Storm Sewer

4.14.10.1 Provide one (1) storm sewer connection to existing municipal storm sewers on James Hill Drive and provide no more than two (2) storm service connections on 180th Street as described in Appendix 1E [Civil Infrastructure Plans]. Service connections are not permitted to outfall directly into ditch(es) and will be connected to storm sewer(s) and/or box culvert(s).

4.14.10.2 Each service connection will be minimum 150mm in diameter and include a manhole inspection chamber at the property line.

4.14.10.3 Any existing storm service connections to the Site encountered during Construction will be capped, filled, and abandoned.

4.14.10.4 Complete works as required by the City of Surrey to address deficiencies in the existing storm sewer systems on James Hill Drive, as described in Appendix 1E [Civil Infrastructure Plans], including:

4.14.10.4(1) Removing and replacing an existing storm service connection;

4.14.10.4(2) Constructing two (2) overbuild manholes at property line on storm services at changes in pipe material or alignment;

4.14.10.4(3) Removing and replacing damaged segments of storm sewer mains in two (2) locations along James Hill Drive;

4.14.10.4(4) Removing and replacing a catchbasin lead with intruding roots;

4.14.10.4(5) Cleaning and clearing encrustations from a catchbasin lead;

4.14.10.4(6) Grouting a catchbasin lead connection to the storm main;

4.14.10.4(7) Removing a metal bar obstructing a storm main; and

4.14.10.4(8) CCTV inspection of a section of storm main.

4.14.10.5 The Design-Builder will undertake detailed storm water modelling including:

4.14.10.5(1) Preparing a model in PC SWMM of the Site, the upstream storm sewer network, the ditch network along 180th Street adjacent to the Site, and continuing south beyond the railway tracks, terminating 180 m downstream of the culverts under Colebrook Road for the pre- and post-development conditions;

4.14.10.5(2) Assessing the impact of the proposed Site development and associated storm water control systems including detention, infiltration, or other mechanisms on the adjacent 180th Street ditch system and downstream networks under the 100-year design event;

4.14.10.5(3) Ensuring all City of Surrey design criteria is met for the Site and proposed adjacent 180th Street ditch system;

4.14.10.5(4) Assessing and commenting on the potential impact of climate change on the Project Site, adjacent 180th Street ditch system, and downstream networks, following City of Surrey design policy for climate change projections;

4.14.10.5(5) Results to be provided in a detailed storm water modelling report; and

4.14.10.5(6) Outfall conditions in accordance with the City as follows; -0.43 m along 180 Street between properties 5175 184 Street and 5168 176 Street for the 5-year storm and 0.0 m for the 100-year storm.

4.14.10.6 Provide rainwater management best management practices for Off-Site landscaping to comply with the Cloverdale McLellan Integrated Stormwater Management Plan and applicable municipal requirements.

4.14.10.7 Rainwater management and storm sewer and ditch sizing will be completed in accordance with the references, design criteria, climate change

recommendations, and all other requirements referenced in the Stormwater Management Report completed by R.F. Binnie and Associates.

4.14.10.8 The existing Class AO ditch on the east side of 180th Street will be upgraded as described in Appendix 1E [Civil Infrastructure Plans] including the following:

4.14.10.8(1) The ditch on the east side of 180th Street will be widened and re-profiled to meet the required capacity as per the Design-Builder's storm water model. The final ditch design will be confirmed by the Design Builder in accordance with City of Surrey, Metro Vancouver, and environmental requirements. The City of Surrey is permitting the west bank to be 1:1 slope with geogrid reinforcement. The City of Surrey requires a 2.0m riparian setback from the curb gutter line to top of bank. Metro Vancouver does not permit the top of bank to be in their SRW and the east top of bank will be located at the property line. City of Surrey is permitting the east ditch to be 1.5H:1V.

4.14.10.8(2) A setback will be constructed on the east side of the proposed ditch to at least the extents of the environmental setback. Fill slopes to meet proposed On-Site elevations will be located east of the setback. Refer to Section 8.1 for earthworks requirements.

4.14.10.8(3) Existing culverts will be removed and ditch 'daylighted' along Project frontage.

4.14.10.8(4) Existing 1200Ø storm sewer connecting to existing culvert east of 180th Street south of Roan Place will remain. Headwall will be provided to accommodate daylighting of exiting ditch.

4.14.10.8(5) New box culverts will be provided at driveway crossings. Culverts will be 2.1 m wide and 1.2 m deep. Headwalls will not be permitted. Inlet and outlet scour considerations will be addressed with rip-rap or other approved methods.

4.14.10.8(6) Ditch and culvert upgrades will extend from existing upstream extent of ditch at Roan Place to existing culverts under railway south of 180th Street cul-de-sac.

4.14.10.9 Off-Site storm sewer, ditch, and culvert design to be coordinated with On-Site storm water management (refer to Section 4.15.6) to ensure ditches along 180th street are not dewatered as a result of any On-Site dewatering.

4.14.11 Road Works

4.14.11.1 The Design and Construction of Off-Site roadways will be in accordance with the preliminary roadway drawings presented in Appendix 1E [Civil Infrastructure Plans].

4.14.11.2 Pavement structure to be designed and subgrade to be reviewed by a Geotechnical Consultant in coordination with requirements from the City of Surrey.

4.14.11.3 Provide intersection upgrades as shown in Appendix 1E [Civil Infrastructure Plans] and as required by the City of Surrey, including roadworks and pavement markings:

4.14.11.3(1) For full-movement traffic signals including concrete curb returns, concrete sidewalk landings, pedestrian curb let-downs, and other civil works on all corners at:

4.14.11.3(1)(a) James Hill Drive and 180th Street; and

4.14.11.3(1)(b) James Hill Drive and 184th Street including 30 m long northbound and southbound left turn bays;

4.14.11.3(2) For extension(s) of left turn bay(s);

4.14.11.3(2)(a) Northbound on 180th Street at Highway 10;

4.14.11.3(2)(b) Northbound on 184th Street at Highway 10;

4.14.11.3(2)(c) Westbound on Highway 10 at 180th Street; and

4.14.11.3(2)(d) Westbound on Highway 10 at 184th Street.

4.14.11.4 The Design-Builder to coordinate with the City of Surrey on Design requirements.

4.14.11.5 James Hill Drive

4.14.11.5(1) James Hill Drive to be upgraded between 180th Street and the eastern extent of Site development as shown in Appendix 1E [Civil Infrastructure Plans], complete with the following:

4.14.11.5(1)(a) Existing concrete barrier curbs to remain on both sides of existing 12.2 m wide roadway;

4.14.11.5(1)(b) Full-depth pavement reconstruction to meet the requirements of the City of Surrey and according to the direction of a geotechnical engineer;

4.14.11.5(1)(c) 2.2 m wide eastbound parking lane adjacent to existing south curb;

4.14.11.5(1)(d) 3.2 m wide eastbound travel lane north of eastbound parking lane;

4.14.11.5(1)(e) 3.6 m wide two-way left turn lane between travel lanes;

4.14.11.5(1)(f) 3.2 m wide westbound travel lane adjacent to existing north curb

4.14.11.5(1)(g) Where suitable to proposed works and in good condition, existing sidewalk, boulevard, street trees and other features north/northeast of north/northeast curb to remain;

4.14.11.5(1)(h) 2.9 m wide boulevard along the south/southwest side of James Hill Drive including existing curb and new streetlights, street trees, and 450mm thick topsoil and sod; refer to the Servicing Agreement.

4.14.11.5(1)(i) 2.0 m wide concrete sidewalk south/southwest of boulevard along south/southwest property line along the frontage of the Lands; and

4.14.11.5(1)(j) 0.5 m wide statutory right-of-way along property line along the frontage of the Lands.

4.14.11.5(2) Existing gates to be removed at 180th Street, at eastern extent of KPU parking lot, and at 184th Street.

4.14.11.5(3) Remove two (2) existing speed humps on James Hill.

4.14.11.5(4) Remove and replace all damaged or vandalized concrete sidewalk panels and concrete barrier curb segments along James Hill Drive, as required.

4.14.11.5(5) Remove and replace five (5) driveway let-downs to the KPU campus on the north/northwest side of James Hill Drive.

4.14.11.5(6) Reinstate the front and rear landscaped boulevards on the north/northwest side of James Hill Drive with topsoil and/or seed as needed to suit finished grade and condition and provide minimum 450mm deep topsoil in front boulevard.

4.14.11.5(7) Replace or provide street trees on the north/northwest side of James Hill Drive as needed to suit proposed works and meet City requirements including condition, spacing, and types of street trees.

4.14.11.6 180th Street

4.14.11.6(1) 180th Street to be upgraded between the southern cul-de-sac and Roan Place as shown in Appendix 1E [Civil Infrastructure Plans], complete with the following:

4.14.11.6(1)(a) 10.0 m wide pavement complete with new full-depth pavement structure meeting the requirements of the

City of Surrey and according to the direction of a Geotechnical Consultant;

4.14.11.6(1)(b) 3.2 m wide northbound travel lane east of crown of road;

4.14.11.6(1)(c) 3.3 m wide southbound travel lane and 3.5 m wide southbound truck queuing lane west of crown of road;

4.14.11.6(1)(d) Concrete barrier curbs on both sides of roadway;

4.14.11.6(1)(e) 1.65 m wide abutting concrete sidewalk, including curb, along existing west property line;

4.14.11.6(1)(f) 4.0 m wide multi-use pathway within 10.0 m wide statutory right-of-way include pedestrian level lighting;

4.14.11.6(1)(g) Widening of ditch as per Section 4.14.10.7, existing culverts to be removed to ‘daylight’ existing ditch between proposed driveway accesses, utility poles to be relocated as per Section 4.14.13;

4.14.11.6(1)(h) Existing property line east of 180th Street to remain; and

4.14.11.6(1)(i) 10.0 m statutory right-of-way and restrictive covenant east of existing property line, for environmental setback minimum 10 m wide from east of new top of bank, to be landscaped in accordance with applicable environmental requirements.

4.14.11.6(2) 180th Street to be upgraded between Roan Place and James Hill Drive as shown in Appendix 1E [Civil Infrastructure Plans], complete with the following:

4.14.11.6(2)(a) 12.2 m wide pavement to meet the requirements of the City of Surrey and according to the direction of a Geotechnical Consultant including rehabilitation of existing roadway and road widening with full-depth pavement structure min. 1.0 m wide;

4.14.11.6(2)(b) 3.2 m wide northbound travel lane and 2.2 m wide curbside parking pockets east of crown of road;

4.14.11.6(2)(c) 3.3 m wide left turn lanes with painted medians and 3.5 m wide southbound travel lane west of crown of road;

4.14.11.6(2)(d) 1.65 m wide new abutting concrete sidewalk, including new concrete barrier curb on west side of 180th Street to taper to and meet existing concrete barrier curb at existing lane south of 5485 180th Street;

4.14.11.6(2)(e) Existing sidewalk, boulevard and concrete barrier curb to remain north of taper;

4.14.11.6(2)(f) 2.0 m wide new abutting concrete sidewalk, including new concrete barrier curb on east side of 180th Street;

4.14.11.6(2)(g) 0.9 m wide landscaped boulevard with existing utility poles to remain and proposed street lighting east of sidewalk; and

4.14.11.6(2)(h) Existing property line and 0.94 m statutory right-of-way east of 180th Street to remain.

4.14.11.6(3) Existing accesses to properties on west side of 180th Street to be maintained with new concrete driveway let-downs to City of Surrey standards and regraded and repaved to suit. Property impacts including regrading and repaving on private property to be coordinated with property owners and the City of Surrey

4.14.11.6(4) Existing fences along properties on west side of 180th Street to remain where feasible or be removed and reinstated as needed.

4.14.11.6(5) Five (5) large existing street trees along frontage of 5337 180th Street to be removed and replaced in coordination with the City of Surrey and under the direction and supervision of a Certified Arborist.

4.14.11.6(6) Other appurtenances within the City right-of-way including hydrants, lawn and catch basins, and valve covers, to be adjusted or relocated to suit road widening and new sidewalk.

4.14.11.7 Highway 10

4.14.11.7(1) Existing westbound Highway 10 to southbound 180th Street left turn bay to be repainted to provide a minimum of 60.0 m of vehicle storage capacity. Repainting to include painted median and removal of existing pavement markings.

4.14.11.7(2) Existing westbound Highway 10 to southbound 184th Street left turn bay to be repainted to provide a minimum of 120.0m of vehicle storage capacity.

4.14.11.7(3) Left turn bays to be modified; refer to the Draft Ministry of Transportation Design Criteria Sheet. The Design-Builder will complete the design in accordance with all Ministry of Transportation requirements and provide a signed and sealed design criteria sheet to suit the final design.

4.14.11.8 Provide driveway accesses to match and suit On-Site roadway layout and provide redundancy as per Section 5.2.3. Provide curb returns at ambulance access locations, at entrances with expected traffic volumes exceeding 100 vehicles per hour and as directed by the City of Surrey. Provide concrete let-downs at all other driveway accesses.

4.14.11.9 All required pavement markings to be painted to suit proposed roadworks as shown in Appendix 1E [Civil Infrastructure Plans], to accommodate turning movements, in accordance with the latest Manual of Uniform Traffic Control Devices for Canada (MUTCD), and as required by the City of Surrey.

4.14.11.10 Design the Site to safely accommodate access and vehicle turning movements for the Coast Mountain Bus Company/TransLink design vehicle (40' L Bus) to enter and exit the Site from both 180th and James Hill Drive for through purposes only (there is no requirement for a bus stop On-Site).

4.14.11.11 Upgrade existing bus stop on east side of 180th Street north of James Hill Drive to meet current City of Surrey and Coast Mountain Bus Company requirements including concrete barrier curb pullout, concrete bus pad and sidewalk connections, and conduit, as required. Temporarily relocate the existing bus stop nearby during Construction as required by the City and Coast Mountain Bus Company.

4.14.11.12 Street trees will be installed by City crews in accordance with latest City requirements for tree planting.

4.14.12 Street Lighting and Traffic Signal

4.14.12.1 The Design-Builder will provide street lighting for surrounding Off-Site roadways including 180th Street and James Hill Drive as required by the City.

4.14.12.2 Lighting Design Criteria Table and AGI lighting calculations will be completed for each road, multi-use pathway, intersection, or other road and boulevard works.

4.14.12.3 Provide street lighting poles, luminaires, conduits, service equipment, and all related appurtenances, to meet City lighting design standards including illuminance/ luminance, layout and spacing, power supply and distribution, and pole sizes and styles.

4.14.12.4 The Design-Builder will provide all new equipment as listed above or conduct a condition assessment of the existing street lighting conduit and bases along James Hill Drive for review and approval by the City of Surrey prior to re-use of existing equipment.

4.14.12.5 The Design-Builder will provide traffic signalization at the following intersections:

4.14.12.5(1) New signalization at James Hill Drive at 180th Street;

4.14.12.5(2) New signalization at James Hill Drive at 184th Street;

4.14.12.5(3) Signalization upgrades for extended northbound left turn bay and westbound left turn bay on 180th Street at Highway 10; and

4.14.12.5(4) Signalization upgrades for extended northbound left turn bay and westbound left turn bay on 184th Street at Highway 10; including:

4.14.12.5(4)(a) Signal phasing design and implementation to suit proposed roadworks as shown in Appendix 1E [Civil Infrastructure Plans] and as outlined in Section 4.14.11;

4.14.12.5(4)(b) Poles, signal heads, pushbuttons, audibles, luminaires, junction boxes and vaults, conduit, conductors and cables, detector loops, controllers, and all related appurtenances required to meet City design standards for traffic signals and control;

4.14.12.5(4)(c) Uninterruptible power supplies (UPS's) will be provided at intersections as required by the City; and

4.14.12.5(4)(d) Emergency vehicle pre-emption systems will be provided at intersections as required by the City.

4.14.12.6 All required street lighting and traffic signal infrastructure, including signal cabinets and doors and required door-swing allowances and workspace requirements, will be within the road right-of-way.

4.14.12.7 The Design-Builder to coordinate with the City on street lighting and traffic signal design requirements.

4.14.13 Power, Telecom, and Natural Gas Utilities

4.14.13.1 Existing utility poles along 180th Street will not be located within ditches. Existing utility poles in conflict with the Design-Builder's final ditch design will need to be relocated or moved underground. Design-Builder will coordinate utility modifications as needed to suit proposed ditch upgrades and roadworks as set out in Appendix 1E [Civil Infrastructure Plans].

4.14.13.2 All civil works associated with relocation and/or undergrounding of existing power and telecom Utilities to accommodate Off-Site infrastructure will be coordinated by the Design-Builder.

4.14.13.3 Power and telecom Utility fees for relocation and/or undergrounding of infrastructure within the footprint of the Off-Site roadworks will be the Authority's

cost. Cost for the coordination of the Utilities and the City is the responsibility of the Design-Builder.

4.14.13.4 The development will be serviced with hydro, gas, Telecommunication and cablevision in accordance with Utility company requirements and City standards.

4.14.13.5 Liaise with relevant Utility suppliers and owners for the Design and Construction of the new hydro, gas, Telecommunication and cablevision Utilities.

4.14.13.6 Resolve all conflicts between existing hydro, gas, Telecommunication and cablevision Utilities and other existing and proposed municipal infrastructures with relevant suppliers and owners.

4.14.13.7 Ensure all necessary permits in connection with the Utility work are obtained.

4.15 On-Site Infrastructure

4.15.1 The Design-Builder will provide all On-Site infrastructure and third-party Utilities as set out in Appendix 1E [Civil Infrastructure Plans].

4.15.2 The Design-Builder will follow the Proximal Work Requirements for Metro Vancouver Water and Liquid Waste System Facilities. The Design-Builder will ensure all Utility and vehicle crossings over GVSDD trunk sewer(s) are designed and approved in coordination with Metro Vancouver. The Design-Builder will also be responsible for any additional coordination of On-Site works with Metro Vancouver, obtaining all required permits from Metro Vancouver, and protecting existing Metro Vancouver infrastructure and access in proximity of the works including the Langley Trunk Sewer and Langley Trunk Sewer No 2 sanitary sewers on 180th Street and along the south property line of the Site.

4.15.3 All applicable materials used in the Construction of the On-Site civil works will be tested in accordance with and at the frequency specified in the latest version of the City's Supplementary Master Municipal Construction Documents and the MMCD Platinum, such as:

4.15.3.1 Concrete Curb and Sidewalk – Section 03 30 53

4.15.3.1(1) cylinder strength tests every 100sq.m., min. once per day, and

4.15.3.1(2) each test to include 3 samples for 7-day and 28-day tests.

4.15.3.2 Aggregates and Granular Materials – Section 31 05 17

4.15.3.2(1) sieve analysis and proctor testing of each type of material;

4.15.3.2(2) once prior to commencing work; and

4.15.3.2(3) once every 1000 tonnes.

4.15.3.3 Trenches – Section 31 23 01

4.15.3.3(1) compaction density tests every 50 metres of trench; and

4.15.3.3(2) at each location, one test for every 600mm of fill, evenly spaced, up to 3 vertical tests.

4.15.3.4 Roadway Excavation, Embankment and Compaction – Section 31 24 13

4.15.3.4(1) density test every 250sq.m. for each 300mm lift; and

4.15.3.4(2) proof rolling of all areas with density tests and/or Benkelman beam tests to determine soft areas.

4.15.3.5 Granular Subbase – Section 32 11 16.1

4.15.3.5(1) density test every 150sq.m., min. once per day; and

4.15.3.5(2) tests evenly spaced along the width and length of area.

4.15.3.6 Granular Base – Section 32 11 23

4.15.3.6(1) density test every 150sq.m., min. once per day;

4.15.3.6(2) density tests evenly spaced along the width and length of area; and

4.15.3.6(3) proof rolling prior to paving or placement of concrete.

4.15.3.7 Hot-mix Asphalt – Section 32 12 16

4.15.3.7(1) Marshall tests min. once per day per location for each asphalt type;

4.15.3.7(2) one sample every 75 metres of roadway, randomly selected from each lane, minimum two samples; and

4.15.3.7(3) one sample every 500sq.m. of other paving, minimum three samples.

4.15.3.8 Superpave Asphalt – Section 32 12 17

4.15.3.8(1) gyratory, moisture content, asphalt content, and percent fracture tests;

4.15.3.8(2) min. once per day every 500 tonnes;

4.15.3.8(3) every 75 metres of roadway, randomly sampled from each lane; and

4.15.3.8(4) every 500sq.m. of other paving, minimum three samples.

4.15.3.9 Topsoil – Section 32 91 21

4.15.3.9(1) analysis of each material prior to commencing work;

4.15.3.9(2) analysis of two random samples of growing medium in each location just before planting.

4.15.3.10 Watermains – Section 33 11 01

4.15.3.10(1) Pressure testing, leakage testing, disinfection, flushing, and water quality testing.

4.15.3.11 Sanitary Sewers – Section 33 30 01

4.15.3.11(1) CCTV testing as per Section 33 01 30.1 for all installed sewers and services of all lengths materials, and diameters, after sewer installation and backfill.

4.15.3.11(2) leakage testing including exfiltration or infiltration tests, low pressure air tests, and short term deflection tests as specified depending upon each pipe diameter and material type.

4.15.3.12 Storm Sewers – Section 33 40 01

4.15.3.12(1) CCTV testing as per Section 33 01 30.1 for all installed sewers and services of all lengths materials, and diameters, after sewer installation and backfill.

4.15.4 The Design and Construction of the On-Site earthworks will be in accordance with the requirements as set out in Section 8.1.

4.15.4.1 The existing ditch within the Metro Vancouver SRW on the north side of the access road will be infilled along the south side of Work Area A and the west/south sides of Work Area B. Infill material will be confirmed and as approved by Design-Builder's geotechnical engineer so as to not add additional weight and/or cause damage to the existing Metro Vancouver main's pipe zone. The finished surface will be of suitable slope for maintenance vehicle access and be of gravel or sod at finished grade. Final design to be reviewed and approved by Metro Vancouver.

4.15.5 Sanitary Sewer System

4.15.5.1 Provide sanitary sewers of a diameter, grade and depth to safely convey all effluent from the Site.

4.15.5.2 The sanitary sewer system will include the pipes, manholes and all other required appurtenances to comply with applicable municipal and provincial standards.

4.15.5.3 On-Site sanitary system will drain by gravity.

4.15.5.4 Sanitary sewer design will follow Class 1 requirements of the Sanitary Sewer Seismic Design Standards in the City's Design Criteria Manual including joint restraint, flexible connections, and other seismic resilience considerations therein.

4.15.5.5 The Design-Builder will undertake corrosion investigation and provide cathodic protection or other corrosion protection method to metallic components of the sanitary system.

4.15.5.6 Drainage from underground parking structure will discharge to sanitary sewer systems. Sanitary sewer systems will be sized adequately to include these loads.

4.15.5.7 Provide a backflow preventer on each sanitary service connection. Backflow preventers will be installed such that they remain accessible for maintenance.

4.15.6 Storm Sewer System

4.15.6.1 Provide storm sewers and rainwater management design for major and minor events to meet the City's bylaws and requirements.

4.15.6.2 On-Site storm system will drain by gravity.

4.15.6.3 Sizing of On-Site storm infrastructure will be completed in accordance with the references, design criteria, and all other requirements referenced in the Stormwater Management Report completed by R.F. Binnie and Associates.

4.15.6.4 Where “minor system” refers to a piped storm conveyance system and “major system” refers to the combination of piped systems, channels, retention or detention basins, roadways and overland flow routes, the systems will:

4.15.6.4(1) Be of a size, grade and depth to safely manage and convey all storm water On-Site to the receiving Off-Site system;

4.15.6.4(2) Include storm water/oil and grit separation devices or other water quality treatment devices meeting City criteria, capturing and treating runoff from all paved traffic and parking areas prior to runoff entering any detention tanks;

4.15.6.4(3) Provide grit separation treatment for roof water run-off before it enters the piped On-Site conveyance network. Oil/water separation is not required for roof water; and

4.15.6.4(4) Provide On-Site storm water mitigation features for the capture, treatment and retention of storm water runoff, including:

4.15.6.4(4)(a) Best management practices (BMPs) and low impact development (LIDs) to capture, store, and infiltrate rainfall during frequent and low-intensity rain events;

4.15.6.4(4)(b) On-lot source controls to mitigate the increase in impervious coverage and enhance water quality treatment, such as directing parking lot/drive aisle runoff to bioswales or rain gardens;

4.15.6.4(4)(c) Measures to minimize disturbance to the pre-development flow patterns to prevent the preferential movement of groundwater along the servicing alignments, if any site servicing is proposed below the groundwater table; and

4.15.6.4(4)(d) Coordination with the City and Authority as needed to determine the requirements for the registration of restrictive covenants for On-Site storm water mitigation.

4.15.6.5 Provide storm water detention basins and storm water quality control inlet chambers. In the case of discrepancies, the highest standard and/or requirement will apply.

4.15.6.6 Design-Builder will meet the following minimum On-Site storm water discharging requirements in accordance with the Cloverdale McLellan Integrated Stormwater Management Plan including:

4.15.6.6(1) Post-development 5-year flow rate from On-Site discharged to the Off-Site storm sewer will be no greater than 50% of the 2-year post-development rate or 5-year pre-development flow rate, whichever provides smaller release rate and requires larger detention storage. The Design-Builder's calculations will be based on climate change adjusted IDF Curves as recommended in the Dillon Consulting Report titled Development of Future IDF statistics for the City of Surrey, dated May 2015;

4.15.6.6(2) Capture the first 25 mm of rainfall in 24 hours from impervious areas such that a 25 mm rainfall event will result in no Site runoff. Calculations to be based on historical IDF curves as per City of Surrey requirements; and

4.15.6.6(3) Only 10% of annual runoff volume will be allowed to flow Off-Site in the form of runoff. Calculations to be based on historical IDF curves as per City of Surrey requirements.

4.15.6.7 Provide sizing calculations for BMPs/LIDs, storm water detention structure(s) and storm water treatment unit(s). On-Site detention systems will be sized without considering flow/volume reductions from on-lot BMPs/LIDs, assuming these are fully saturated and provide zero storage volume.

4.15.6.8 Site drainage construction and design work will conform to the City's Erosion and Sediment Control Bylaw 16138.

4.15.6.9 Provide adequately sized water quality/sediment control components, before discharging to the On-Site retention systems, groundwater recharge facilities or the Off-Site drainage system.

4.15.6.10 On-Site storm water management to be coordinated with Off-Site storm sewer, ditch, and culvert design (refer to Section 4.14.10) to ensure ditches along 180th street are not dewatered as a result of any On-Site dewatering.

4.15.6.11 Drainage from underground parking structure may not discharge to storm sewer systems.

4.15.7 Water Main System and Appurtenances

4.15.7.1 Provide a combined water main system of diameter, grade, and depth to safely meet domestic demand and fire flow requirements. The On-Site water main will be looped between both service connections to the Off-Site water mains and the domestic water main system will loop the Facility as described by Appendix 1E [Civil Infrastructure Plans].

4.15.7.2 Where any building On-Site requires fire sprinkler, standpipe system, or any fire protection system, the domestic and fire water service lines will be split either On-Site at the property line or the water entry point to that building as determined in consultation with the Authority and coordinated with the City of Surrey. Provide a reduced pressure backflow preventer on each domestic line and an appropriate backflow preventer on each fire line depending on the fire system classification.

4.15.7.3 The water main system will include the pipes, valves, hydrants, fittings and all other required appurtenances to comply with applicable municipal and provincial standards.

4.15.7.4 Firefighting volumetric demands are to be calculated using the Fire Underwriters Survey (FUS) method unless alternates are otherwise approved by the applicable AHJ.

4.15.7.5 If required to meet the FUS fire flow demands, the Design-Builder will provide back-up, permanent fire-fighting equipment.

4.15.7.6 The water main system will include approved backflow preventers necessary to protect the municipal system and On-Site facilities from Contaminants based on the hazard level of the Facility.

4.15.7.7 Provide a double check valve assembly backflow preventer at any connection to an On-Site fire hydrant from the combined domestic/fire water main.

4.15.7.8 Provide an appropriate backflow preventer for each applicable fixture On-Site as per BC Plumbing Code and the City’s Cross Connection Control Specifications.

4.15.7.9 Backflow preventers will be installed such that they remain accessible for maintenance.

4.15.7.10 Water system design will follow the requirements of the Water System Seismic Design Standards in the City’s Design Criteria Manual including joint restraint and other seismic resilience considerations therein.

4.15.7.11 Water system design will provide corrosion protection on all metallic components of the water systems and follow the requirements of Corrosion Protection in the City's Design Criteria Manual including corrosion investigation and the application of exterior zinc-coating on metallic pipes.

4.15.8 Road Works

4.15.8.1 Design and construct On-Site roadways, including the pavement, curbs and gutters, sidewalks, walkways, signage, pavement markings, and traffic calming devices. Sidewalks and walkways will be accessible to Persons with Disabilities and provide safe passage between parking areas and layby stall areas to the corresponding Facility entrance points.

4.15.8.2 Pavement structure will meet the recommendations of the Design-Builder's geotechnical engineer.

4.15.8.3 All roadways will accommodate fire truck access in accordance with the Surrey Building Bylaw 17850 requirements or the requirements of the municipality's fire department, whichever is more stringent.

4.15.8.4 Use surfacing materials that will meet intended use and minimize the 'heat island' effect, where possible.

4.15.8.5 Provisions for On-Site roadways will be required to account for snow removal machinery and methods in winter snowfall months.

4.15.8.6 Roadways and paved areas will have positive drainage to shed rainwater quickly to a storm drainage facility.

4.15.8.7 Access road above underground chambers will be waterproofed to prevent water seepage and flooding of the chambers.

4.15.8.8 No surface ponding is permitted within On-Site roadways.

4.15.9 Street Lighting

4.15.9.1 Provide lighting for On-Site roadways, walkways and parking areas to ensure safe vehicle and pedestrian traffic with respect to collisions, personal safety, and Facility access/egress. Provide lighting sympathetic to all neighbouring properties.

4.15.10 Power, Telecom, and Natural Gas Utilities

4.15.10.1 The Design-Builder will:

4.15.10.1(1) For FortisBC:

4.15.10.1(1)(a) Coordinate both On-Site and Off-Site underground civil with FortisBC as per Section 7.4.1.1(7). FortisBC will supply and install both On-Site and Off-Site gas Utilities.

4.15.10.1(2) For Telecommunications Carriers:

4.15.10.1(2)(a) Coordinate and provide services as per Section 7.7 and Section 7.8.

4.15.10.1(3) For BCH:

4.15.10.1(3)(a) Coordinate and provide services as per Section 7.7.3.

4.15.10.2 Liaise with relevant Utility suppliers and owners for the Design and Construction of the new third-party Utilities.

4.15.10.3 Resolve all conflicts between third-party Utilities and other existing and proposed municipal infrastructures with relevant suppliers and owners.

4.15.10.4 Ensure all necessary permits in connection with the Utility work are obtained.

4.16 Parking

4.16.1 General Requirements

4.16.1.1 The minimum sizes, widths and slopes for all parking stalls, drive aisles and vehicle ramps will meet the City bylaw requirements.

4.16.1.2 Provide wall-mounted waste receptacles on every floor of the underground parking located near each of the Staff and Patient Service Elevators and the Parking Shuttle Passengers Elevators.

4.16.1.3 Each parking stall designed for Persons with Disabilities will count as one (1) parking stall only.

4.16.1.4 Provide a total of seven hundred and thirty (730) parking stalls including a minimum of twenty-three (23) accessible to Persons with Disabilities. Motorcycle stalls described in Section 4.16.1.6(2), hospital transfer vehicles, the hearse vehicle and ambulances will be in addition to this figure.

4.16.1.5 Provide the following minimum number of at-grade surface parking stalls:

4.16.1.5(1) Three hundred and seventy-five (375) parking stalls including:

4.16.1.5(1)(a) Minimum of ten (10) for short-term parking located adjacent to the ED public entrance of which two (2) will be dedicated and marked for Police vehicles;

4.16.1.5(1)(b) Minimum of fifteen (15) for short-term parking located adjacent to the Main Entrance Covered Drop-Off;

4.16.1.5(1)(c) Fifteen (15) parking stalls including those as required by the City’s bylaw for Persons with

Disabilities, located near and dedicated to the Child Care Centre;

4.16.1.5(1)(d) Minimum of eight (8) and maximum eleven (11) stalls accessible to Persons with Disabilities, and located near the Facility's public entrances;

4.16.1.5(1)(e) Minimum of six (6) located adjacent to the Energy Centre to meet the following requirements:

4.16.1.5.1.(e).1 Two (2) sized for single unit box vans 10m L x 4.0m H;

4.16.1.5.1.(e).2 Four (4) sized for full size duel rear-wheel trucks 6.5m L x 3.5m H; and

4.16.1.5.1.(e).3 Provide 115V and 240V outdoor rated electrical outlets adjacent to three (3) of the stalls.

4.16.1.6 Provide the following minimum number of underground parking stalls:

4.16.1.6(1) Three hundred and fifty-five (355) parking stalls including the balance of the total stalls which are required to be accessible to Persons with Disabilities, located near the Facility's Parking Shuttle Passengers;

4.16.1.6(2) Ten (10) motorcycle parking stalls; and

4.16.1.6(3) One (1) enclosed sally-port for a hearse vehicle.

4.16.1.7 Provide six (6) ambulance vehicles parking stalls including:

4.16.1.7(1) Four (4) in the External Ambulance Canopy/Vehicle Bay; and

4.16.1.7(2) Two (2) located adjacent to the External Ambulance Canopy/Vehicle Bay.

4.16.1.8 The enclosed sally-port will be designed to provide all maneuvering clearances around the perimeter of the vehicle for loading/unloading of the stretcher/cadaver with the vehicle parked inside and the doors closed. Provide overhead coiling doors for the enclosed Sally-Port; refer to 6.8.5 Section 08 33 23 – Overhead Coiling Doors.

4.16.2 Layby Stalls for Pick-up and Drop-Off

4.16.2.1 In addition to the total number of parking stalls described in Section 4.16.1.4, provide the following layby pick-up and drop-off parking stalls for hospital transfer vehicles:

4.16.2.1(1) Three (3) located adjacent to the Covered Drop-Off;

4.16.2.1(2) Two (2) located adjacent to the at-grade Vestibule – Patient Transfer; and

4.16.2.1(3) Two (2) in the underground parking located adjacent to the Vestibule – Patient Transfer.

4.16.2.2 Within the total number of parking stalls described in Section 4.16.1.4, provide the following layby pick-up and drop-off layby parking stalls for public vehicles:

4.16.2.2(1) Two (2) located adjacent to the Covered Drop-Off;

4.16.2.2(2) Two (2) located adjacent to the Child Care Centre public entrance;

4.16.2.2(3) Three (3) located adjacent to the Emergency Vestibule - Walk-In Entry; and

4.16.2.2(4) Three (3) located adjacent to the Vestibule – Patient Transfer.

4.16.2.3 Within the total number of parking stalls described in Section 4.16.1.4, provide the following layby pick-up and drop-off layby parking stalls for vendor and courier vehicles;

4.16.2.3(1) Two (2) located adjacent to the Covered Drop-Off;

4.16.2.3(2) Two (2) located adjacent to the loading dock; and

4.16.2.3(3) One (1) located adjacent to the Cyclotron/Radiopharmaceutical Facility Vestibule – Receiving.

4.16.2.4 Design the Facility to accommodate all the Authority's and BCEHS largest ambulance vehicles as follows:

4.16.2.4(1) (W/L/H) – 2.9 m / 7.0 m / 2.9 m

4.16.2.5 Design the Facility to accommodate all Authority's hospital transfer vehicles include:

4.16.2.5(1) Accessible Bus (W / L / H). 2.2 m / 6.2 m / 2.8 m;

4.16.2.5(2) Accessible/ Stretcher Min-Van (W / L / H). 2.0 m / 5.2 m / 1.7 m;

4.16.2.5(3) Pro-Master - SWB (W / L / H). 2.1 m / 5.4 m / 2.3 m; and

4.16.2.5(4) Pro-Master - LWB/Hi Roof (W / L / H). 2.1 m / 6.0 m / 2.6 m.

4.16.2.6 Layby stalls for hospital transfer vehicles will be sized to meet the larger space requirements of either:

4.16.2.6(1) City Class B loading bay, or

4.16.2.6(2) With clear space on either side of the vehicle for a lift or ramp plus 1.2 m, with clear space at the rear of the vehicle for 3.0 m.

4.16.2.7 Provide vertical clearance over all stalls and vehicle paths in the layby stall drop-off and pick-up area to accommodate the design vehicles including ambulances and fire truck for future flexibility.

4.16.2.8 The Design-Builder will coordinate all requirements for car share parking as determined in consultation with the Authority.

4.16.3 Protection from Inclement Weather

4.16.3.1 Provide protection from inclement weather using canopies or a porte cochere extending the full length of all layby stalls to provide complete coverage of the occupants entering and exiting the vehicles (from either side) including the lift zone for hospital transfer vehicles.

4.16.3.2 Ensure that areas protected from weather still receive daylight using appropriate measures such as increased height-to-depth proportions and the use of transparent or translucent roof panels.

4.16.4 Service Vehicles

4.16.4.1 Design the Facility to accommodate layby parking areas for the following service vehicles. Unless noted otherwise, service vehicle layby stalls are in addition to loading bays described in Section 5.7.18 Loading Docks.

4.16.4.1(1) One (1) WB-20 semi-trailer located at the designated bulk oxygen site. The Design will accommodate the rear of the trailer on the spill pad during filling operations with the vehicle parallel to the bulk pad;

4.16.4.1(2) One (1) HSU Medical Gas Truck located at the loading dock;

4.16.4.1(3) One (1) HSU Potable Water Truck located at the loading dock;

4.16.4.1(4) Mobile Medical Unit; refer to Section 5.3;

4.16.4.1(5) One (1) HSU - Grease Trap Truck located near the Patient Food Services Component;

4.16.4.1(6) One (1) WB-20 – Mobile Cooler Truck located at the loading dock;

4.16.4.1(7) One (1) HSU – BCH Truck located near BCH service entrance room access doors;

4.16.4.1(8) One (1) WB-20 semi-trailer located near generator fuel tanks;

4.16.4.1(9) Locate fibre splice van for CPPS manhole access in accordance with Appendix 1G [Campus Perimeter Pathway System Technical Specifications].

4.16.4.1(10) One (1) HSU Sanitary waste pumper truck located near the sanitary storage tank, refer to Section 7.1.30.4;

4.16.4.1(11) One (1) HSU Decontamination waste pumper truck located near the decontamination tank, refer to Section 7.1.30.8(5);

4.16.4.1(12) One (1) HSU Process water supply truck located near the process water system, refer to Section 7.1.30.8(1);

4.16.4.1(13) One (1) HSU for supply truck to supply steam, chilled and heating water located near the Energy Centre; and

4.16.4.1(14) One (1) HSU UPS and electrical load bank testing truck.

4.16.4.2 Space for service vehicles will be located away from the public entrances.

4.16.4.3 Design services vehicle flows to be separate from public vehicles flows and pedestrian movement on the Site.

4.16.5 Parking Layout and Circulation

4.16.5.1 Lay out parking in an orderly and logical design to minimize confusion and excessive circulation.

4.16.5.2 Design parking areas such that it does not include dead-ends requiring a vehicle to back up for more than 10 m.

4.16.5.3 The minimum vertical clearances within the underground parking will accommodate hospital transfer vehicles based on the highest design vehicle described in Section 4.16.2.4. All other levels of underground parking where hospital transfer vehicles are not required to access, will have a minimum vertical clearance over all stalls and drive aisles of 2.2 m or additional as required by the City bylaw. No pipes, sprinklers or other fixtures are permitted to encroach on this minimum clearance.

4.16.5.4 Maximum allowable slope or cross-fall is 5%, applicable to both the parking stalls and access aisles.

4.16.5.5 Traffic flow will be designed to reduce car speed and traffic calming measures will be provided to slow cars down to encourage safe traffic speed. Traffic calming measures include landscape features, raised crosswalks, road textures, curb bulges and speed humps.

4.16.5.6 Provide safe pathways which are demarcated for bicycle traffic through the underground parking to and from the Bicycle Parking and Cycling Amenities.

4.16.6 Drivers' Visibility

4.16.6.1 Provide unobstructed visibility between parking areas and elevator lobbies, exit stairwells and entrance points to the Facility through glazed vestibule entrance doors, windows and door sidelights. Windows in exit stair doors are to be

provided in addition to windows in demising walls and/or full height door sidelights.

4.16.6.2 Do not use interior walls that obstruct drivers' visibility to drive aisles.

4.16.7 Security in Parking Areas

4.16.7.1 Minimize hiding spaces in the Design of parking areas. Design parking areas in accordance with CPTED principles.

4.16.7.2 A method will be provided for users to readily summon help if in distress or danger both in exterior parking areas and in the underground parking; refer to Section 7.9.5 Fixed Panic Duress System.

4.16.7.3 Provide underground parking that is secured and locked with rolling security gates when not in use.

4.16.7.4 Provide card reader access control and timer control function at all overhead rolling security gate locations. Overhead rolling security gates are required for after-hours Staff access at the following locations, at a minimum:

4.16.7.4(1) All exterior access points to the underground parking; and

4.16.7.4(2) Within the underground parking between Level P1 and lower levels of parking. The exact location and areas of these separations will be as approved by the Authority based on the Design.

4.16.7.5 Provide a man-door with electronic access control directly adjacent to any overhead rolling security gate for after-hours access to and from the underground parking by authorized persons.

4.16.7.6 Provide adequate provision for ingress and egress to all parking spaces to ensure ease of mobility, ample manoeuvring clearances, and safety of vehicles and pedestrians.

4.16.7.7 Provide anti-graffiti coatings on all exposed concrete walls surfaces throughout the underground parking area.

4.16.8 Demarcations, Barriers and Painting

4.16.8.1 Number all parking stalls in a specific contiguous numbering sequence that is mutually exclusive. Parking stall numbering will be proposed by the Design-Builder and determined in consultation with the Authority.

4.16.8.2 Provide all parking stall lines and stall numbers. Parking stall lines and stall numbers will be painted in white. Stall numbers will be painted on the pavement and on the wall at a height visible to the driver when in the vehicle. Parking spaces will be delineated by double line paint markings.

4.16.8.3 Paint all exterior pick-up and drop-off layby parking stalls in yellow.

4.16.8.4 Provide bent steel plate protective covers painted yellow and suitably fastened to adjacent substrate at the required height to collect all vehicle bumpers at all exposed vertical rainwater leaders, other miscellaneous piping and fixtures as required to protect from any potential vehicular impact damage throughout.

4.16.8.5 Provide painted pedestrian pathways that are clearly marked.

4.16.8.6 Use lead-free paint for all demarcations on the floor such as stall stripes, numbers, and traffic markings.

4.16.8.7 Provide concrete-filled domed steel bollards painted yellow and suitably fastened to adjacent substrate to protect the jambs of overhead doors, glazed screens, lobbies, vestibules, service rooms, bicycle storage areas, walls, sprinkler pipes and all fixtures within vehicular access as required to protect from any potential vehicular impact damage throughout.

4.16.8.8 Provide wheel stops at parking stall locations as required by the Authority to protect property such as equipment, lighting fixtures, landscaping or similar items from vehicle damage.

4.16.9 Parking Wayfinding

4.16.9.1 Use Wayfinding strategies, including signage, to allow each underground parking level to be identifiable and distinct to assist in orientation and ease of finding/identifying parking stalls. Coordinate width, height and location of stall numbers with horizontal banding. Refer to Appendix 1R [Wayfinding Standards and Requirements] for acceptable strategies.

4.16.9.2 Provide a direct route for pedestrians to navigate from each parking area or underground parking level to the nearest Facility public entry point, including Parking Shuttle Passenger Elevators and parking exit stairs.

4.16.9.3 Delineate pathways to Facility entry points with illuminated Wayfinding signage that includes the names of services reached most immediately from each entrance.

4.16.10 Vehicle Access

4.16.10.1 The Design-Builder will provide access to the Site for all vehicles described in this Agreement, in accordance with Appendix 1E [Civil Infrastructure Plans] unless otherwise approved by the Authority and City.

4.16.10.2 The Design-Builder will determine the following in consultation with the Authority:

4.16.10.2(1) Location of vehicle access and egress from the underground parking areas;

4.16.10.2(2) Location of On-Site roadways and surface parking;

4.16.10.2(3) Locations of layby stalls; and

4.16.10.2(4) Access to all Components located at-grade.

4.16.10.3 Underground Parking Requirements

4.16.10.3(1) Access to underground parking will be clearly marked with Wayfinding signage;

4.16.10.3(2) Access ramps and any surrounding retaining walls or structures will be designed at or above the minimum elevation described in Section 5.2.1 to mitigate flooding of below grade areas such as underground parking and stairwells;

4.16.10.3(3) Provide clear delineation of all entry points and exits from the underground parking;

4.16.10.3(4) All floors of the underground parking will be contiguous. Vehicles will be able to access all floors of the underground parking without having to leave the underground parking and re-enter; and

4.16.10.3(5) For all exterior vehicular ramps, provide reveals in a herringbone pattern for additional traction.

4.16.11 Ambulance Vehicles

4.16.11.1 Provide an at-grade External Ambulance Canopy/Vehicle Bay for four (4) ambulance vehicles; refer to Section 4.16.2.4 and Section 5.11.

4.16.11.2 All areas of the Facility which are required to accommodate ambulances will comply with Ambulance Station Design Standards, BCAS, and BCEHS, including minimum vertical clearances.

4.16.12 Automated Parking Payment System

4.16.12.1 The Facility will include an unattended automated parking payment system through pay-by-stall or pay-by-License plate real time PCI-compliant coin/credit card pay stations.

4.16.12.2 The Authority will install the automated parking payment system with its vendor. The Design-Builder will be responsible for coordinating of the installation of the automated parking payment system and the following at each location:

4.16.12.2(1) Appropriate clearances for access and servicing;

4.16.12.2(2) All infrastructure necessary to support the system, including power and Data Drops installed to the appropriate Communications Room in the Facility; refer to Section 7.8 Communications (Division 27);

4.16.12.2(3) IP Video Surveillance camera coverage;

4.16.12.2(4) Paint striping around the area for safety;

4.16.12.2(5) Concrete filled steel bollards for safety; and

4.16.12.2(6) Securing the system with bolts to concrete. The system will not be bolted to asphalt;

4.16.12.3 The automated parking payment system will meet the requirements of the Luke II Installation Guide for electrical power.

4.16.12.4 Automated parking payment system will be provided at the following locations in the Facility:

4.16.12.4(1) Minimum four (4) parking payment machines; two (2) per floor in the underground parking near the Parking Shuttle Passenger Elevator lobbies;

4.16.12.4(2) Minimum two (2) parking payment machines in the T1.02.08 Waiting Area;

4.16.12.4(3) Minimum one (1) parking payment machine in the T2.01.02 Waiting Area;

4.16.12.4(4) Minimum one (1) parking payment machine in the Emergency Department waiting area. The Design-Builder will provide infrastructure for an additional parking payment machine, such that the Authority can install an additional parking payment machine in the future with minimal disruption to the Facility; and

4.16.12.4(5) In exterior surface parking areas at locations determined in consultation with the Authority through the Review Procedure, and near the Vestibule - Main Entrance.

4.16.12.5 Automated parking payment system will be located to facilitate efficient payment by users without requiring back-tracking and return trips.

4.16.12.6 Final locations for the automated parking payment system will be as determined with the Authority to ensure pay stations are in safe and secure areas and are provided in sufficient quantities to prevent delay and queuing for paying users.

4.16.13 Real-Time Parking Count System

4.16.13.1 General Requirements

4.16.13.1(1) The Design-Builder will provide a real-time parking counting system for the Facility underground parking areas.

4.16.13.1(2) Real-time parking counting system will count the number of vehicles as they enter and exit the underground parking areas.

4.16.13.1(3) Provide parking display information by means of LED signage located at strategic points, including all vehicle entrances to underground parking to alert drivers to the parking availability status. LED signage to be coordinated with Wayfinding signage and use the visual language of the Wayfinding sign program.

4.16.13.1(4) Parking display information to include the following:

4.16.13.1(4)(a) Total number of public and Staff parking spaces in each underground parking area and level;

4.16.13.1(4)(b) Real-time number of public and Staff parking spaces available in each underground parking area, which will take into account parking spaces accessible to Persons with Disabilities; and

4.16.13.1(4)(c) Integration with perimeter pylon signage.

4.16.13.1(5) The display of real-time information will be in coordination with the Wayfinding requirements of this Schedule.

4.16.13.2 Performance Criteria

4.16.13.2(1) Real-time parking counting system sensors will be Tamper Resistant, weatherproof and installed at all entrance and exits of all underground parking areas.

4.16.13.2(2) The real-time parking counting system will include auditing and reporting functionality that will be accessible via the network by authorized Staff.

4.16.13.2(3) Parking count system will be centrally supported to reset the parking count remotely.

4.16.13.2(4) Real-time parking counting system will have the capability to be expanded upon to provide counting for all parking locations within the property line the future.

4.16.13.2(5) Real-time parking counting system will have the capability to send real-time parking count information to a future Authority web-based system such as web-based portal information.

4.16.13.2(6) Cabling will follow requirements of Structured Cabling as per Section 7.8 Communications (Division 27).

4.16.13.2(7) Cabling will be run in conduit and be rated as outside cable plant.

4.16.13.3 Programming

4.16.13.3(1) The real-time parking counting system will be programmable and flexible, allowing the Authority to make future changes to the ratio

of Staff and public parking stalls by floor in the underground parking.

4.16.13.3(2) The Design-Builder is responsible for all programming of the real-time parking counting system, in accordance with the system manufacturer.

4.16.13.3(3) System programming is to be completed in coordination with and to the satisfaction of the Authority.

4.16.14 Bicycle Parking and Cycling Amenities

4.16.14.1 The Design-Builder will:

4.16.14.1(1) Provide bicycle parking and change facilities in accordance with the LEED Bicycle Facilities Credit or the City requirements, the more stringent will govern.

4.16.14.1(2) For purposes of the calculating bike facilities as set out in the LEED methodology, the regular building occupants will be 1460 and the peak visitors will be 865.

4.16.14.1(3) Achieving the LEED Bicycle Facilities Credit is not a requirement of the Project but will be used a methodology for determining quantities for bicycle parking and change facilities to be provided, unless noted otherwise.

4.16.14.1(4) Provide infrastructure in accordance with Fraser Health Transportation Demand Management and Commuter Services Design Guidelines – Bicycle Parking Facilities such as:

4.16.14.1(4)(a) Enclosures for Bike Cages/Rooms;

4.16.14.1(4)(b) Doors;

4.16.14.1(4)(c) Safety, Security and Access; and

4.16.14.1(4)(d) Signage and Wayfinding.

4.16.14.1(5) Locate the long-term secured bicycle parking and storage for Staff at-grade or on Level P1 of the underground parking only.

4.16.14.1(6) Locate short-term bicycle stalls in well lit and high-traffic pedestrian areas with weather protection; refer to Section 8.2.4.2(2)(a).

4.16.14.1(7) Bicycle parking and storage for Staff will be located adjacent to where Staff are expected to use the elevators.

4.16.14.1(8) Provide a slip-resistant finish on cyclist and pedestrian circulation areas into and within the underground parking that provide access to bicycle parking and storage areas.

4.16.14.1(9) Provide security and access control:

4.16.14.1(9)(a) Secured access with an access card reader and coverage with surveillance camera for the entire bicycle parking and storage area; and

4.16.14.1(9)(b) Lights will be turned on at all times in fully enclosed areas.

4.16.14.1(10) Provide signage and Wayfinding to short-term bicycle parking stalls and long-term secured bicycle parking area.

4.16.14.1(11) Provide for e-bike battery charging in accordance with Section 7.7.10.2(44).

4.16.15 Electric Vehicle Charging

4.16.15.1 Provide AC Level 2 EV charging stations for 10% plus the infrastructure and rough-in for an additional 10% of all parking stalls as set out in Sections 4.16.1.5(1) and 4.16.1.6(1) which includes only the required boxes and conduit Raceways with pull strings installed from electrical room to approximate location of future EV charging station, Conditional CDP and associated feeders sized to support the future load and spatial allowance for future transformers and panelboards.

4.16.15.2 Provide and Commission AC Level 2 EV charging stations (208V single phase, 40A EVSE) capable of a maximum 6.6kW continuous charge rate. EV charging stations will use load sharing capabilities at the branch panelboard, feeder, and transformer levels with a nameplate-to-peak power ratio of 3:1 (e.g. 33% demand factor) to minimize the size of the required upstream infrastructure. Branch circuit-level load sharing is not permitted.

4.16.15.3 In addition to public use EV charging stations, provide and Commission an AC Level 2 EV charging station (208V single phase, 40A EVSE) on conditional power for ambulance use at each location described in Section 4.16.1.7. EV charging stations to have a demand factor of 100% (no load sharing). Provide a manual transfer switch to supply ambulance EVSE from delayed vital.

4.16.15.4 Provide a 20A outlet on a dedicated delayed vital circuit for ambulance equipment charging, in addition to the EV charging stations, at each of the parking stalls noted in Section 4.16.15.3. Outlet configuration to be determined in consultation with the Authority.

4.16.15.5 Provide dedicated transformers for EV charging to be fed directly from conditional 600V CDPs. Integrate all EVSE with the Facility’s central load management system to allow load shedding.

4.16.15.6 All EVSE will be networked with point-of-payment features, fault alert notifications and usage rules with complete remote management capabilities. Alerts will be integrated with the IBMP system, and ongoing charger management services (e.g. network operation, user authentication, payment processing, customer support, maintenance) will be available through the Authority's third-party EV charging service provider (Electrum). Wireless EVSE network connections are not permitted.

4.16.15.7 Provide AC Level 2 EV charging stations which are OCPP capable and enabled to provide the Authority maximum flexibility in the EV system hardware.

4.16.15.8 The EV charging system will send notifications via text messages (SMS), e-mail, and smartphone applications to alert the user after a 2-hour charging time limit is reached. The alert message content to the user will be as provided by the Authority.

4.16.15.9 Additional requirements for EV charging station locations include:

4.16.15.9(1) two (2) for parking stalls accessible to Persons with Disabilities within the underground parking;

4.16.15.9(2) one (1) near the Energy Centre, refer to Section 4.16.1.5(1)(e); and

4.16.15.9(3) no surface parking stalls provided for Persons with Disabilities will have EV charging stations.

4.17 Exterior Signage and Wayfinding Requirements

4.17.1 Provide Wayfinding to meet the requirements of Appendix 1R [Wayfinding Standards and Requirements].

4.17.2 Design Wayfinding signage to direct all Facility users by way of clearly configured and easily understood lettering and/or graphic pictograms. Provide well labeled directories to help identify traffic corridors, Facility and Component entrances and clinical zones, and to indicate primary, secondary and interdepartmental paths of travel. These directories will include orientation clues such as "YOU ARE HERE" labels and colour coded zone indicators. Use components such as street names, parking lots and north arrows help to orient the user.

4.17.3 Design Wayfinding signage that is flexible and economically changeable as departments or Components will evolve and change throughout the life of the Facility.

4.17.4 Arrange pedestrian pathways to ease Wayfinding and create an amenable environment for pedestrians using coordinated methods which inform people of routes through the Site to specific buildings and entries or to the major street and transit nodes.

4.17.5 Provide well-signed pedestrian routes such that pedestrians do not have to travel along vehicle roads or ramps.

4.17.6 Provide visually connected pathways and integrated outdoor amenity areas with required signage.

4.17.7 Provide external directional signage that:

4.17.7.1 clearly identifies buildings and their Components including entrances, drop-off areas and all parking areas;

4.17.7.2 is easily understandable by Patients and visitors using it to access the Facility for first time;

4.17.7.3 clearly indicates the entry point(s), access points for public parking, lay-by drop-off locations, entry points to the buildings and where there are multiple entrances, signs clearly identify which entrances are for which purpose, any restrictions for both entry and/or parking for various vehicle types and any after-hours access limitations;

4.17.7.4 is well-illuminated, backlit, reflective or high contrast and easily visible at night;

4.17.7.5 minimizes light spillage;

4.17.7.6 uses universal symbols and standard colours for parking signage;

4.17.7.7 clearly identifies areas where EV charging stations are located within the parking areas;

4.17.7.8 uses the Authority’s graphic standard for all logo placement; and

4.17.7.9 resists wind loads as required by BCBC.

4.17.8 Provide all necessary exterior illuminated signage along the surrounding roadways including 180th Street and James Hill Drive. Signage will be legible for drivers at an adequate distance that they can safely slow down and enter the Site for drop-off, pick-up and parking areas.

4.17.9 Provide all temporary Site signage required prior to and during Construction.

PART 5. FACILITY DESIGN REQUIREMENTS

5.1 Adaptability, Flexibility and Maintainability

5.1.1 General Requirements

5.1.1.1 The Design-Builder will:

5.1.1.1(1) Provide a Design that will accommodate changes to uses and functions in the Facility with minimal impact to the Facility's structure and Building Systems;

5.1.1.1(2) Provide a Design that will accommodate changes to circulation and flows of Staff, Patients and services with minimal impact to the Facility's structure and Building Systems resulting from connections to the Future Expansion;

5.1.1.1(3) Utilize Building Systems and Components that facilitate changes in the Facility configuration and changes in servicing;

5.1.1.1(4) Minimize the need for the Authority to undertake maintenance that requires special safe work procedures and hazardous classifications;

5.1.1.1(5) Provide a Design that accommodates program, service, work and equipment changes with minimized Utility infrastructure and impact;

5.1.1.1(6) Locate and group permanent elements, such as stairs, elevators, duct shafts and mechanical and electrical risers to minimize constraints on future changes to the Facility;

5.1.1.1(7) Ensure that columns will not impact the functionality and intended use of any room or area;

5.1.1.1(8) Provide a Design that minimizes the use of interior shear walls or interior cross-braces; locate shear walls at cores to minimize their impact on Clinical Components; and, if used, locate discrete interior shear walls to maximize current and future flexibility;

5.1.1.1(9) Provide adaptability and flexibility in highly technical areas, such as recovery areas, that contain many small rooms with stringent functional and ergonomic requirements affecting the placement of furniture and Equipment;

5.1.1.1(10) Provide additional capacity which is usable and functional for the Authority in the future, within mechanical and electrical services, including the following, as set out in Sections 7.1 and 7.7:

5.1.1.1(10)(a) Vertical and horizontal risers;

5.1.1.1(10)(b) Distribution shafts;

5.1.1.1(10)(c) Equipment space in service rooms;

5.1.1.1(10)(d) Equipment capacity; and

5.1.1.1(10)(e) Plenums.

5.1.1.1(11) Accommodate the vertical and horizontal distribution of electrical and mechanical services to allow maintenance and changes to occur, including increasing capacity and lifecycle replacement of systems such as drains and domestic water piping, with no interruptions to the Authority's operations, particularly where the need for service flexibility is highest;

5.1.1.1(12) Provide Building Systems designed to minimize service disruptions within the Facility for ongoing maintenance and future renovations;

5.1.1.1(13) Protect the Facility against water damage by providing waterproof flooring throughout the following areas complete with a minimum 150 mm high concrete curb at the perimeter (including at door thresholds complete with ramps for access) and where penetrations occur such as at pipe, cable and duct penetrations. Concrete curbs will be dowelled into the floor slab below and all joints between the concrete slab and curb will be sealed for a completely waterproof installation; refer to Section 09 67 70 – Waterproof Flooring. Fire stopping is not acceptable for a waterproof membrane.

5.1.1.1(13)(a) Building service rooms and spaces;

5.1.1.1(13)(b) Mechanical floors and rooms;

5.1.1.1(13)(c) Maintenance walkways and interstitial floors;

5.1.1.1(13)(d) Throughout the Energy Centre in areas such as:

5.1.1.1.13.(d).1 Steam Plant;

5.1.1.1.13.(d).2 Heating Plant;

5.1.1.1.13.(d).3 Air conditioning and process cooling chiller(s) plant;

5.1.1.1.13.(d).4 Domestic hot water generation plant and RO System for steam boilers;

5.1.1.1.13.(d).5 Heat-recovery chiller(s) plant; and

5.1.1.1.13.(d).6 Areas containing cooling towers chemical treatment and stream filtration system(s).

5.1.1.1(13)(e) Elevator machine rooms; and

5.1.1.1(13)(f) Other areas which in the opinion of the Authority acting reasonably, contain equipment that may cause water damage.

5.1.1.2 Negative Air Source

5.1.1.2(1) Provide one (1) operable glazing or window panel of a reasonable size to allow the Authority a negative air source connection to the exterior for future renovations in each of the following locations:

5.1.1.2(1)(a) Along the exterior wall within each 9 m x 9 m structural column support grid; and

5.1.1.2(1)(b) in each Patient Room.

5.1.1.3 Operating Rooms Future Equipment

5.1.1.3(1) Provide a system of Raceways for power and communications wiring above and below Operating Rooms for future Equipment. Provide one (1) 35 mm power conduit from each panel serving the room and one (1) 53 mm communications conduit from the cable tray to junction boxes in the ceiling space above the room.

5.1.1.4 Demountable Partitions

5.1.1.4(1) The Authority will consider Demountable Partitions systems in certain areas of the Facility on a case-by-case basis provided:

5.1.1.4(1)(a) The Design-Builder demonstrates to the satisfaction of the Authority that such systems provide added value in terms of flexibility, maintenance and life cycling operations; and

5.1.1.4(1)(b) They meet all requirements as set out in this Agreement.

5.1.1.5 Future X-Y Gantry Ceiling Lift Systems

5.1.1.5(1) Provide all structural supports, anchors, backing and electrical power for the Authority's future installation of x-y gantry ceiling lift systems in the following spaces:

5.1.1.5(1)(a) Seven (7) A2.03 Exam Rooms; and

5.1.1.5(1)(b) Two (2) A2.05 Chair Bay - Exam/Treatment.

5.1.1.5(2) All infrastructure to support the Authority's future installation x-y gantry ceiling lift systems will be consistent, standardized and meet the requirements of the x-y gantry ceiling lift systems as set out in this Schedule.

5.1.1.5(3) Ensure Building Systems are located such that they do not obstruct or otherwise limit the Authority's ability to install x-y gantry ceiling lift systems in the future.

5.1.2 Maintainability

5.1.2.1 The Design-Builder will:

5.1.2.1(1) Demonstrate to the Authority through BIM modeling, all equipment replacement, shipping and rigging routes, including how the strategic location of I-beams, lifting rigs and lifting eyes provided by the Design-Builder will enable the Authority to perform maintenance activities;

5.1.2.1(2) Provide crane plans for base building equipment as well as Equipment listed in Appendix 1H [Equipment and Furniture] which will require removal / replacement by external crane either via rooftop, knock-out panels or otherwise;

5.1.2.1(3) Construct the Site to support the crane plus load weight as indicated by the crane lift plans. The design of all external features such as parking, lighting, roadways, trees and landscaping will account for the crane position and maneuverability such that no elements will be negatively impacted or interfered with by the future crane activities.

5.1.2.1(4) Provide installation pathways and maintenance access clearances for all Equipment.

5.1.2.1(5) Provide access for the replacement of equipment due to failure or life-cycle replacement without disruption to adjacent equipment and systems;

5.1.2.1(6) Refer to Section 7.7.10.2(8) for conduit requirements within concrete slabs.

5.1.2.1(7) Provide a system or strategy to support equipment where conduit is not imbedded into the slab, to allow for ease of servicing to security stations, control rooms and medical Equipment. Raised access flooring is not permitted;

5.1.2.1(8) Provide at all mechanical equipment locations, a minimum of 1.5 m floor space clearance or comply with the manufacturers service clearance requirements, whichever is greater, at all locations where maintenance is to be performed;

5.1.2.1(9) Provide a minimum 600 mm clearance around biological safety cabinets, fume hoods and laminar flow hoods for cleaning and maintenance. Provide clearance at all Equipment locations to comply with the manufacturers service clearance requirements

where maintenance is to be performed; refer to Appendix 1H [Equipment and Furniture];

5.1.2.1(10) Locate all equipment such that it can be easily accessed for maintenance, repaired in-situ, and removed and replaced without impacting clinical functions or the need to remove other equipment. Location of all services and equipment will be coordinated to ensure that access clearances are maintained;

5.1.2.1(11) Arrange domestic water piping, services and infrastructure in the ceiling plenum to ensure maintenance and lifecycle replacement access clearances are provided and future flexibility of the space is optimized. To the maximum extent possible, domestic water piping will be in the lower parts of the ceiling space;

5.1.2.1(12) Ensure that operable components such as valves and dampers are accessible without the use of additional equipment or ladders, wherever possible. Locate all gauges and monitoring interfaces in a convenient location for ease of access and visual monitoring;

5.1.2.1(13) Provide access to the ceiling space for Building Systems maintenance only from corridors, mechanical rooms or CSA Type III spaces as classified by CSA Z317.2. Access will be secure but convenient. If ceiling tiles are used, provide the ceiling tile layout such that access to the ceiling space requiring a maintenance and inspection cube in the corridor below will not reduce the clear corridor to less than half the required width, or require a temporary negative pressure room. Refer to Section 5.1.2 for additional requirements;

5.1.2.1(14) Provide knock-out panels to allow for the installation, servicing and future replacement of any specialized Equipment that cannot easily be removed from the Facility through the Staff and Patient Service Elevators or at-grade through Back-of-House corridors and service door openings. Refer to Appendix 1H [Equipment and Furniture] for specialized Equipment such as CNC machines, MRI and CT scanners;

5.1.2.1(15) Provide access doors along the perimeter walls of the underground parking structure such that the Authority can easily access Building Services within, crossing or otherwise associated with the Seismically Isolated Building Structure that would require regular maintenance. Access doors will consist of hollow metal doors and steel frames complete with storeroom function hardware requirements. The exact locations, widths and hardware requirements will be determined in consultation with the Authority through the Review Procedure; and

5.1.2.1(16) Design the Seismically Isolated Building Structure such that the Authority can access the entire inside face of the structural moat wall, outside face of the exterior walls of the underground parking structure and all Building Services within, crossing or otherwise associated with the Seismically Isolated Building Structure with a scissor lift. Enable the Authority's ease of maintenance of these systems by providing double doors (approximately 2.4 m wide clear opening) where ever the scissor lift will be used. Provide a 120V GFCI outlet at each access point such that the Authority can use an extension cord for maintenance equipment.

5.1.2.2 Knock-out panels will:

5.1.2.2(1) Provide adequate clear width based on equipment requirements;

5.1.2.2(2) Accommodate the opening with minimal impact on the Facility building envelope by designing systems such as cladding, air vapour barriers and flashings to easily accept removal and reinstatement;

5.1.2.2(3) Be designed structurally with all components and reinforcement to accommodate the opening without requiring structural retrofit of the surrounding structure; and

5.1.2.2(4) If within concrete, be delineated by a linear indentation by using a V-shaped chamfer strip on either side of the panel.

5.1.2.3 Provide continuous 1.2 m clear width, smooth surface, rooftop access pathways for Staff with mobile carts to access equipment for maintenance and/or removal. Pathways will have an additional wear layer of roofing material or protective concrete pavers applied over the final overall roofing membrane to reduce depletion of the roof surface. Pathways will utilise materials with grit or other non-slip finishes.

5.1.2.4 All canopies and overhangs will be designed to accept the weight of persons walking on them for repeated cleaning and maintenance. Materials will be durable and robust. Plastics, canvas or other fabrics are not permitted.

5.1.2.5 The Design-Builder will provide a shielded access hatch, as a component of the complete radiation shielding assembly for the Cyclotron Vault, above the Cyclotron Vault as well as any required openings and roof hatches such as within the interstitial floor or mechanical floor and roof, for the unobstructed installation and replacement of the cyclotron Equipment, refer to Appendix 1H [Equipment and Furniture] and Section 5.12.4.4.

5.1.2.6 The Design-Builder will minimize confined spaces in the Design. Where confined spaces do exist, they will be designed in accordance with Fraser Health Confined Space Entry Program requirements.

5.1.2.7 Enclosed spaces that are potential confined spaces will be evaluated to ensure risk is minimized by providing means of entry or exit, ventilation, lighting, eliminate or reduce physical obstructions and allow for rescue and first aid access.

5.1.2.8 Interstitial Floor and Maintenance Walkways

5.1.2.8(1) Provide a mechanical floor or interstitial floor complete with maintenance walkways directly above the Perioperative Operating Room Area and Procedure Room Areas. Design the mechanical floor or interstitial floor such that:

5.1.2.8(1)(a) Maintenance or replacement of any of the services can be completed without negatively impacting the operation of the Procedure Rooms, Operating Rooms or similar spaces without FMO having to enter:

5.1.2.8.1.(a).1 Front-of-House areas;
5.1.2.8.1.(a).2 Patient Care Areas; and
5.1.2.8.1.(a).3 semi-restricted and/or restricted areas as defined in CSA Z8000.

5.1.2.8(1)(b) they are accessible from the Patient and Service Elevators and exit stairways through Back-of-House circulation.

5.1.2.8(2) Provide an interstitial floor or mechanical floor complete with maintenance walkways directly above the following areas in Component M. Functional Imaging:

5.1.2.8(2)(a)	M1.22	Quality Control Room - Clean Rooms;
5.1.2.8(2)(b)	M1.23	Quality Control Room - Small Clean Room;
5.1.2.8(2)(c)	M1.24	Packaging Room;
5.1.2.8(2)(d)	M1.25	Airlock;
5.1.2.8(2)(e)	M1.38	Gowning Room;
5.1.2.8(2)(f)	M1.26	Clean Room;
5.1.2.8(2)(g)	M1.27	Small Clean Room;
5.1.2.8(2)(h)	M1.28	Control Room - Cyclotron;
5.1.2.8(2)(i)	M1.29	Storage - Contaminated Waste;
5.1.2.8(2)(j)	M1.30	Workshop - Electronic - Cyclotron;
5.1.2.8(2)(k)	M1.31	Equipment Room - Cyclotron;

5.1.2.8(2)(l) M1.32 Storage - Shielded - Cyclotron; and

5.1.2.8(2)(m) M1.33 Cyclotron Vault.

5.1.2.8(3) The interstitial floor or mechanical floor serving those areas in Component M. Functional Imaging as set out in Section 5.1.2.8(2) will be accessible through Back-of-House circulation connected to the Patient and Service Elevators serving the interstitial or mechanical floor level, as approved by the Authority. The interstitial floor or mechanical floor serving Component M. Functional Imaging will be where services such as the following are located for ease of access and maintenance:

5.1.2.8(3)(a) VAV boxes, reheat coils, control valves, piping system isolation valves, strainers, vents;

5.1.2.8(3)(b) Vendor Equipment such as the water package;

5.1.2.8(3)(c) DDC controllers and instrumentation serving the VAV's, reheats or other controlled equipment; and

5.1.2.8(3)(d) Other miscellaneous equipment serving those areas of Component M. Functional Imaging as set out in Section 5.1.2.8(2) not mentioned above.

5.1.2.8(4) Provide a maintenance walkway below the MDR to serve as an access space for FMO to service the infrastructure below the MDR.

5.1.2.8(5) Maintenance walkways will be a minimum width of 1.5 m with a minimum continuous Ceiling Height of 2.4 m AFF.

5.1.2.8(6) Refer to requirements set out in Section 5.12 Structural Design and Section 5.7.16.16.

5.1.2.9 Mechanical Service Spaces

5.1.2.9(1) For every 2000 NSM of mechanical service space including mechanical floors and rooftop penthouses (excluding the Energy Centre requirements described separately in Section 7.2), provide the following to support the on-going maintenance of the Facility:

5.1.2.9(1)(a) Workbenches and storage:

5.1.2.9.1.(a).1 Provide a minimum of three (3) approximately 1.8 m long workbenches and six (6) approximately 600 mm deep x 1.8m long storage shelves; shelving will be sized to accommodate one (1) complete set of spare

filters for all the AHU within the mechanical room; and

5.1.2.9.1.(a).2 Storage shelves will be provided to hold items used in the regular maintenance of the equipment such as belts, valves, reliefs, PRVs and filters.

5.1.2.9.1.(a).3 Storage shelf heights will be in accordance with Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving and Racks.

5.1.2.9(1)(b) Utility sink:

5.1.2.9.1.(b).1 Provide a minimum of one (1) stainless steel utility sink for every three (3) workbenches.

5.1.2.9(1)(c) Offices:

5.1.2.9.1.(c).1 Provide a minimum of one (1) 10.0 NSM office for Staff complete with workstation and furnishings similar to EC1.2 Office-Private located in the Energy Centre. Offices will not be located in the mechanical space above the Cyclotron/Radiopharmaceutical area.

5.1.2.9(1)(d) Washrooms:

5.1.2.9.1.(d).1 Provide a minimum of one (1) 4.5 NSM Staff washroom similar to EC1.5 Washroom-Staff complete with 2-piece, incl. toilet, sink, gender neutral, not accessible.

5.1.2.9(2) Design the space for these items such that they are adjacent to their point of use for the convenience of Staff working on the equipment as determined in consultation with the Authority through the Review Procedure.

5.1.3 Future CC Rooms and Spaces

5.1.3.1 The Design-Builder will provide the design, and complete Reviewed status, for the future conversion spaces in Components K. Radiation Therapy Planning and L. Radiation Therapy Delivery as described Appendix 1A [Clinical Specifications and Functional Space Requirements].

5.1.3.2 Provide L1.04c Treatment Bunker Interior and L1.05b Control Room as Shelled Space for the future installation of a digital linear accelerator with MR mounted within; refer to Appendix 1H [Equipment and Furniture].

5.1.3.3 Provide all services as required by the Equipment manufacturer to minimize future work and disruption to the Facility during the Authority's future installation.

5.1.3.4 The location of rough-in and services described below will be determined in consultation with the Authority through the Review Procedure and include a

‘vendor neutral’ design which can accommodate multiple options allowing the Authority flexibility in selecting their future Equipment.

5.1.3.5 Plan the location and proximity of future Equipment with regards to other equipment and magnetic fringe field interference. Underground parking will be a minimum of 7.5 m away from the Equipment's isocentre in the vertical plane and 5.5 m in horizontal (X/Y) plane or as otherwise required by the Equipment vendor. Provide magnetic shielding such as silicon steel plates between the Radiation Therapy zone and underground parking areas.

5.1.3.6 With regards to the L1.04c Treatment Bunker Interior and L1.05b Control Room as Shelled Space, the Design-Builder will:

5.1.3.6(1) Provide interior walls and finishes to route services, fire separations and any required fire resistance ratings to meet all applicable codes and standards;

5.1.3.6(2) Provide doors complete with door hardware within interior walls as required by the Authority to secure the Shelled Space;

5.1.3.6(3) Provide fire stopping at all service penetrations. Where necessary, provide canning sleeves for forming voids at all future service locations within concrete slabs;

5.1.3.6(4) Provide GB on the interior side of exterior walls complete with minimal finishes as required to meet all applicable codes and standards;

5.1.3.6(5) Provide a structural system such that the work required to modify the Facility for the future fit-out of these spaces will be minimized;

5.1.3.6(6) Construct the treatment bunker without maze walls for ease of future Equipment installation;

5.1.3.6(7) Provide concrete wall complete with radiation protection between the treatment bunker and control room;

5.1.3.6(8) Provide lighting and fire alarm devices to meet BC Building Code requirements;

5.1.3.6(9) Provide one (1) duplex receptacle, half on vital and half on conditional for every 10 m of wall space;

5.1.3.6(10) Provide ventilation including helium exhaust system, and burst vents, dielectric gas exhaust system and associated oxygen sensors and alarms as per manufacturer’s requirements and ventilation for the Treatment Bunker and associated Control Room;

5.1.3.6(11) Provide chilled water from the dedicated circuit described under Section 7.5.10.1(17) with capacity as required by the manufacturer;

5.1.3.6(12) Provide infrastructure for future BMS controls;

5.1.3.6(13) Provide a pre-action fire suppression system with distribution piping downstream of the pre-action valve to be installed at time of fit-out by the Authority;

5.1.3.6(14) Rough-in medical gases from the central systems, terminated, valved and capped at ceiling level for extension at time of fit-out by the Authority;

5.1.3.6(15) Provide all radiation protection and systems for the future Equipment complete with the Radiation Protection Advisor's calculations for the radiation shielding requirements to satisfy applicable regulations and the Authority in accordance with Section 6.13 Special Construction (Division 13);

5.1.3.6(16) Design for all environmental requirements including electro magnetic interference and vibration of the Equipment; and

5.1.3.6(17) Provide and demonstrate to the satisfaction of the Authority, suitable delivery access route for the future Equipment.

5.1.3.7 With regards to the future spaces for Components K. Radiation Therapy Planning the Design-Builder will:

5.1.3.7(1) Provide a helium vent quench pipe for the future Equipment to be capped in the ceiling space; and

5.1.3.7(2) Provide and demonstrate to the satisfaction of the Authority, suitable delivery access route for the future Equipment.

5.1.4 Future Conversion of Exam Rooms

5.1.4.1 The Design-Builder will provide all Exam Rooms in the A. Ambulatory Care Component, such that they can be easily converted in the future by the Authority to Exam/Treatment Rooms with minimal disruption to on-going operations.

5.1.4.2 The Exam Rooms in A. Ambulatory Care will be designed with:

5.1.4.2(1) the same room dimensions and proportions as the Exam/Treatment Rooms in Component C. Emergency, such that they accommodate both exam tables on opening day, and larger stretchers in the future with all required clearances for both sets of Equipment; and

5.1.4.2(2) regard to the Authority's future conversion of the Exam Room door to the Exam/Treatment Room door, as set out in Appendix

1B [Minimum Room Requirements] to minimize the amount of work involved including relocation and demolition of elements such as sinks, fixtures and fittings.

5.1.4.3 The Design-Builder will demonstrate to the satisfaction of the Authority, that Exam Rooms in A. Ambulatory Care will accommodate the requirements of this Section, through Submittals as set out in Section 2.5.4.12(2).

5.1.5 Future Underground Parking (Level P3)

5.1.5.1 The Design-Builder will construct all Unassigned Space on the lowest floor of underground parking (Level P3) as future parking area such that the Authority can easily convert it into future parking stalls. The future parking area on Level P3 will allow it to be converted into future parking stalls with minimal disruption to on-going operations.

5.1.6 Un-Equipped Rooms

5.1.6.1 The Design and Construction of Un-Equipped rooms will accommodate and accept the future Equipment as it would be installed in a completed equipped room of the same function.

5.1.6.2 The following rooms listed in Appendix 1A [Clinical Specifications and Functional Space Requirements] will be Un-Equipped;

5.1.6.2(1) One (1) F4.07 Imaging Room - Gen Rad; and

5.1.6.2(2) One (1) F4.08 Control Booth - Gen Rad.

5.1.7 Future Automated Guided Vehicles

5.1.7.1 The Design-Builder will provide spaces, finishes and infrastructure rough-in as set out in this Agreement that support the Authority's goal to operate a fleet of five (5) AGV's to serve the Facility in the future.

5.1.7.2 Design the Facility for AGV movements between all elevator staging areas, Patient Food Services, Linen (Clean Cart Staging & Soiled Cart Staging), Material Management Waste Management (near waste Compactors) and Send/Receive stations servicing all applicable floors. Refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] for additional requirements.

5.1.7.3 For all AGV travel routes, provide epoxy flooring as set out in 6.9.10 Section 09 67 23 – Fluid Applied Resinous Flooring and with static dissipative electrical resistance of 104 Ohm and slip resistance finish.

5.1.7.4 Provide motor operated/automatic doors or electromagnetic hold-open devices at all doors along the AGV travel path.

5.1.7.5 Provide cart send/receive depots are sized appropriately to accommodate the dimensions of the Authority's future AGV's which will be approximately 2.785 m (D) x 3.034 m (W)] in tandem or 2.785 m (D) x 2.017 m (W) each if separated.

5.1.7.6 In collaboration with the Authority, identify locations for future AGV communication control cabinets and provide rough-in for the AGV communication control cabinets (RIO Box) which at a minimum will require 120 VAC, 15A power supply and ethernet network drop, where all AGV peripheral equipment will be located such as cart sensors, cart arrival beacon/light, motorized and electromagnetic doors, fire doors, fire alarm, elevators, audio and lighted warning signs, status lights. Future AGV Communication control cabinets will be in an unobstructed location where they can be accessed for maintenance (approximate cabinets dimensions are 380mm (H) x 600 mm (W) x 210 mm (D)). The rough-in will include conduit with data cables, power conduits connected to electrical panels with a junction box located at the load end and complete with internal wiring as required for the load. Rough-in for all charging station power will be 120/208V.

5.1.7.7 To enable the Authority to implement the future AGV's to serve the Facility, the Design-Builder will:

5.1.7.7(1) Rough-in for lighted warning signs mounted on the walls or ceilings at each intersection between Staff and AGV paths of travel;

5.1.7.7(2) Rough-in for lighted warning signs on either side of each AGV equipped automatic door;

5.1.7.7(3) Provide Data Drops at the Energy Centre Control Room for the AGV system control workstation;

5.1.7.7(4) Provide Data Drops for dispatch control panels, battery chargers, and communication control cabinets (RIO Box);

5.1.7.7(5) Include provisions for all AGV system components to be powered by Clinical UPS power circuits;

5.1.7.7(6) Include provisions for communication/integration such as with fire doors, protocol during fire, and behavior during emergency;

5.1.7.7(7) Include provisions for integration with the Staff and Patient Service elevators;

5.1.7.7(8) Include provisions for integration with access control system;

5.1.7.7(9) Include provisions for cart send/receive depots status light (Arrival/Full/Room-in-Use) mounted outside each depot;

5.1.7.7(10) Include provisions for cart send/receive positions cart sensors; and

5.1.7.7(11) Ensure that cart send positions are associated with an adjacent touch-screen dispatch terminal mounted to a control enclosure (with power outlet and Data Drop) with a plug-in power supply.

5.2 Post-disaster

5.2.1 Design the Facility (including Child Care Centre) to mitigate the risk of flooding by locating the main floor, and unless noted otherwise, all services at or above a minimum elevation of 6.0 m. Service pathways, tunnels and similar utilidors are not permitted below this minimum elevation, except as described in Section 5.2.1.10. The only items permitted to be located below the 6.0 m elevation include:

5.2.1.1 Site services as set out in Appendix 1E [Civil Infrastructure Plans];

5.2.1.2 Underground parking and layby stalls as required in Section 4.16 Parking;

5.2.1.3 Bicycle Parking and Cycling Amenities areas;

5.2.1.4 Component Q2 Morgue refer to Appendix 1A [Clinical Specifications and Functional Space Requirements];

5.2.1.5 Water Entry Rooms; refer to Section 7.3.1 Fire Protection;

5.2.1.6 Parking Shuttle Passenger Elevators and hydraulic equipment;

5.2.1.7 Sanitary storage tanks and pumps; refer to Section 7.1.30.4;

5.2.1.8 Telecommunications Rooms that exclusively serve the underground parking levels; refer to Section 7.8.9.5;

5.2.1.9 Electrical Rooms that exclusively serve the underground parking level; and

5.2.1.10 Utilidor containing liquid and/or medical gas piping services between the Energy Centre and the Core Hospital, constructed to be waterproof on all sides and bottom with no openings below the stated minimum 6 m elevation. Drainage will be provided by a dedicated sump with N+1 pumps, piped up and over the waterproof walls and connected to the building sanitary drainage system such that a backup in the Facility drainage system does not cause any drainage to enter the utilidor or prevent the utilidor from being drained. Access to the utilidor will be provided by stairs at either end that do not compromise the waterproof nature of the utilidor's construction.

5.2.2 Design the Facility (excluding the Child Care Centre) to meet post-disaster requirements per the BCBC and local bylaws that are in effect at the time of Building Permit submission.

5.2.3 Provide redundant access routes for service vehicles as set out in Section 4.16.4 such that they can reach their point-of-use at the Facility from both 180th Street and James Hill Drive.

5.2.4 Design the Facility, so that:

5.2.4.1 The need to protect the life safety of all Facility occupants and the need for continuing services following an earthquake or other disaster are considered and provided;

5.2.4.2 The Facility will remain operational and usable by the Authority for its intended functions both during and immediately after an event in order to minimize impact to Patients or ongoing critical and non-critical procedures.

5.2.4.3 Refer to Section 7.7.4.2(2) for post-disaster generator capacity requirements;

5.2.4.4 The Facility's structure, structural components, non-structural components, and the Building Systems and Equipment anchorages, are designed and constructed to post-disaster standards in accordance with the in accordance with applicable code requirements; and

5.2.4.5 Essential services including the electrical and communications systems, HVAC, steam, domestic water, fuel supply, sanitary drainage, storm systems, medical gases and fire protection will be provided to post-disaster standards as defined in the BCBC. These services will continue to function post-disaster. Locate and secure services in structures and enclosures that meet post-disaster standards as defined in the BCBC and CSA S832-14 Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

5.2.5 Emergency Operations Centre

5.2.5.1 The group of spaces within the U6 Command Centre will serve as the Emergency Operations Centre during extreme events and will be designed and constructed as a Type I space under CSA Z317.2 and in accordance with CSA Z8000-18 requirements. Refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] for further requirements.

5.2.6 Exterior Connections

5.2.6.1 Provide connections on the exterior of the Facility for the following services:

5.2.6.1(1) Supply of potable water services; refer to Section 4.16.4.1(3);

5.2.6.1(2) Sanitary sewage waste pump out; refer to Section 4.16.4.1(10);

5.2.6.1(3) Decontamination water storage tank pump out; refer to Section 4.16.4.1(11);

5.2.6.1(4) Medical oxygen services; refer to Section 4.16.4.1(1);

5.2.6.1(5) Supply to generator fuel tanks; refer to Section 4.16.4.1(8);

5.2.6.1(6) Process water tank supply; refer to Section 4.16.4.1(12);

5.2.6.1(7) Mobile Cooler Truck, refer to Section 4.16.4.1(6);

5.2.6.1(8) Grease Trap Truck, refer to Section 4.16.4.1(5);

5.2.6.1(9) UPS and electrical load bank testing, refer to Section 7.7.4.1(8);

5.2.6.1(10) Mobile Medical Unit; refer to Section 5.3;

5.2.6.1(11) Steam Boiler; refer to Section 4.16.4.1(13);

5.2.6.1(12) Chilled water; refer to Section 4.16.4.1(13); and

5.2.6.1(13) Heating water; refer to Section 4.16.4.1(13).

5.2.6.2 The design of the layby parking stalls for service vehicle as set out in Section 4.16.4 will allow the oxygen, potable water, and sewage holding service connections to be accessed simultaneously while maintaining the Authority's 24/7 operations.

5.2.7 Catastrophic Event Management

5.2.7.1 Outbreak Control Zones

5.2.7.1(1) Provide Outbreak Control Zones as described in Section 5.14 Infection Control;

5.3 Mobile Medical Unit

5.3.1 Provide the infrastructure and support facilities to accommodate the Authority's deployment of British Columbia's Mobile Medical Unit (MMU) and the requirements set out in the Mobile Medical Unit Facilities Reference Guide, Mobile Medical Unit Site Footprint and Mobile Medical Unit Deployment Workbook.

5.3.2 Provide Site access for the MMU which includes:

5.3.2.1 Ease of manoeuvrability and positioning both On-Site and Off-Site; and

5.3.2.2 Sufficient clearance from trees, building overhangs or any other obstacles.

5.3.3 Provide an On-Site parking location for the MMU near the Emergency Component.

5.3.4 Parking

5.3.4.1 Configuration of the MMU and supply trailer parking will be as determined in consultation with the Authority;

5.3.4.2 Provide staging area for vacuum truck to service the MMU; and

5.3.4.3 Minimize the impact of the MMU to the Facility's parking areas, where possible.

5.3.5 Mechanical

5.3.5.1 Refer to Section 7.3.1.3 Plumbing (Division 22).

5.3.6 Electrical

5.3.6.1 Refer to Section 7.7 Electrical (Division 26).

5.3.7 Telecommunications

5.3.7.1 Refer to Section 7.8 Communications (Division 27).

5.4 Energy Centre

5.4.1 General Requirements

5.4.1.1 The Energy Centre means the collection of rooms and exterior spaces containing the major mechanical-HVAC, plumbing, electrical, communications and central distribution hubs required for the Project.

5.4.1.2 All mechanical building services infrastructure serving the Facility from the Energy Centre as set out in Section 7.2.11 will be routed and located within interstitial or mechanical floors and provide access to Staff for maintenance and replacement of equipment.

5.4.1.3 The Energy Centre will be:

5.4.1.3(1) where all the Project's energy is either generated or distributed from and will provide all the required energy capacity for the Project as described in this Agreement;

5.4.1.3(2) Designed for future growth, refer to Section 4.2.1.2 including the placement of intake and exhaust louvers such that the building can be expanded in the future without negatively impacting the on-going operations or the future footprint of the Facility's expansion;

5.4.1.3(3) Designed such that it includes glazing to maximize natural light and views to the exterior; refer to Section 5.7.1.5;

5.4.1.3(4) Designed such that noise and vibration are not transferred to/from the Core Hospital and Cancer Centre; refer to Section 5.12.1.10;

5.4.1.3(5) Located with Convenient Access to the loading dock for maintenance operations through Back-of-House circulation;

5.4.1.3(6) Designed with a dedicated Freight Elevator that serves all floor levels including roof areas with Major Mechanical Equipment or Major Electrical Equipment and is located and accessible for ease of transporting major pieces of equipment; refer to Section 6.14.1.2(6) Energy Centre Freight Elevator;

5.4.1.3(7) Designed such that Major Mechanical Equipment and Major Electrical Equipment are located at or above the minimum elevation described in Section 5.2.1, Refer to Section 7.8.9.3(5)(a) and Section 7.8.9.4(3)(a) for additional requirements;

5.4.1.3(8) Designed with interior connections which provide Convenient Access to the FMO Component for materials and supplies to be transported to and from the Facility;

5.4.1.3(9) Distinct from the Facility in terms of it's architectural form, character, materials, colours and details which will positively reflect it's use and purpose;

5.4.1.3(10) Designed to enable removal and replacement of Major Electrical Equipment and Major Mechanical Equipment without the need to relocate adjacent equipment; and

5.4.1.3(11) Designed with access corridors, door openings and overhead coiling doors of sufficient size and clearances to allow for the replacement of Major Electrical Equipment and Major Mechanical Equipment.

5.4.1.4 Provide concrete floor sealer throughout all service areas except for where waterproof flooring or other floor finishes are required by this Schedule.

5.4.1.5 Provide a Control Room designed to meet the requirements as set out in ISO 11064 with Convenient Access to the Steam Plant, Heating Plant and Cooling Towers. If the plants are located on separate floor levels, provide stairs adjacent to the Control Room for Staff to easily access them. If more than one (1) door is required in the Control Room to achieve the access requirements, the location of any additional doors will not negatively impact the functionality of the room or reduce the useable NSM prescribed in the Schedule of Accommodation.

5.4.1.6 The Control Room will be the central point of monitoring, interfacing and control of all the Facility integrated operating systems such as Nurse Call, Fire Alarm, BMS, Elevators, Lighting Control, Public Address, Dynamic Glass etc. There will be one uniform interface to route alarms, access and visualize all systems.

5.4.1.7 Provide workbenches and utility sinks within the Steam Plant and Heating Plant as follows:

5.4.1.7(1) Workbenches and storage:

5.4.1.7(1)(a) Provide a minimum of two (2) approximately 1.8 m long workbenches and two (2) approximately 600 mm deep x 1.8m long shelves;

5.4.1.7(1)(b) Storage shelf heights will be in accordance with Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving and Racks;

5.4.1.7(1)(c) Storage shelves will be provided to hold items used in the regular maintenance of the equipment such as belts, valves, reliefs, PRVs and filters; and

5.4.1.7(1)(d) Design the space for these items such that they are adjacent to their point of use for the convenience of Staff working on the equipment.

5.4.1.7(2) Utility sink:

5.4.1.7(2)(a) Provide a minimum of one (1) stainless steel utility sink for every two (2) workbenches.

5.4.2 Mechanical System Requirements

5.4.2.1 Locate all intake louvers of the Energy Centre so that outdoor air is available 24/7 and is not required to pass through areas whose operations may impact the availability of outdoor air at any time, including emergency scenarios. Generator radiator cooling air will be discharged in a location where the elevated temperature will not have an adverse impact to users of the Facility.

5.4.2.2 Fresh air intakes will be located to not entrain Contaminants from outdoor sources. All intakes will be in areas that are not accessible by the public and will not be located near exhaust air outlets. Exhaust air louvres and outlets will be located to prevent the re-entrainment of Contaminants in accordance with CSA Z317.2.

5.4.2.3 Orient the fresh air intake louvers of the Energy Centre to face away from occupied space and noise sensitive locations as outlined in Appendix 1D [Acoustic, Vibration, and Noise Control Measures] and so that outdoor air entering the ventilation system does not contain any Contaminant in a concentration greater than normal outdoor ambient air in that locality.

5.4.2.4 Take into account the locations of emergency generator exhaust and ensure that contaminated exhaust and fumes are not introduced into the Facility fresh air intakes.

5.4.2.5 Provide valved and capped connections at the exterior wall of the Energy Centre for connection of temporary boilers and chillers as required by CSA Z317.2. Space for the temporary boilers and chillers would not be required for using each type of temporary equipment simultaneously. Refer to Section 5.2.6 for the full list of Facility exterior connections.

5.4.2.6 Provide six (6) quick connect compressed air outlets spread throughout the Energy Centre.

5.4.2.7 For additional requirements, refer to Section 7.2 Energy Centre Mechanical Requirements.

5.4.3 Electrical System Requirements

5.4.3.1 The Design-Builder will provide electrical systems as follows:

5.4.3.1(1) High Voltage emergency generators, paralleling switchgear and, associated ancillary systems;

5.4.3.1(2) Incoming service switchgear (service box) if BCH requirements allow;

5.4.3.1(3) High Voltage Automatic Transfer Switches;

5.4.3.1(4) High voltage switchgear, except for transformer primary isolating means;

5.4.3.1(5) Electrical distribution serving the Energy Centre and adjacent Facility areas, including main transformers, 600V switchgear, 600V CDPs, distribution transformers, 208V CDPs and panelboards; and

5.4.3.1(6) Locate all Major Electrical Equipment at or above the minimum elevation described in Section 5.2.1, including switches, switchgear, HVATS, CDPs, MCCs, transformers, UPS, and associated auxiliary systems.

5.4.3.2 5.4.2.7 For additional requirements, refer to Section 7.7 Electrical (Division 26).

5.4.4 Communications and Security System Requirements

5.4.4.1 Refer to Section 7.8 Communications (Division 27) and Section 7.9 Electronic Safety and Security (Division 28) for further requirements.

5.4.5 Schedule of Accommodation

5.4.5.1 The following table outlines the minimum space requirements for the Energy Centre. The Design-Builder will determine the specific space requirements for Electrical and Mechanical areas and equipment based on the Design and in accordance with the requirements of this Agreement, including Section 5.1.2.

Ref. No.	Room Type	Area Requirements			Room Remarks
		units	nsm/unit	nsm	
EC. ENERGY CENTRE					
EC1. General Requirements					
EC1.1	Control Room	1.0	20.0	20.0	Provide Line of Sight to the boiler plant for observation and supervision of this area. Provide windows complete with fire rated ceramic glass sized and canted (angled) to provide maximum unobstructed view of the plant, prioritising boilers, pressure vessels and chillers. Provide room requirements as set out in Appendix 1B [Minimum Room Requirement] for "Office - Private".
EC1.2	Office-Private	2.0	10.0	20.0	Locate one office in the EC.3 electrical area, and one in chiller plant.

Ref. No.	Room Type	Area Requirements			Room Remarks
		units	nsm/unit	nsm	
					Provide room requirements as set out in Appendix 1B [Minimum Room Requirement] for "Office - Private".
EC1.3	Meeting Room – 8-seat	1.0	15.0	15.0	Incl. table, 8 seats. Provide room requirements as set out in Appendix 1B [Minimum Room Requirement] for "Meeting Room - 8-Seat".
EC1.4	Lockers-Staff	1.0	10.0	10.0	Incl. 8 full-height lockers, benches. Provide room requirements as set out in Appendix 1B [Minimum Room Requirement] for "Locker Room - Universal".
EC1.5	Washroom-Staff	2.0	4.5	9.0	2 piece, incl. toilet, sink. Provide room requirements as set out in Appendix 1B [Minimum Room Requirement] for "Washroom - Staff".
EC1.6	Washroom/Shower-Staff	1	4.5	4.5	3 piece incl. toilet, sink, hand-held shower. Refer to Appendix 1B [Minimum Room Requirement] for "Washroom/Shower - Staff" for additional room requirements.
EC1.7	Vestibule	1	10.0	10.0	Main entrance vestibule for EC. Provide room requirements as set out in Appendix 1B [Minimum Room Requirement] for "Vestibule - Walk-In Entry".
EC1.9	Chemical Storage Room	1	15.0	15.0	Provide chemical containment, eyewash/emergency shower station, ventilation, stainless steel sink and counter.
	TOTAL NSM: General Requirements			**103.5**	
EC2. Mechanical Requirements					
EC2.1	Steam Plant	Area will be determined in consultation with the Authority and meet the requirements of this Agreement.			Provide eyewash/shower station and utility sink.
EC2.2	Heating Plant				
EC2.3	Air conditioning and process cooling chiller(s) plant	Area will be determined in consultation with the Authority and meet the requirements of this Agreement.			Provide eyewash/shower station and utility sink.
EC2.4	Allowance for 2080 future chiller plant expansion				
EC2.5	Domestic hot water generation plant and RO System for steam boilers				
EC2.6	Heat-recovery chiller (s) plant				

Ref. No.	Room Type	Area Requirements			Room Remarks
		units	nsm/unit	nsm	
EC2.7	Cooling Towers chemical treatment and side stream filtration system(s)				Provide eyewash/shower station and utility sink.
EC2.8	Elevator Machine Room	1	15.0	15.0	
EC2.9	Miscellaneous Auxiliary Equipment	1	70.0	70.0	For auxiliary cooling equipment serving electrical spaces.
EC2.10	Cooling Towers	Area will be determined in consultation with the Authority and meet the requirements of this Agreement.			
EC3. Electrical Requirements					
EC3.1	BCH Utility Room	Area will be determined in consultation with the Authority and meet the requirements of this Agreement.			Provide double door to exterior.
EC3.2	V & DV ATS Room				Provide double door to exterior.
EC3.3	Electrical Distribution & Conditional ATS Room				Provide double door to exterior.
EC3.4	Energy Centre V/DV Transformer and MDP Room				Provide double door to exterior.
EC3.5	Generator Paralleling Switchgear Room				
EC3.6	Local Telecom Room (TR) - Energy Centre				Refer to 7.8 Communications (Division 27) for requirements
EC3.7	Energy Centre Floor Electrical Room (FER)				

5.5 Exterior Emergency Generator Building Enclosure

5.5.1 General Requirements

5.5.1.1 The emergency generators will be located at or above a minimum elevation of 6.0 m; refer to Section 5.2.1.

5.5.1.2 Provide each emergency generator within a single, walk-in outdoor sound attenuated building enclosure complete with all access stairs and landings constructed of steel as described in this Schedule. The dimensions of the enclosure will align with the footprint (length and width) of the fuel tank below.

5.5.1.3 Provide full weather protection above and extending 600 mm beyond the edge of the access landings and stairs to minimize ingress of precipitation such as rain and snow into the stair and landing areas.

5.5.1.4 All access and egress points will be protected from snow and rain by canopies or overhangs that extend a minimum 1.2 m beyond the face of the enclosure and on both sides of the opening a minimum of 600 mm.

5.5.1.5 Building and all auxiliary systems to comply with BCBC requirements including all referenced Codes & Standards.

5.5.1.6 Building will be designed to meet BCBC requirements for seismic and wind parameters with Importance factors of 1.5 and 1.25 respectively.

5.5.1.7 Enclosure floor surface will consist of steel checker plate. All enclosure structural steel support members will be located below the floor to prevent a tripping hazard.

5.5.1.8 Building will be designed for a minus 15 degree C to plus 40 degree C outdoor ambient operating conditions, NEMA 3R weather protective enclosure with an integral base.

5.5.1.9 Provide a discharge plenum and removable end wall for equipment access.

5.5.1.10 Exterior shell construction will be minimum 12-gauge galvanized steel to ASTM A-653/A 653M-13, all welded construction.

5.5.1.11 Provide corrosion resistant exterior painting system to ASTM standards. Refer to Section 6.9.15.2(3) for Exterior Painting and Finishing Schedule for painting requirements.

5.5.1.12 Walls will be minimum 75 mm (3") thick insulated with 152 mm (“6”) minimum steel wall studs 600 mm (24") on centre maximum.

5.5.1.13 Roof will be minimum 200 mm (4") deep with cross members approximately every 600 mm (24") on centre maximum.

5.5.1.14 Roof will be peaked design to prevent ponding of water.

5.5.1.15 Insulation will be minimum 75 mm (3") thick rigid insulation. Insulation material will be non-toxic and will be suitable for sound attenuation and for direct exposure to personnel.

5.5.1.16 Provide a reinforced concrete raft slab foundation structure to support the fuel tank and generators and enclosure above.

5.5.1.17 Raft slab will be designed to resist uplift and buoyancy of the fuel tanks.

5.5.1.18 Fuel tanks will be provided with hold-downs to secure the fuel tanks to the raft slab during a flood event.

5.5.1.19 Interior liner will be perforated galvanized steel.

5.5.1.20 Acceptable Enclosure Manufacturers include:

5.5.1.20(1) Silhouette Steel;

5.5.1.20(2) Alumtek;

5.5.1.20(3) Sonic Enclosures; and

5.5.1.20(4) or alternative as approved by the Authority.

5.5.2 Acoustic Requirements

5.5.2.1 Unit Sound Attenuation: The sound pressure level will not exceed an average of 72 dBA at 7m in a free field condition.

5.5.2.2 Noise levels from generator operations will comply with the requirements of Appendix 1D [Acoustic, Vibration, and Noise Control Measures], refer to Section 5.c.

5.5.3 Mechanical Requirements

5.5.3.1 Provide the enclosure with internal air ducting and automatic dampers to allow warm air from the discharge side of the engine's radiator to be partially or fully recirculated (as required to meet space temperature set point) within the enclosure during cold weather. This system will be thermostatically controlled (controlling room return/recirculation and discharge/relief air dampers) to maintain a minimum internal enclosure temperature of 15°C (during heating mode) under at minimum outdoor design temperature of minus 15°C. The air duct will be extended to discharge air at the air inlet end of the enclosure. Utilize heat of the radiator during cold weather conditions, and avoid indoor conditions falling below freezing caused by intake air condition during generator operation.

5.5.3.2 In addition, a heat-pump (refrigerant-based) split system will be provided for each generator enclosure to supply heating and cooling (heating set point 15°C, cooling set point 22°C) of the space (complete with programmable thermostat). The heat-pump (refrigerant-based) split system will be powered by the Facility's vital power. Provide indoor enclosure temperature monitoring by the BMS (tied to Facility BMS system) with notification if the indoor ambient temperature drops below 12°C. The heat pump installation will provide a split DX system capable of maintaining the enclosure's indoor temperature set point during summer or winter conditions when the generator(s) are not running.

5.5.3.3 Fully integrate each packaged generator and associated systems with Facility BMS.

5.5.3.4 For each emergency generator enclosure, provide a complete dry chemical fire suppression system or Vortex fire extinguishing system with each system connected to the main fire alarm panel.

5.5.4 Generator Set Accessories

5.5.4.1 Block Heater: Provide 208 V AC, 1-phase coolant circulating pumps and heavy duty 208 V AC, 1-phase block heaters, thermostatically controlled, sized to maintain 40°C coolant temperature with ambient temperature of +10°C. Locate control thermostat to sense and maintain coolant temperature such that top of engine block is maintained at 40°C to 60°C.

5.5.4.2 Provide separate oil pressure switch and controls to turn pump and heater power off when engine is running. Plumb heater for forced pump circulation. Coordinate block heater kW rating and circulation plumbing size/routing to avoid localized boiling of coolant in block heater. Oversize or poorly circulating block heaters will be cause for non-acceptance of equipment.

5.5.4.3 Provide AC-powered block heater circulation pump with TEFC close-coupled motor and combination starter, all mounted and wired. Control pump to operate whenever block heater is on.

5.5.4.4 Exhaust Silencer, Flex, and Insulation Materials: Provide exhaust silencer insulation blankets, configured to suit the engine and Site installation requirements. Show details on shop drawings.

5.5.4.5 Provide single high quality, “Hospital-grade,” indoor, exhaust silencer complete with flanged inlet and outlet to suit the installation. Provide dual silencers for dual outlet engines. Include silencer condensate drain connection located to prevent water drain-back into the engine. Provide exhaust silencer sound attenuation adequate to reduce exhaust noise to 72 dBA measured at 7 m radial distance from the outlet. Provide exhaust pipe outlet frequency spectrum data with shop drawing submission for 50% load and full load condition with the exhaust silencer installed.

5.5.4.6 Provide flexible sections designed to interface between engine outlet connections and combining piping inlet. Length of flex is to suit the installation requirements. Flex is to have sufficient flexibility so as not to impose any unacceptable loads onto engine connection when exhaust silencer and piping is rigidly mounted to the enclosure and the generator set is exposed to start-up/shutdown movement, or to movement resulting from design seismic forces.

5.5.4.7 Provide prefabricated, wire-in-place, fibreglass engine exhaust insulation blankets for engine manifold, and exhaust flexible sections.

5.5.4.8 Cycle-Lubrication Pump: Provide unit-mounted, wired, and plumbed AC or DC-operated cycle-lubrication pump. Pump will provide automatic engine lubrication for approximately one minute per 8 hours or per manufacturer’s recommendations.

5.5.4.9 Size pump and select controls to avoid over-lubrication. Lock out pump during engine operation. Provide check valves and isolation valves.

5.5.4.10 Pump delivery will enter engine before the oil filters so that only filtered oil is delivered. Configure pump suction and provide delivery valves to utilize circulation pump for removal of sump oil during oil changes. Provide manual pushbutton for local pump run. AC pump and controls are to be CSA-approved and installed in accordance with BC Electrical Code requirements. Select and install equipment suitable for application in sprinklered equipment room.

5.5.4.11 Fuel System: Provide each generator with an outdoor double wall sub-base fuel tank. The capacity will be enough for 72 hours full load operation. Comply with requirements of the latest editions of CSA B139 and; ULC CAN4-S601- 07 Standards. Fuel system will include:

5.5.4.11(1) Manual fill capability with 95% overfill prevention system and integral tank sounding fitting. Manual fill is to be leak free when tank is overfilled to overflow pipe level.

5.5.4.11(2) Factory-installed monitoring system for leak detection of the interstitial space. System is to include local visual leak indication plus switch with contacts for alarm at the GCP.

5.5.4.11(3) Emergency vent fitting and cover with minimum 3.0 m extension piece or as required to raise the emergency vent 0.5 m above the highest point in the overflow piping to the main tank. Coordinate extension piece length with Installation Contractor when pipe routing elevations are established.

5.5.4.11(4) Proof test production tank in accordance with ULC S601 requirements.

5.5.4.11(5) Fitting and heavy-duty level switch assembly, and separate wall-mount relay and alarm panel to provide interfaces to fuel transfer pump control, and to operate low or high fuel/ indicator level alarm, and low or high fuel level alarms in GCP. Include switches, 10 A rated SPDT contacts at:

- 5.5.4.11(5)(a) 95% full for high fuel alarm and transfer pump stop;
- 5.5.4.11(5)(b) 85% full high-level transfer pump stop;
- 5.5.4.11(5)(c) 60% full for low fuel alarm;
- 5.5.4.11(5)(d) 30% full for low fuel alarm and transfer pump control stop; and
- 5.5.4.11(5)(e) Locate level switches away from fuel fill fitting to avoid splash disturbance of floats.

5.5.4.11(6) Tank walls to be min. 50 mm above foundation pad.

5.5.4.11(7) Anti-corrosion painting system for tank. Provide tank manufacturer’s guarantee for tank to be corrosion resistant for five (5) years.

5.5.4.11(8) Provide each generator with a fuel transfer pump with all piping including vents and electrical controls and starters. Provide dedicated automatically controlled fuel oil polishing system for each generator package, and its dedicated fuel oil tank/system. Refer to Section 7.2 for more information on fuel oil polishing system requirements.

5.5.4.11(9) Interconnect fuel/oil piping between multiple generator’s dedicated fuel oil tanks in a daisy chain configuration, so that each transfer fuel oil pump (being part of each generator package) can transfer fuel from the adjacent fuel oil tank to the associated fuel oil tank.

5.5.4.11(10) Pumps are to be used to manually transfer fuel between the generator fuel tanks. Provide the pumps as complete pump skid arrangement. Size each pump to transfer fuel at 500 L/hr. Only one (1) transfer pump will run at a time by means of a selector switch.

5.5.4.11(11) Pump will only be permitted to start (manually) if its supply tank level fuel level is greater than 60% and will stop (automatic) if the receiving tank level reaches 85% or more, or if supply tank level reaches 30% or less.

5.5.4.11(12) Provide continuous tank fuel level indication for both fuel tanks on the fuel pump transfer panel and indicating lights for the level switches at the four (4) levels noted above.

5.5.4.11(13) Drip Trays: Provide removable drip trays under complete engine and radiator. Size trays to suit installed accessibility. Manufacture trays of 18-gauge galvanized steel, 35 mm deep, with leak-free corner joints and rolled edges to prevent cuts and abrasion. Route breather hoses and radiator overflow hose to drip tray.

5.5.4.12 Engine Instrumentation

5.5.4.12(1) The diesel engine will be equipped with the following instruments:

5.5.4.12(1)(a) Low water temperature switch;

5.5.4.12(1)(b) Over-speed switch;

5.5.4.12(1)(c) Low oil pressure switch;

5.5.4.12(1)(d) Low water level switch;

5.5.4.12(1)(e) High water temperature switch; and

5.5.4.12(1)(f) Provide sensing instruments for the engine generator sets to permit compliance with the CSA C282 requirements. Provide identification of all instruments and field wiring. Use lamacoid labels for field instruments.

5.5.4.12(2) Test and Commission all new instrumentation.

5.5.4.12(3) Acceptable Contractors (Suppliers)

5.5.4.12(3)(a) To be considered by the Authority as an acceptable alternative to those firms listed below, the Design-Builder will submit and demonstrate the following:

5.5.4.12.3.(a).1 The firm is routinely involved in the sale and servicing of new larger engine generators for

standby power applications of the type described herein;

5.5.4.12.3.(a).2 The firm directly employs as Staff personnel factory certified repair and maintenance facilities capable of full engine generator major overhauls;

5.5.4.12.3.(a).3 The firm maintenance and repair facilities will be equipped with large machinery such as lathes, presses, drills, dynamometers etc., as required to perform the work. Service facilities will include large engine performance testing equipment and engine testing bays. The firms will have local service offices in the lower mainland area and will be capable of providing service personnel to the Facility within 2 hours' notice;

5.5.4.12.3.(a).4 The firm directly employs Staff service personnel who are certified by the engine manufacturer to undertake warranty repairs to the engine generator assembly. This work will include performing engine management software & firmware upgrades and engine diagnostic work. A letter from the engine manufacturer is required for confirmation of this requirement; and

5.5.4.12.3.(a).5 Provide references for three (3) similar acute care BC hospital projects having multi-generator paralleling and incorporating closed transition automatic transfer systems and completed in the last six (6) years.

5.5.4.12(3)(b) Subject to compliance with these specifications, the following diesel engine generator suppliers/ manufacturers are considered acceptable Contractors:

5.5.4.12.3.(b).1 Cullen Diesel BC Ltd. – MTU; and

5.5.4.12.3.(b).2 Cummins Western Canada – Cummins.

5.5.5 Electrical Requirements

5.5.5.1 Provide both 120 Vac LED type industrial vapour tight lighting with wire cage protection and 24 Vdc battery operated emergency lighting, as required by CSA 282. Provide a minimum of 4 dual head battery pack units for each generator. Interior illumination to be an average of 400 lux. Connect lighting to a 50/50 mixture of Clinical UPS and Vital power.

5.5.5.2 Provide exterior lighting to illuminate generator walk-ways, entrance doors, access door areas, stairs and refueling stations.

5.5.5.3 Provide fire alarm initiation and signal devices in each generator enclosure including bell/strobes, manual pull stations and heat detectors (2 per generator) complete with an addressable module to allow for connection of the devices to the Facility's fire alarm system. Connect an auxiliary contact from each detector to their respective generator controller for monitoring by the Emergency Power System.

5.5.5.4 Provide a minimum of two (2) 60A 120/208V 3PH 4W 30CCT panelboards, one (1) on vital power and the other on conditional power in each enclosure.

5.5.5.5 Provide duplex receptacles every 7 m along interior wall and every 10 m on the exterior walls. Receptacles to be split evenly on vital and conditional power.

5.5.5.6 Doors will be provided with outdoor card reader with electric door strike. On the inside of each access door provide a keypad to permit operator to confirm presence if the door was opened by means the door's key lock.

5.5.5.7 Keypad and access control will be an extension of the Facility's door access control system. Two (2) form 'C' dry contacts will also be provided for each door' open/closed status by means of concealed door frame switches located in the hinged side of the door.

5.5.5.8 Provide local generator annunciator panel in each enclosure and remote annunciator in the EC1.1 Control Room. Annunciators to signal BMS with any alarms or troubles. Alerts and troubles to be as per CSA 282.

5.5.6 Communications Requirements

5.5.6.1 Refer to Section 7.8 Division 27 for Telecommunications Outlets and Wi-Fi coverage requirements.

5.6 Commissioning (LEED + Z8001 Framework)

5.6.1 General Requirements

5.6.1.1 Commissioning will be carried out in accordance with CAN/CSA Z8001 and CAN/CSA Z317 series standards. In addition, integrated systems testing of fire protection and life safety systems will be carried out and documented in accordance with CAN/ULC S1001. If these standards do not meet the requirements for the relevant LEED prerequisite and credit, the most stringent applicable standard will be followed in order to satisfy all requirements.

5.6.1.2 The Commissioning process will be planned and executed in accordance with all other standards and guidelines listed in Section 2.4 as applicable to specific systems.

5.6.1.3 The Design-Builder will provide a fully Commissioned Facility to the Authority. This includes assisting the CxP with the development of Commissioning Plan documentation and overall responsibility for scheduling and execution of the Commissioning work.

5.6.1.4 The Commissioning process will verify that installed equipment, systems and integrated systems operate in accordance with the contract documents, design criteria and intent.

5.6.2 Commissioning Team Organizational Structure

5.6.2.1 The Design-Builder will procure a Commissioning Provider (CxP) who is responsible for the overall Commissioning program.

5.6.2.2 The CxP will fulfill the scope of work and documentation requirements of LEED v4 Fundamental and Enhanced Commissioning (6 Points).

5.6.2.3 The CxP will not be a member of a firm involved in the Design and Construction of the Facility.

5.6.2.4 The Authority has retained a separate firm acting in the role of Commissioning Authority (CxA) that will provide general oversight of the Design-Builder's Commissioning program and review and approve all Commissioning documentation and test results.

5.6.3 Commissioning Provider (CxP) Responsibilities - The CxP will lead all commissioning-related activities and complete the following tasks for all Building Systems outlined:

5.6.3.1 Become familiar with the Owner's Project Requirements (OPR) and documented review as required for LEED v4 Fundamental and Enhanced Commissioning requirements;

5.6.3.2 Provide documented progressive reviews of the designers' Basis of Design (BOD) for adequacy, completeness, and adherence to the OPR;

5.6.3.3 Develop and be responsible for the implementation of the Commissioning Plan;

5.6.3.4 Develop functional performance test procedures and checklists (including integrated system testing and post-Substantial Completion, seasonal, and deferred testing), lead their execution, and witness and document test results.

5.6.3.5 Provide Commissioning-focused design reviews at the 30%, 50%,70%, 90% and 100% Design and Construction Documents stages. After each design review, lead a meeting with the Authority, CxA, and design team to discuss the findings and required follow up actions. Carry review comments forward into subsequent reviews and provide a record of all review comments and their resolution.

5.6.3.6 Develop Commissioning specifications and review any Commissioning specification sections prepared by the Design-Builder's consultants for consistency. Provide Commissioning specifications for all construction Divisions included in the list of Systems to be Commissioned specifying the Commissioning requirements for all equipment and systems, including those for which technical details are not defined in this Schedule 1 [Statement of Requirements].

5.6.3.7 Review all shop drawing Submittals from the perspective of Building Systems, that is, to confirm that temperatures, pressures, and voltages will be met by the

Building Systems. Provide review comments to the Design-Builder, Authority, and CxA and maintain both a log of Submittal reviews to facilitate tracking by the Authority and a log of open review comments for follow-up;

5.6.3.8 Perform review and On-Site verification of equipment factory acceptance testing and static and pre-functional checks prior to equipment start-up;

5.6.3.9 Complete documentation of static verification, as follows:

5.6.3.9(1) Verify and/or perform static verification before start-up activities and Functional Testing; and

5.6.3.9(2) Verify and document that all system elements conform to the design requirements and are correctly installed in accordance with the manufacturer's installation and operations manual, connected, and labelled. Confirm this is completed prior to related system equipment start-up;

5.6.3.10 Perform review and On-Site verification of equipment start-up checks. This includes reviewing mock-ups of key spaces to identify areas of conflict;

5.6.3.11 Carry out start-up duties, as follows:

5.6.3.11(1) Witness and document all start-up activities and assemble reports for inclusion in the Commissioning report; and

5.6.3.11(2) Ensure that internal equipment controls are verified and documented during start-up by the party responsible for starting the equipment;

5.6.3.12 Conduct Functional Testing for relevant systems and CSA-Z8001, as applicable;

5.6.3.13 Develop functional performance and integrated system test procedures in consultation with the Authority and obtain the Authority's approval of final procedures;

5.6.3.14 Conduct dry run of integrated Life Safety Systems testing in accordance with the test plans produced by the CxA and with CAN/ULC S1001 Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.

5.6.3.15 Carry out review of O&M manuals;

5.6.3.16 Coordinate all training and demonstrations to the Authority;

5.6.3.17 Complete Commissioning report for CxA review and approval;

5.6.3.18 Complete systems manual for CxA review and approval;

5.6.3.19 Complete seasonal or deferred Functional Testing for CxA review and approval;

5.6.3.20 Perform pre-warranty expiration review performance testing for CxA review and approval;

5.6.3.21 Complete LEED monitoring based commissioning analysis (at least quarterly during first year of operation) for CxA review and approval;

5.6.3.22 Create and maintain an issues log to track all Commissioning-related issues throughout the entire Construction, acceptance, and post-Substantial Completion phases of the Commissioning process;

5.6.3.23 Lead equipment demonstration to the Authority, ensuring that the following requirements are met:

5.6.3.23(1) Demonstration activities will only be scheduled for equipment and systems where no deficiencies which impact system operation, functionality, or calibration remain; and

5.6.3.23(2) The equipment/system will be in a state that allows automatic operation as intended by the design and associated control sequences.

5.6.3.24 Lead the resolution of all Commissioning-related issues.

5.6.4 Systems to be Commissioned

5.6.4.1 The Commissioning requirements of Section 5.6 and Appendix 1L [Commissioning Roles and Responsibilities] apply to all of the following equipment and systems:

5.6.4.1(1) Building Envelope;

5.6.4.1(2) Concrete, Masonry, Metals, Wood, Plastics and Composites (Divisions 3 to 6; as applicable to building envelope);

5.6.4.1(3) Thermal and Moisture Protection (Division 7);

5.6.4.1(4) Openings (Division 8);

5.6.4.1(5) Architectural Systems, such as

5.6.4.1(5)(a) Wall assemblies;

5.6.4.1(5)(b) Floor and ceiling assemblies;

5.6.4.1(5)(c) Interior space assemblies; and

5.6.4.1(5)(d) Acoustic barriers.

5.6.4.1(6) Specialties (Division 10);

5.6.4.1(7) Equipment (Division 11/12);

5.6.4.1(8) Special Construction (Division 13);

5.6.4.1(9) Conveying Equipment (Division 14);

5.6.4.1(10) Pneumatic Tube System;

5.6.4.1(11) Food Services and Equipment, and Walk-In Cooler;

5.6.4.1(12) Fire Suppression (Division 21);

5.6.4.1(13) Plumbing (Division 22);

5.6.4.1(14) Heating, Ventilating and Air Conditioning (Division 23);

5.6.4.1(15) Integrated Automation (Division 25);

5.6.4.1(16) Electrical (Division 26);

5.6.4.1(17) Communications (Division 27);

5.6.4.1(18) Electronic Safety and Security (Division 28); and

5.6.4.1(19) Campus Perimeter Pathway System (CPPS).

5.6.4.2 Refer to Table 1 and Table 2 in Appendix 1L [Commissioning Roles and Responsibilities] for an illustration of the expected sequential operation of various Commissioning milestone activities intended to ensure meaningful engagement opportunities for the Authority.

5.6.4.3 In addition to the information in the preceding and following sections, refer to Appendix 1L [Commissioning Roles and Responsibilities]. The list of Building Systems included in these sections and Appendix 1L [Commissioning Roles and Responsibilities] is reproduced from CSA Z8001 and not intended to be exhaustive. The Design-Builder and the CxP will ensure that all CSA Z8001 systems applicable to the Project are included in the Commissioning process, even if not listed in these Sections or in Appendix 1L [Commissioning Roles and Responsibilities].

5.6.4.4 In addition to the above, the Authority requires that all other specific or unique mechanical, plumbing, or fire protection systems required by this Agreement, but not listed specifically in the Commissioning section, be included in the CxP scope.

5.6.5 Design Stage Commissioning Process

5.6.5.1 Owner’s Project Requirements (OPR)

5.6.5.1(1) This Schedule 1 [Statement of Requirements] will be considered to be the OPR for the Project as defined by LEED, CSA and other Commissioning standards.

5.6.5.1(2) CxP will review this Schedule 1 [Statement of Requirements] for compliance with LEED requirements and provide a summary

report identifying any elements for which additional information may need to be provided by the Authority in accordance with LEED or best practice Commissioning requirements.

5.6.5.1(3) CxP will be responsible for ensuring that all supporting OPR documentation required for the LEED Fundamental Commissioning prerequisite is compiled and submitted to the LEED certifier.

5.6.5.2 Basis of Design

5.6.5.2(1) The Design-Builder will provide the Authority with the Basis of Design (BoD), which is a written document that records the concepts implemented, calculations performed, decisions made, and product selections used to meet the Authority's requirements and satisfy the applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

5.6.5.2(2) The Basis of Design will set out detailed information on the design team's approach to meeting the Authority's requirements so as to provide the Authority with a better understanding of design issues and secure the Authority's approval of critical design decisions.

5.6.5.2(3) The Basis of Design is also intended to be used as a reference by the stakeholders in the Commissioning process, to promote understanding of all systems to be commissioned, and by the Authority for ongoing building operation, re-commissioning, and maintenance for the life of the facility. Systems Descriptions from the Basis of Design will be a key component of the Systems Manuals produced at the demonstration and acceptance stage of the project.

5.6.5.2(4) The Basis of Design will be organized by each design discipline (division) and be broken down at a system level. For each system, the Basis of Design will include the following, as applicable:

5.6.5.2(4)(a) Narrative system descriptions detailing the systems architecture and overall design concept, including central/head-end equipment, networking, risers/distribution/routing, manifolds/zone-level equipment, end-use devices, and associated controls;

5.6.5.2(4)(b) Overview of control system types, control schemes, interconnections, integrations, philosophy behind

the sequences/strategies, and a high-level summary of how each system is expected to operate under various situations and modes;

5.6.5.2(4)(c) System and assembly options considered;

5.6.5.2(4)(d) System and assembly selection reasoning, including references to Authority requirements affecting primary design decisions, schedule/budget limitations, or other considerations;

5.6.5.2(4)(e) Facility, system, and assembly performance assumptions, including the following:

- 5.6.5.2.4.(e).1 Assumptions for calculations/sizing;
- 5.6.5.2.4.(e).2 Redundancy/spare capacity;
- 5.6.5.2.4.(e).3 Analytical procedures and tools;
- 5.6.5.2.4.(e).4 Environmental conditions;
- 5.6.5.2.4.(e).5 Limiting conditions;
- 5.6.5.2.4.(e).6 Reference make and models; and
- 5.6.5.2.4.(e).7 Operational assumptions, including occupancy, building usage, and diversity.

5.6.5.2(4)(f) Codes, standards, guidelines, regulations, and other references;

5.6.5.2(4)(g) Owner guidelines and directives; and

5.6.5.2(4)(h) Engineering and/or architectural guidelines for design developed by the design team or others.

5.6.5.2(5) The Design-Builder will submit an updated Basis of Design for all major systems at each design Submittal (30%, 50%, 70%, 90%, and 100%). Each Submittal must provide updated design rationale along with increasingly detailed system descriptions. Each Submittal will clearly identify changes and updates from previous versions to streamline the review process.

5.6.5.2(6) The Basis of Design will be updated by the Design-Builder to as-built condition during the late stages of Construction for incorporation into the Systems Manual (LEED v4) / Facility Manual (Schedule 1 - Appendix 1V Asset Management).

5.6.5.3 Commissioning Design Reviews

5.6.5.3(1) The CxA will review each Basis of Design submission for adequacy, completeness, and alignment with the Authority’s requirements.

5.6.5.3(2) Commissioning design reviews will be performed by CxA and CxP at each design Submittal (30%, 50%, 70%, 90%, and 100%).

5.6.5.3(3) Commissioning design reviews for mechanical systems will include review of access for reading gauges, entering doors and panels, and observing and replacing filters and coils; required isolation valves, dampers, interlocks, piping, etc. to allow for manual overrides, simulating failures, seasonal/full-load and other testing conditions; pressure and temperature (P/T) plugs close to controlling sensors for verifying their calibration; pressure gauges, thermometers and flow meters in strategic areas for verifying system performance and ongoing O&M; pressure and temperature (P/T) plugs at less critical areas or on smaller equipment where gages and thermometers may not be required; specification of the location and criteria for the VAV duct static pressure sensor and chilled water differential pressure sensors; adequate balancing valves, flow metering and control stations and control system functions to facilitate and verify reliable test and balance; uniform inlet connection requirements to VAV terminal boxes; maintenance access to components requiring service / replacement; required isolation valves, dampers, interlocks, piping, etc. to allow for manual overrides, simulating failures, seasonal/full-load and other testing conditions; and detailed and complete sequences of operation for all systems and equipment.

5.6.5.3(4) Similarly detailed commissioning design review criteria will be developed by the CxP for all other disciplines and systems (i.e. fire suppression, integrated automation, electrical, communications, and electronic safety and security) and summarized in the design review reports. Design reviews will include breakout of each design review criterion and its status based on the CxP review of each design Submittal.

5.6.5.3(5) Comments requiring follow up will be documented in the Commissioning issues log. Project Co design team will provide responses to all CxP and CxA review comments prior to each subsequent design Submittal; responses will be incorporated into the Commissioning issues log.

5.6.5.3(6) Upon completion of Design stage, the Commissioning issues log will include a record of all CxP and CxA design review comments along with a record of their resolution. Any remaining open issues will be carried on the Construction stage Commissioning issues log by the CxP to ensure they are resolved.

5.6.6 Commissioning Plan

5.6.6.1 Commissioning Plan will be structured to include the following items at a minimum:

5.6.6.1(1) Table of Contents;

5.6.6.1(2) General Project Information;

5.6.6.1(3) Cx Process Overview, Goals and Objectives;

5.6.6.1(4) Standards and Guidelines:

5.6.6.1(4)(a) List of applicable standards applying to health care facility infrastructure and systems (e.g., CSA Z8000, Z32, Z3217.1, Z317.2, Z7396.1, and the Z317 series of engineering and physical plant standards);

5.6.6.1(5) Scope of Commissioning: Systems to be Commissioned:

5.6.6.1(5)(a) Summary of all Systems and equipment to be Commissioned; and

5.6.6.1(5)(b) A list of the health care-specific elements that will be included in the Commissioning process schedule.

5.6.6.1(6) Building Systems Overview:

5.6.6.1(6)(a) Basis of Design documentation as defined elsewhere in Section 5.6.5.2, provided as a reference for the Commissioning team; and

5.6.6.1(6)(b) Integration Matrix and associated descriptions of the systems integrations design intent which will be tested as part of the Commissioning process.

5.6.6.1(7) Commissioning Team & Organizational Chart:

5.6.6.1(7)(a) Directory of all Commissioning team members, including contact information of the various organizations, and names of all specific persons to be involved in the Commissioning work; and

5.6.6.1(7)(b) Organizational chart overview of the team structure, contractual relationships and information flow.

5.6.6.1(8) Team Roles and Responsibilities:

5.6.6.1(8)(a) Summary of responsibilities of each member of the Commissioning team as related to all major Commissioning tasks and deliverables; and

5.6.6.1(8)(b) This will include a Cx responsibility matrix in line with CSAZ8001 and the project-specific requirements.

5.6.6.1(9) Communication Protocols:

5.6.6.1(9)(a) Detailed plan for communications and coordination between representatives of the Design-Builder's and Authority's Commissioning teams; and

5.6.6.1(9)(b) Description of Design-Builder's proposed system for managing documentation and records of tests, inspections, quality assurance and training.

5.6.6.1(10) Commissioning Processes and Activities:

5.6.6.1(10)(a) Description of the commissioning process through Design, Construction, Occupancy and Operations/Warranty Stage;

5.6.6.1(10)(b) Information regarding who is responsible to complete static verification checks and supporting documentation and the sampling rate that will be verified On-Site by the CxP; and

5.6.6.1(10)(c) Information regarding who is responsible to complete start up reports and the sampling rate of equipment start-ups that will be witnessed and verified On-Site by the CxP;

5.6.6.1(10)(d) Frequency of Commissioning meetings;

5.6.6.1(10)(e) Monitoring based Commissioning requirements;

5.6.6.1(10)(f) Authority training needs;

5.6.6.1(10)(g) Documentation;

5.6.6.1(10)(h) Report of defects and deficiencies;

5.6.6.1(10)(i) Commissioning issue resolution process;

5.6.6.1(10)(j) Asset Management; and

5.6.6.1(10)(k) Commissioning process tracking tool:

5.6.6.1.10.(k).1 Summary lists/tables of all required commissioning deliverables down to the equipment level, identifying party responsible (contractor, vendor, 3rd party, CxP), which will:

(k).1.1 be used by the CxP to track submission of completed test documentation; and

(k).1.2 include a dashboard summary suitable for progress reporting to all project stakeholders.

5.6.6.1.10.(k).2 Systems and equipment lists used in the Commissioning Plan, which will:

(k).2.1 be aligned with the asset identification designations in the Schedule 1 - Appendix 1V – Asset Management Requirements; and

(k).2.2 will include information on manufacturer/make, model, installed location and area served (room/space or zone as applicable) for all equipment, based on reviewed Submittals.

5.6.6.1(11) Discipline-Specific Commissioning Process Details:

5.6.6.1(11)(a) Description of the Commissioning activities for all systems within each Division, including Architectural, Envelope, Fire Protection, Plumbing, Mechanical, Electrical, Communications, Electronic Safety & Security, FF&E, and others as required;

5.6.6.1(11)(b) Dedicated section for each Division, with sub-sections detailing the steps in the Cx process system by system. Role of the installing contractors, equipment vendors, CxP, designers, Authority and other relevant stakeholders will be defined;

5.6.6.1(11)(c) Mechanical sections of the Cx Plan, including:

5.6.6.1.11.(c).1 The timing for Commissioning activities and approvals for the potable water system, based on the requirements of CAN/CSA-Z317.13 for flushing, testing and, where necessary, treating of water systems during and after Construction;

5.6.6.1.11.(c).2 The timing for Commissioning activities and approvals for the HVAC system, from the start of Design, through the phases of Construction and the sequential stages of occupancy by building Staff, outpatients, and inpatients, to final acceptance of the Facility; and

5.6.6.1.11.(c).3 An outline of post Substantial Completion Commissioning activities for HVAC system performance evaluation and optimization under various load conditions.

5.6.6.1(12) Sampling Rates for CxP Inspections and Testing:

5.6.6.1(12)(a) Summary of the proposed sampling rates to be applied to the project for each equipment/system type.

5.6.6.1(13) Commissioning Documentation – All Forms, Checklists, and Test Plans to be used for the project:

5.6.6.1(13)(a) Commissioning process tracking tool;

5.6.6.1(13)(b) Envelope Commissioning forms and checklists;

5.6.6.1(13)(c) Pre-functional checklists and manufacturer Cx report templates;

5.6.6.1(13)(d) Functional test plans;

5.6.6.1(13)(e) Integration test plans; and

5.6.6.1(13)(f) Clinical functional scenario test plans.

5.6.6.1(14) Training Plans:

5.6.6.1(14)(a) Training plans will be provided for all systems and major equipment;

5.6.6.1(14)(b) Training plans will include details on trainer/presenter, proposed agenda with durations of each major topic, along with a package containing the training reference materials that will be presented; and

5.6.6.1(14)(c) The CxP will work with the Authority to establish an agreed-upon template for training plans, which will be followed by the Design-Builder, Sub-Contractors and equipment manufacturer’s representatives in the preparation of project-specific training plans.

5.6.6.1(15) Monitoring Based Commissioning Plan:

5.6.6.1(15)(a) In order to achieve LEED V4 Energy and Atmosphere Credit Enhanced Commissioning, Option 2: Enhanced and Monitoring-Based Commissioning, the CxP will develop a program to assess performance of energy- and water-consuming systems post Occupancy.

5.6.6.1(16) Commissioning Schedule:

5.6.6.1(16)(a) Increasing detail will be incorporated into the various Commissioning schedule submissions throughout Design and Construction stage as subtrades provide the necessary input on sequencing and duration of specific tasks.

5.6.7 Communication Protocols

5.6.7.1 The CxP will provide all reporting directly to both the Authority and Design-Builder.

5.6.7.2 The CxP will provide regular reporting to the Authority throughout the Project to ensure that Design-Builder's Commissioning activities are carried out in accordance with the Commissioning Plan.

5.6.7.3 All Commissioning documentation will be made available to the Authority throughout the Commissioning process and compiled for the Authority's records in the final Commissioning Report.

5.6.8 Document Control and Submission

5.6.8.1 A central digital repository will be used to share all Commissioning documentation with the Authority throughout the entire Commissioning process. When documentation is added to the repository, the Design-Builder will provide the Authority with a transmittal notification identifying what has been added, the document name, and the location within sub-folders in the repository. The Design-Builder will implement a cloud-based Commissioning management software or alternate system providing similar functionality for this purpose.

5.6.8.2 The Design-Builder will establish and follow a document control program for Commissioning to ensure that the submission of all inspection and test reports, training plans, and any other Commissioning documentation is done in a consistent and organized manner.

5.6.8.3 Test reports and other Commissioning documentation will be made available to the Authority in "real time" throughout Commissioning, such that the appropriate documentation can be reviewed by the CxP, Design-Builder's Design Team, Authority and CxA prior to proceeding with subsequent phases of the Cx process.

5.6.8.4 Commissioning documentation will be provided within one (1) week of completion of the associated On-Site inspection or testing.

5.6.8.5 Documentation will follow clear numbering and naming conventions and be organized in such a way as to facilitate review and tracking by all project stakeholders.

5.6.8.6 The Cx Plan will include a list of all required documentation and its status, which will be maintained throughout the Project.

5.6.8.7 The document control system will be demonstrated prior to the start of any On-Site Commissioning activities.

5.6.8.8 The Commissioning document management system will be aligned with Appendix 1V [Asset Management Requirements] to facilitate transfer of Commissioning documentation or asset data collected during Commissioning to individual assets in the Authority's Computerized Maintenance Management System (CMMS).

5.6.9 Commissioning Management

5.6.9.1 The CxP will lead and organize the Commissioning team.

5.6.9.2 The Design-Builder’s subcontracted trades will designate Commissioning representatives who will attend the Commissioning meetings and follow up on Commissioning-related items.

5.6.9.3 The CxP will chair and keep minutes of Commissioning meetings and maintain issues log tracking.

5.6.9.4 The frequency of the Cx meetings will be set out in the initial Commissioning Plan for review by the Authority.

5.6.9.5 The minimum frequency of Commissioning meetings throughout the Design stage is as follows:

5.6.9.5(1) Quarterly (every three (3) months).

5.6.9.6 The minimum frequency of Commissioning meetings leading up to Substantial Completion is as follows:

5.6.9.6(1) Series of common Commissioning meetings:

5.6.9.6(1)(a) Biweekly (2 times per month), beginning at 12 months from Substantial Completion; and

5.6.9.6(1)(b) Weekly, beginning at six (6) months from Substantial Completion.

5.6.9.6(2) Series of envelope Commissioning meetings:

5.6.9.6(2)(a) At least monthly during envelope Construction, beginning prior to start of first-installation mock-ups for envelope materials and assemblies.

5.6.9.7 The minimum frequency of Commissioning meetings post Substantial Completion is as follows:

5.6.9.7(1) Weekly in the first month following the date of Substantial Completion;

5.6.9.7(2) Biweekly in the first 6 months following the date of Substantial Completion;

5.6.9.7(3) Monthly in the six (6) to twelve (12) months following the date of Substantial Completion; and

5.6.9.8 A dedicated series of envelope Commissioning meetings will be held monthly throughout Construction, separate from the above.

5.6.9.9 Discipline-specific Commissioning meeting series (e.g. Mechanical, Electrical, Communications, Electronic Safety and Security) will be established as required in order to facilitate focused review of the above topics as applicable to each discipline during times where it is not practical or efficient to cover in a common meeting.

5.6.9.10 At a minimum, Commissioning meetings will cover the following agenda items:

5.6.9.10(1) Status of Commissioning Plan documents:

5.6.9.10(1)(a) Cx checksheets, vendor reports;

5.6.9.10(1)(b) Testing & Balancing (TAB) plan(s);

5.6.9.10(1)(c) Functional and integration test plans;

5.6.9.10(1)(d) Demonstration to Authority agendas; and

5.6.9.10(1)(e) Training plans.

5.6.9.10(2) Review of Commissioning schedule as related to progress of install and Cx work on site;

5.6.9.10(3) New and outstanding Cx documentation submissions (based on completed Cx Activities to date);

5.6.9.10(4) Commissioning schedule look-ahead (activities targeted prior to next meeting), and coordination of required participants;

5.6.9.10(5) Review of high-priority Cx issues log items;

5.6.9.10(6) Status of systems manual and as-built drawing submissions;

5.6.9.10(7) Handover of spare parts and materials inventory; and

5.6.9.10(8) Status of asset identification and labeling process and of information transfer to the Authority’s Computerized Maintenance Management System (CMMS).

5.6.10 Progress Reporting

5.6.10.1 Cx progress reports will be provided at the following frequency:

5.6.10.1(1) Every second month during the Design stage;

5.6.10.1(2) Every second month during early Construction;

5.6.10.1(3) Monthly during pre-functional checkout;

5.6.10.1(4) Every two weeks during Functional Testing, training, and handover;

5.6.10.1(5) Monthly during the first six (6) months following the date of Substantial Completion; and

5.6.10.1(6) Every second month during the six (6) to twelve (12) months following the date of Substantial Completion.

5.6.10.2 Cx progress reports will provide the following information:

5.6.10.2(1) Status of all Cx process deliverables;

5.6.10.2(2) Dashboard summary of the status of pre-functional testing and Functional Testing activities for all major systems;

5.6.10.2(3) Summary of work completed since last progress report; and

5.6.10.2(4) Commissioning issues log.

5.6.11 Commissioning Schedule

5.6.11.1 The CxP will develop a Cx schedule outline, which will be iterated through and developed with input from the Authority and the Design-Builder at the Cx meetings.

5.6.11.2 Integration with Construction Schedule: The Cx Schedule will be a subsection of the Construction Schedule, include clear and visible dependencies to Construction activities and highlight all critical-path Commissioning activities.

5.6.11.3 Cx schedule will be drafted during the Design phase and updated throughout Construction.

5.6.11.4 Cx Schedule will be developed and maintained with sufficient detail to facilitate the witnessing of or participation in Commissioning activities by the CxP and the Authority and any other required parties throughout all phases of the Commissioning process. Cx Schedule will include complete details of each step in the Commissioning process for every discipline/division.

5.6.11.5 The Design-Builder will provide key milestone dates, including for the following work, activities or events (Refer to the Design-Build Agreement, Schedule 11 [Design and Construction Schedule] for further requirements):

5.6.11.5(1) Envelope Cx Activities:

5.6.11.5(1)(a) High-level summary of each envelope subtrade's on-site activities and construction checklist completion period;

5.6.11.5(1)(b) Envelope mock-ups; and

5.6.11.5(1)(c) Performance testing.

5.6.11.5(2) Connection to Utilities;

5.6.11.5(3) Permanent power availability;

5.6.11.5(4) Completion of building or zone enclosure;

5.6.11.5(5) Communications/IT Infrastructure:

5.6.11.5(5)(a) All phased Construction tasks and milestones identified in Section 2.9, including CPPS installation and inspections, network ready date, Authority and telecommunication carrier install and commissioning activities;

5.6.11.5(5)(b) Structured cabling testing and Commissioning; and

5.6.11.5(5)(c) Software Assessment Form (SAF) submission and review process.

5.6.11.5(6) Dates that various building systems require network and internet connectivity;

5.6.11.5(7) Building clean & readiness for ventilation activation for each air system (by zone);

5.6.11.5(8) All four phases of Commissioning for all individual systems, including sub-tasks detailing the Cx activities of each phase;

5.6.11.5(9) Startup of all major equipment (contractor and vendor);

5.6.11.5(10) Time period for submission of completed test reports;

5.6.11.5(11) Time period for Authority review of completed test reports;

5.6.11.5(12) Clinical equipment commissioning activities;

5.6.11.5(13) Systems integration testing, integrated Life Safety Systems testing, integrated systems operational testing, and clinical functional scenario testing;

5.6.11.5(14) Demonstration to consultants, Demonstration to Authority;

5.6.11.5(15) O&M Manual draft and final submissions;

5.6.11.5(16) Training for all equipment and systems;

5.6.11.5(17) Commissioning Report issuances;

5.6.11.5(18) Seasonal Testing;

5.6.11.5(19) Monitoring Based Commissioning (MBCx):

5.6.11.5(19)(a) MBCx report issuances; and

5.6.11.5(19)(b) MBCx process meetings.

5.6.11.6 The CxP will work with the Design-Builder, and the Design-Builder's trades will provide equipment start-up and Commissioning durations to the CxP for inclusion in the Cx schedule.

5.6.11.7 Related to the above, the Design-Builder will ensure that Communications Rooms are Equipment-ready in accordance with Section 7.8.

5.6.11.8 After development of the initial Cx schedule, the CxP will hold a meeting with all applicable members of the Design-Builder's team and the Authority's Representatives to review the key steps and milestones and identify opportunities to optimize the Commissioning schedule.

5.6.11.9 The Design-Builder will address review comments from the Authority and the Authority's Representatives throughout Construction as required to ensure that the Cx schedule meets all of the requirements set out in this Schedule 1 [Statement of Requirements].

5.6.11.10 The Design-Builder will work with the Authority's IM/IT team to develop a Commissioning schedule that allows sufficient time for the Authority's IM/IT team to plan, install and Commission network infrastructure supporting both Authority and Design-Builder systems. Incorporate schedule interdependencies with IM/IT work as required.

5.6.11.11 Related to the above, Design-Builder will ensure that Communications Rooms are ready for IT installations on the scheduled dates. This includes sealed floors, dust-free spaces, provision of ventilation and/or temporary cooling, and other applicable requirements.

5.6.11.12 The FMO Network is a critical component for the Commissioning of electrical and mechanical IP building systems. Design-Builder will ensure that the FMO Network is fast-tracked to support accelerated and optimized Commissioning schedules of FMO buildings systems.

5.6.11.13 All Design-Builder Building Systems equipment and Equipment described in Appendix 1H [Equipment and Furniture] will be included in the Cx schedule. The party responsible for providing the equipment or Equipment item will provide input into the Cx schedule for timelines and durations. Additionally, the party responsible for providing the item will provide input as to which Building Systems are required for each key item, as this will inform the Cx schedule.

5.6.11.14 Acceptance testing dates and durations will be included in the overall Cx schedule. Dates/durations will be provided by the Design-Builder and the Authority, based on each party's responsibility for supplying the given item.

5.6.11.15 The Cx schedule will be reviewed at every Commissioning meeting, and an updated version will be issued along with Commissioning meeting minutes.

5.6.12 Commissioning Issues Log

5.6.12.1 A Commissioning issues log will be maintained by the CxP throughout the Commissioning process and regularly updated and distributed to the Project team.

5.6.12.2 The Commissioning issues log will include all items identified during CxP design reviews as well as issues noted during static inspections, start-up, Functional Testing, demonstration to Consultant, demonstration to Authority, training, or any other Commissioning activities. This includes any Authority stakeholder review comments related to Commissioning or the associated documentation.

5.6.12.3 All issues noted by the CxP must be tracked in the Commissioning issues log for full transparency. Separate 'internal' deficiency lists will not be used.

5.6.12.4 Commissioning issues log entries will document how each issue has been resolved and be included in the final Commissioning Report.

5.6.13 Construction Stage Commissioning Process

5.6.13.1 Commissioning will generally follow the phases described in this section. Each phase is applicable to every major and/or separate system.

5.6.13.2 Phase 1 – System and Equipment Readiness

5.6.13.2(1) The Commissioning team will perform and document static verification before start-up activities and Functional Testing.

5.6.13.2(2) Static completion includes verifying that the products used comply with the shop drawings and performance documents, that the name-plate data is recorded on the data collection sheets, and that the installation of the equipment is in conformance with manufacturer recommendations and industry standard trade practices.

5.6.13.2(3) The CxP will review the status of Design-Builder's adherence to the Authority Software Assessment Form process for Building Systems software.

5.6.13.2(4) During this Project phase, the CxP will conduct biweekly site visits to review equipment and system installations, review readiness for activation, and report on serviceability of installed equipment. These will be documented in Commissioning field review reports.

5.6.13.3 Phase 2 – System Activation, Testing and Balancing

5.6.13.3(1) Each piece of equipment and end-use device will receive a documented pre-functional checkout by the installing contractor and/or equipment vendor. No sampling strategies will be used. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of the equipment or subsystems of the given system.

5.6.13.3(2) Subcontractor and vendor pre-functional checkout procedures for each system will capture the full functionality, including integration with other Building Systems, to ensure system readiness for successful Phase 3 Verification of System Performance by the CxP.

5.6.13.3(3) CxP will witness major equipment and system start-ups and provide field review reports summarizing each site visit. This will include, at a minimum, the systems identified in the subsequent division-specific Commissioning requirements of Section 5.6.

5.6.13.3(4) Pre-functional checklists and test reports will be submitted and reviewed by the CxP, prior to proceeding with Phase 3 Functional Testing activities.

5.6.13.3(5) Any issues requiring follow up, or that are otherwise relevant to Commissioning or future operation and maintenance, will be recorded in the Commissioning issues log.

5.6.13.3(6) Construction or installation errors, or any other issues or deficiencies impacting the ability of the Equipment, equipment or systems to meet the design intent, will be identified on the issues log and remedied prior to proceeding to Phase 3 Functional Testing activities.

5.6.13.4 Phase 3 – Verification of System Performance

5.6.13.4(1) Phase 3 Activities will be sequenced as follows in the Commissioning schedule: Functional Testing, integration testing, and demonstration to Design-Builder’s Design Professional Engineer of Record.

5.6.13.4(2) Scheduling of Functional Testing and integration testing activities will be shared with the Authority in advance, in a manner that allows for witnessing by the Authority’s subject matter experts when the Authority has determined there is value in attending specific tests. Test dates must be provided to the Authority at least 14 days in advance.

5.6.13.4(3) Functional Testing will be completed with reports submitted by the CxP, reviewed by the Authority, and confirmed to be free of

any issues impacting their ability to meet the design intent prior to proceeding with integration testing of any associated systems.

5.6.13.4(4) Functional Testing

5.6.13.4(4)(a) Functional Testing will be performed using functional performance test plans specific to the requirements of the Project. The CxP will determine the methods of functional performance testing for each piece of equipment or system to be tested and develop project-specific functional performance test scripts for all equipment and systems.

5.6.13.4(4)(b) Functional Testing will include functional real-time tests of systems in all major modes of operation, catastrophic modes, equipment failure modes, recovery from loss of primary energy source (electricity or natural gas) and verification of spare capacity.

5.6.13.4(4)(c) The CxP will coordinate, witness, document and report on functional performance tests performed by installing contractors and submit completed test reports using the approved Functional Testing forms from the Cx Plan.

5.6.13.4(4)(d) Use of ‘Commissioning Agent’ subtrades by installing contractors, if applicable, does not lessen the responsibility of the CxP in the Functional Testing or any other aspects of the Commissioning process.

5.6.13.4(4)(e) CxP sampling rates for Functional Testing of identical or near-identical pieces of equipment will be as defined in Appendix 1L [Commissioning Roles and Requirements], at a minimum. For Equipment, equipment or systems in which a minimum sampling rate is not identified, the CxP sampling rate will be as set out in ASHRAE Guideline Table 1.1, Annex N, for final Commissioning process testing.

5.6.13.4(4)(f) The CxP will confirm system readiness for testing prior to conducting Functional Testing. Functional Testing will be selectively witnessed by the Authority, and the Design-Builder is responsible for ensuring that systems, including applicable controls, are ready for testing and will provide advance notification to the Authority if they are not,

to save the Authority from making unnecessary visits to the site.

5.6.13.4(5) Demonstration to Design-Builder's Design Professional Engineer of Record

5.6.13.4(5)(a) Following Functional Testing, formal demonstration of various systems and equipment to the Design-Builder's Design Professional Engineer of Record is required where identified in Appendix 1L [Commissioning Roles and Responsibilities], Table 3, at a minimum. The scope of review, observations, deficiencies, and any other recommended adjustments or actions will be documented in a summary report by the Engineer of Record and captured in the Commissioning issues log for follow up.

5.6.13.4(6) Systems Integration Testing

5.6.13.4(6)(a) The Design-Builder will complete systems integration testing to verify that the design intent has been met for all integrations between systems.

5.6.13.4(6)(b) Systems integration testing will be performed by the CxP and may be completed as part of Functional Testing or may be required as a discrete step following the completion of Functional Testing of individual integrated systems. The Commissioning Plan will define the Design-Builder's proposed approach and include the necessary test plans.

5.6.13.4(6)(c) The Commissioning schedule will identify dependencies between readiness of integrated systems (completed Functional Testing) required to proceed with systems integration testing.

5.6.13.4(7) Integrated Life Safety Systems (ILSS) Testing (ULC S1001)

5.6.13.4(7)(a) The ILSS test plan will be developed by the CxA and executed by the Design-Builder.

5.6.13.4(7)(b) The ILSS test plan will be produced in accordance with ULC S1001 Standard and include all systems. Interactions with the fire alarm system will be tested, including fire suppression, mechanical, access control, generator/ATS, nurse call, radios, vertical transportation, public address, lighting controls, and multimedia/AV, and pneumatic tube systems.

5.6.13.4(7)(c) Design-Builder's design team will be responsible for facilitating test plan development by providing any clarifications or details requested by the CxA regarding systems or integration design intent.

5.6.13.4(7)(d) Dry Run Testing

5.6.13.4.7.(d).1 Dry tun testing will be performed by the Design-Builder according to the ILSS test plan to be witnessed and documented by the CxP using the test forms provided.

5.6.13.4.7.(d).2 Retesting will be completed as required for the CxP to verify that all interactions are functioning to meet the design intent prior to calling for testing with the Authority and CxA.

5.6.13.4(7)(e) ILSS Testing with CxA

5.6.13.4.7.(e).1 Upon Authority and CxA review of the successful dry run test report, and prior to occupancy walkthroughs with the AHJ, the Design-Builder will schedule formal ILSS testing with the Authority and CxA.

5.6.13.4.7.(e).2 ILSS testing will be performed by the Design-Builder according to the ILSS test plan be witnessed and documented by the CxA using the same test forms.

5.6.13.4(8) Integrated Systems Operational Testing (ISOT)

5.6.13.4(8)(a) The ISOT plans will be developed by the CxA and executed by the Design-Builder.

5.6.13.4(8)(b) The ISOT plans will be developed by the CxA in consultation with the Authority to validate multiple key operational scenarios and as final acceptance tests for complex systems, including the items below. The Design-Builder will assume that the following tests are required at a minimum:

5.6.13.4.8.(b).1 Loss of utility power;

5.6.13.4.8.(b).2 Clinical functional scenarios;

(b).2.1 Multi-code scenarios;

(b).2.2 Elevator call scenarios; and

(b).2.3 Site security lockdown event.

5.6.13.4.8.(b).3 Outbreak control scenario;

5.6.13.4.8.(b).4 Catastrophic event / post-disaster scenario(s);

5.6.13.4.8.(b).5 Loss of network communication;

5.6.13.4.8.(b).6 Redundancy testing – mechanical & electrical equipment failure scenarios;

5.6.13.4.8.(b).7 Central plant capacity testing;

5.6.13.4.8.(b).8 Heating plant operation on secondary energy source;

5.6.13.4.8.(b).9 Load shedding / load management;

(b).9.1 HVAC; and

(b).9.2 Electrical.

5.6.13.4.8.(b).10 Integration Matrix functions;

5.6.13.4.8.(b).11 Energy Centre Control Room monitoring and control provisions and workflows; and

5.6.13.4.8.(b).12 Emergency service connections.

5.6.13.4(8)(c) Design-Builder's design team will be responsible for facilitating test plan development by providing any clarifications or details requested by the CxA regarding systems or integration design intent.

5.6.13.4(8)(d) Dry Run Testing

5.6.13.4.8.(d).1 Dry run testing will be performed by the Design-Builder according to the ISOT Plans be witnessed and documented by the CxP using the test forms provided.

5.6.13.4.8.(d).2 Retesting will be completed as required for the CxP to verify that all systems included in the test plans are functioning to meet the design intent prior to calling for testing with the Authority and CxA.

5.6.13.4(8)(e) Integrated Systems Operational Testing with CxA

5.6.13.4.8.(e).1 Upon Authority and CxA review of successful dry run ISOT test report, and prior to occupancy walkthroughs with the AHJ, the Design-Builder will schedule formal ISOT testing with the Authority and CxA.

5.6.13.4.8.(e).2 ISOT testing will be performed by the Design-Builder according to the ISOT plan be witnessed and documented by the CxA using the same test forms.

5.6.13.5 Phase 4 – Demonstration and Acceptance

5.6.13.5(1) Submission of all Phase 3 Cx test documentation for any given system, review of test documentation by the Authority, and confirmation that systems are free of any issues impacting their ability to meet design intent is a prerequisite to scheduling of Phase 4 activities.

5.6.13.5(2) Demonstration to Authority

5.6.13.5(2)(a) Design-Builder will organize a demonstration of each system to the Authority. This applies to

equipment and systems belonging to all disciplines/divisions.

5.6.13.5(2)(b) Each demonstration will be provided by qualified personnel with appropriate project-specific knowledge and capability. This will include the installing contractor, manufacturer's representative, controls contractor, balancer and CxP, as necessary.

5.6.13.5(2)(c) Typical demonstration will include review of installation (system walk-down), demonstration of core functionality, failure modes / redundancy / back-up modes of operation, and integrations.

5.6.13.5(2)(d) The agenda for each session will be defined by the Authority based on submitted test results and any other relevant considerations.

5.6.13.5(2)(e) Demonstrations will range from a couple of hours for smaller or simpler systems to full-day or multi-day sessions for larger and more complex systems.

5.6.13.5(3) Training

5.6.13.5(3)(a) The Design-Builder and its CxP will coordinate Equipment, equipment, and overall Building System training for each system provided by the Design-Builder. Training will also include integration of Authority-provided Equipment with Design-Builder-provided systems when integration exists. Training will include the following items as well as the training requirements listed in applicable division-specific specification sections and in the Appendices to this Schedule. Where the requirements of the division-specific specification sections exceed the requirements listed here, they are deemed to be in addition to those listed here:

5.6.13.5.3.(a).1 The Design-Builder will provide the Authority with the number of training sessions by the 90% submission for the Authority to confirm the resources needed for each session.

5.6.13.5.3.(a).2 The Design-Builder will provide Commissioning Plan draft submissions beginning at the design stage, which will include progressive updates to the training program, including proposed training agendas for all systems and equipment.

5.6.13.5.3.(a).3 The number of sessions will be determined by the type of training needed and the number of persons requiring the training. The Design-Builder will present the proposed number of sessions to the Authority for approval, and the Authority, acting reasonably, will work with the Design-Builder to confirm the training sessions needed for each system.

5.6.13.5.3.(a).4 The Design-Builder and the systems manufacturer will provide the Authority with training for their installed Equipment, equipment, components, and systems as stand-alone and integrated systems, including detailed operating and maintenance instructions.

5.6.13.5.3.(a).5 The Design-Builder will schedule all training activities and coordinate with all necessary parties, including the Authority, for the dates and resources required.

5.6.13.5.3.(a).6 The Design-Builder will provide the Authority with a finalized training session agenda and training plan reference materials at least six (6) months prior to the proposed training dates.

5.6.13.5.3.(a).7 Each training session will be scheduled to allow for adequate sessions for each system and adequate operator shift coverage as approved by the Authority.

5.6.13.5.3.(a).8 Training will be provided at the Site, delivered by instructors who are certified by the manufacturer to conduct training, and be professionally video recorded for future self-paced training.

5.6.13.5.3.(a).9 The Design-Builder will structure each session to start with the classroom instruction for the overall system, followed by hands-on instruction for equipment, with the services of the equipment supplier as required. Demonstrate the start-up and shutdown of each system as well as the general operation for end users.

5.6.13.5.3.(a).10 The Design-Builder will provide separate levels of training for the following roles:

(a).10.1 System administrator;

(a).10.2 Supervisor;

(a).10.3 Maintainer; and

(a).10.4 Operator/end user.

5.6.13.5.3.(a).11 Training session topics will include the following:

(a).11.1 Types of installed systems;
(a).11.2 Design intent and design criteria;
(a).11.3 Use of O&M manuals;
(a).11.4 Design constraints;
(a).11.5 Environmental responsiveness of the system;
(a).11.6 General system operation, interaction and integration with other systems;
(a).11.7 Controls, including various operating modes, such as start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms;
(a).11.8 Energy efficiency functions, adjustments and optimization;
(a).11.9 Relevant health and safety issues;
(a).11.10 Equipment Lock-Out and Tag-Out procedures. The Design-Builder will provide written procedures, in conjunction with the Authority's lock-out and tag-out program, complete with photos and video for lock-out and tag-out procedures. Applicable confined space entry procedures will be included as well;
(a).11.11 Service, maintenance, diagnostics, repairs and replacement sources;
(a).11.12 Factory training for specialty equipment, which is better provided at the vendor's facilities; and
(a).11.13 Use of reports and logs.

5.6.14 Commissioning Report and Systems Manual

5.6.14.1 Substantial Completion Cx Report

5.6.14.1(1) Design-Builder will submit a preliminary Commissioning Report within the 30 days leading up to Substantial Completion

5.6.14.1(2) The preliminary Commissioning Report will confirm that all Construction phase Commissioning activities have been completed and will comprise all associated documentation, including completed test reports and records of completed training, as set out in the Commissioning Plan.

5.6.14.1(3) The Authority will be provided with a digital version of the Commissioning Report with electronic bookmarks to facilitate navigation of all sections and subsections.

5.6.14.2 Final Cx Report

5.6.14.2(1) An updated final Commissioning Report will be submitted prior to completion of the Warranty Period. The final Commissioning Report will include all new and updated Commissioning documentation generated since the time of the preliminary Commissioning Report, including the updated Commissioning issues log, seasonal and deferred test reports, monitoring-based Commissioning process reports and meeting records, and warranty review reports.

5.6.14.3 Systems Manual

5.6.14.3(1) The Design-Builder will address the LEED v4 Commissioning prerequisite and credit requirements for systems manual, current facilities requirements, and O&M plan, as well as Project O&M manual requirements and Commissioning manual (CSA Z8002) requirements by incorporating these elements into a single consolidated systems manual for each discipline (as applicable).

5.6.14.3(2) The Design-Builder will coordinate with the Authority to confirm the desired structure and organization for the systems manual, beginning in the Design Development Stage and continuing through progressive Commissioning Plan development and collaborative meetings.

5.6.14.3(3) The systems manual will be submitted within the 30 days leading up to Substantial Completion.

5.6.15 Seasonal Testing and Adjustments

5.6.15.1 CxP will lead seasonal testing of HVAC systems and provide summary reports documenting all findings.

5.6.15.2 Any issues identified will be included in an updated Cx issues log distributed with the report.

5.6.15.3 Seasonal testing will be performed as three (3) discrete activities scheduled approximately 3, 6 and 9 months after Construction-stage Functional Testing for the associated systems.

5.6.15.4 The Design-Builder will schedule testing to be conducted during shoulder season and peak heating/cooling outdoor conditions.

5.6.15.5 Refer to subsequent Division 23 Commissioning for detailed requirements.

5.6.16 Monitoring-Based Commissioning

5.6.16.1 The Monitoring-Based Commissioning (MBCx) process requirements of LEED v4 will be executed in coordination with the requirements of Section 7.6.3.34 Measurement and Verification (M&V) and of Schedule 5, Appendix 2 [Measurement & Verification Plan].

5.6.16.2 The MBCx plan will incorporate analysis and reporting from the M&V metering and data collection systems as well as the AFDDR systems of Division 25.

5.6.16.3 The CxP will develop the MBCx plan in consultation with the Authority to align data collection, analysis and reporting with Authority requirements and existing energy analysis systems.

5.6.16.4 The MBCx plan will include quarterly MBCx process meetings during the first year of operation to review M&V, AFDDR, and MBCx reports with the project team and determine an action plan for identifying and correcting operational errors and deficiencies, including review and update of the Commissioning issues log.

5.6.16.5 Collaborative meetings will be held between the Design-Builder and the Authority to develop the MBCx plan at the following milestones:

5.6.16.5(1) Design Development phase;

5.6.16.5(2) Construction Documents phase;

5.6.16.5(3) Prior to the first BMS controls Submittal;

5.6.16.5(4) Prior to the start of Commissioning of BMS and metering devices; and

5.6.16.5(5) Substantial Completion (prior to start of monitoring period).

5.6.16.6 Updated MBCx plan submissions will be provided by Design-Builder within 3 weeks of each of these meetings.

5.6.17 Warranty Review

5.6.17.1 The CxP will lead a warranty review meeting and review on site 2 months prior to the end of the 24-month Warranty Period. This will include a review of the following items:

5.6.17.1(1) Authority feedback on;

5.6.17.1(1)(a) Previously noted warranty issues;

5.6.17.1(1)(b) Occupant comfort and indoor environmental quality; and

5.6.17.1(1)(c) Maintenance team observations, challenges, and issues to be considered for a warranty claim.

5.6.17.1(2) Status of O&M manuals and as-builts;

5.6.17.1(3) Status and findings of MBCx process;

5.6.17.1(4) Unresolved Commissioning issues log items; and

5.6.17.1(5) Walkthrough for physical review of noted items.

5.6.17.2 The CxP will summarize the results of the warranty review meeting and walkthrough in a summary report and an updated Commissioning issues log.

5.6.18 Openings (Division 08)

5.6.18.1 Doors and Door Hardware Commissioning

5.6.18.1(1) Design-Builder will perform and document a complete inspection of all interior and exterior doors and door hardware for the Facility to verify that the correct door type, hardware, operating devices, and electromechanical locking components are installed at the proper locations and fully functional.

5.6.18.1(2) The Commissioning checklist will include the following: Smoke seals, acoustic seals, sweeps, gaskets, mutes, door protection, astragals, door bottoms, strike plates, strike plate dust box, electric strikes, automatic operator, lockset, mag lock, closer, closer adjustment for back-check and spring preload (opening effort in lbs/ft or kg/m) and closing speed and latching speed, door slamming shut, wall stops, hold-open device, door-to-frame gaps, door-to-floor gaps, door-to-frame alignment, fire-rating labels, door lites, signage affixed to door in accordance with AAADM, remote keyed position, keypad, access card reader, coordinator and correct action thereof, no field modifications to the door assembly have been performed that void the label, excess holes in door or frame, missing or broken parts, door racked or warped or bent or dented, frame bent or dented, hinge bind, correct hinges installed, weather tight or airtight, caulking and sealants, auto door opening and closing speeds, body guard sensor(s), super scan sensors, correct lock function, key operation, correct keying, screws and fasteners flush to surfaces, screw heads not stripped, through bolts for operator arm, through bolts for astragal, latch protector, power transfer hinge or cable, auto door bottom and function, seals and weather-stripping, and door bottom gasket not damaged or torn.

5.6.18.1(3) Completion of door and door hardware pre-functional checkout (along with pre-functional checkout of Division 28 access controls) for each opening in a given area will be a prerequisite to Functional Testing of access controls for that area.

5.6.18.1(4) Functional Testing of door hardware will include functional verification of all door hardware operation, including all manual and automatic opening, closing, latching and locking functions as

well as access control and security functions, such as door contact switches, request-to-exit devices, card readers and keypads required for Division 28. Testing will include verification of complete sequences of operation, adjustment of timing of opening and closing, and overrides.

5.6.18.2 Refer to subsequent section for additional envelope Commissioning requirements as related to Division 8 scope of work.

5.6.19 Envelope

5.6.19.1 Testing will be in accordance with the requirements set out in Section 6.1.1.6 Building Envelope Requirements; and

5.6.19.2 The complete building envelope system is required to be included in the Commissioning Plan. Full compliance with LEED Energy and Atmosphere Credit, Enhanced Commissioning – Option 2 Envelope Commissioning is required, and the Design-Builder will procure a Building Enclosure Commissioning Authority in accordance with the LEED requirements for this credit and will report all findings directly to the CxA.

5.6.19.3 NIBS Guideline 3 (referenced in subsequent heading) will be the primary standard defining building envelope Commissioning process; however, all other requirements of LEED v4 Energy and Atmosphere Credit, Enhanced Commissioning – Option 2 Envelope Commissioning must also be met.

5.6.19.4 National Institute of Building Sciences (NIBS) Guideline 3

5.6.19.4(1) The Envelope Commissioning process planned and executed in line with NIBS Guideline 3 Building Enclosure Commissioning (BECx) process.

5.6.19.4(2) The BECx plan will be a sub-component of the overall Commissioning Plan and will read as a standalone document as well.

5.6.19.4(3) The BECx plan will align with NIBS Guideline 3 and define the Design-Builder’s approach to meeting its specific requirements from Schematic Design through occupancy and operations phase.

5.6.19.5 Building Enclosure Specialist (BES)

5.6.19.5(1) The Design-Builder's Building Envelope Consultant, as defined in Section 6.1.1.6 Building Envelope Requirements, will act in the role of Building Enclosure Specialist (BES) and fulfill all requirements of this role set out in NIBS Guideline 3.

5.6.19.6 Building Enclosure Commissioning Provider (BECxP)

5.6.19.6(1) Design-Builder will designate a qualified representative to act in the role of Building Enclosure Commissioning Provider (BECxP) and fulfill all requirements of the Building Enclosure Commissioning Authority (BECxA) role as set out in NIBS Guideline 3.

5.6.19.6(2) The BECxP is an entity who is designated by the team to formally document the Project-specific BECx. This entity must be trained, experienced and knowledgeable in the process of building enclosure Commissioning and possess basic architectural and building science knowledge of the design, performance, systems and construction related to the building enclosure.

5.6.19.6(3) The BECxP role may be fulfilled by the BES, CxP or an additional member of the team.

5.6.20 Equipment Commissioning

5.6.20.1 All Design-Builder- and Authority-supplied Equipment will be included in the Commissioning process and the Commissioning Plan.

5.6.20.2 The Design-Builder will ensure that the building services infrastructure needed for the Commissioning of each piece of Equipment is reviewed and coordinated for all Equipment (including Authority supplied) and those requirements identified in the Cx Schedule.

5.6.20.3 The Design-Builder will produce a list of all Equipment items for tracking of the Commissioning and handover process and associated deliverables.

5.6.20.4 The Commissioning Plan will include a standard Equipment handover form to be completed for all Equipment items, as well Equipment-specific manufacturer's Commissioning documentation, as applicable. The Design-Builder will develop a Project-specific form in consultation with the Authority.

5.6.20.5 For Authority-supplied Equipment and clinical Commissioning, ensure that clinical Equipment start-up is included in the Commissioning schedule and user training is provided. In addition, clinical Equipment will be stress tested as part of the integrated test plan prepared by CxP. As per CSA-Z8001, integration testing will be done under actual conditions, and not simulated conditions. The intent is to go through various scenarios, under normal and emergency power, to ensure that the integrated systems work as required. This includes developing real-life scenarios so that the clinical team can run through various steps to validate clinical function of the room. The test plan will include input from the Authority;

5.6.20.6 The prerequisite for integrated systems testing of Equipment and Building Systems equipment includes acceptance test reports that have been accepted by the Design-Builder and approved by the Authority, as follows:

5.6.20.6(1) The Design-Builder will Commission all Building Systems serving Equipment prior to overall acceptance testing of Equipment and

Building Systems equipment supplied by the Design-Builder; refer to Appendix 1H [Equipment and Furniture];

5.6.20.6(2) Overall acceptance testing of Equipment and Building Systems equipment that is supplied by the Authority is by the Authority, but it is a prerequisite that Commissioning of Building Systems serving Equipment and Building Systems equipment is complete prior to acceptance testing; refer to Appendix 1H [Equipment and Furniture];

5.6.20.6(3) Equipment and Building Systems equipment Commissioning will be included as a Commissioning schedule line item. At the Design-Builder's Cx meetings, the Authority's Representatives will provide input as to which Building Systems are needed for Cx of Equipment and Building Systems equipment, and this will be included in the overall Cx schedule; and

5.6.20.6(4) End-to-end integrated testing will be performed as part of the Commissioning of Equipment and Building Systems equipment.

5.6.20.7 Medical Device Reprocessing (MDR) Department Equipment

5.6.20.7(1) The Commissioning Plan and Cx Schedule will include details of MDR Commissioning, including steam sterilizer equipment operational qualification in accordance with CAN/CSA Z314.

5.6.21 CC Equipment Commissioning

5.6.21.1 The Design-Builder will:

5.6.21.1(1) Not commence the vendor acceptance testing of Equipment until such time the Authority is satisfied that the thirty (30) day demonstration period as set out in Section 2.7.6.2 is complete;

5.6.21.1(2) Ensure that all Facility services such as plumbing, electrical and HVAC systems, as required for the Commissioning of Equipment, are provided;

5.6.21.1(3) Ensure that communications systems are operational and full network access will be available;

5.6.21.1(4) Ensure that there is no disruption of services during the Commissioning process from commencement of Commissioning through to completion;

5.6.21.1(5) Ensure that, as service loads such as the cyclotron's and linear accelerator's power and chilled water supply are added to the Energy Centre, all systems balancing is completed as each piece of Equipment comes online;

5.6.21.1(6) Coordinate with the Authority during the Authority's operational readiness activities, which will commence prior to Substantial Completion;

5.6.21.1(7) Provide Equipment training to all Staff, such as those listed in this Schedule that are involved with the Authority's Commissioning process;

5.6.21.1(8) Provide the Authority with radiation safety measurements, which will then be collected and approved by the Authority's RSO prior to the Design-Builder's application for the appropriate licenses from the CNSC; and

5.6.21.1(9) Not proceed with vendor acceptance testing activities until such time as all required licenses have been obtained such as the license to operate for the purpose of Commissioning.

5.6.21.2 Installation, vendor acceptance testing and integrated end-to-end testing of CC specialty Equipment such as cyclotrons, linear accelerators, CTs, etc., will be completed by the Design-Builder under the supervision and approval of the Authority's medical physicist and/or Staff described in Section 5.6.20.5.

5.6.21.3 Ensure all Equipment is operating to the manufacturer's recommendations and that seamless information transfer between Equipment through designated network is provided and accepted by the Authority.

5.6.21.4 The Commissioning and vendor acceptance testing process will be carried out in accordance with BC Cancer Medical Physics requirements and requires approval by the Authority's medical physicist and/or Staff as described in Section 5.6.20.5.

5.6.21.5 Upon completion of the installation and vendor acceptance testing, the Design-Builder will cooperate with the Authority and allow access to the Authority's complement of Staff such that they can commence the Authority's operational readiness activities that will occur sequentially as the Equipment is deemed acceptable. Staff will vary depending on the Equipment and will generally include the following:

5.6.21.5(1) Linear accelerators, PET-CTs, SPECT-CTs, CTs by the Authority's medical physicists;

5.6.21.5(2) Cyclotron by the Authority's cyclotron operators;

5.6.21.5(3) Radiochemistry Equipment by the Authority's radiochemists; and

5.6.21.5(4) Radiation monitoring system by the Authority's RSOs, etc.

5.6.21.6 The Authority's operational readiness activities include items such as:

5.6.21.6(1) Using quality assurance Equipment to measure, validate and collect Equipment parameters;

5.6.21.6(2) Populating information into the treatment planning software or other validation software; and

5.6.21.6(3) End-to-end testing of the system from simulation to treatment planning to treatment delivery for all Equipment.

5.6.22 Acoustic and Vibration Performance Testing

5.6.22.1 The Design-Builder is responsible for all acoustic performance testing, corrective actions and any follow-up to demonstrate and achieve compliance with the requirements as set out in this Schedule.

5.6.22.2 Post-Construction performance verification tests will be carried out by the Design-Builder to confirm the sound isolation performance of the partitions in the Facility, as follows:

5.6.22.2(1) A test plan that includes the number and location of all tests will be provided to the Authority for approval before testing begins;

5.6.22.2(2) These tests will be performed at the first opportunity once rooms are enclosed and before Construction is complete so that corrective measures can be applied to spaces that are not yet complete;

5.6.22.2(3) Testing will be done on two separate examples of each unique wall assembly having a required STC rating of 45 or more (Refer to Appendix 1D [Acoustic, Vibration, and Noise Control Measures]) and on all operable partitions;

5.6.22.2(4) ASTC tests will be done wherever the test standard can be applied;

5.6.22.2(5) NIC tests will be done only when ASTC standard test requirements cannot be met;

5.6.22.2(6) The measured ASTC or NIC performance will be within five (5) points of the STC ratings specified in Appendix 1D [Acoustic, Vibration, and Noise Control] to be deemed compliant;

5.6.22.2(7) Where internal partitions include doors and/or windows, the target STCC of the partition will be calculated based on the assigned STC ratings for each Component as specified in Appendix 1D [Acoustic, Vibration, and Noise Control] and the area of each Component. The measured ASTC or NIC value will be within 5 points of the calculated STCC value to be deemed compliant;

5.6.22.2(8) Compliance test reports will be provided to the Authority for review and approval and will include calculations of the STCC, where applicable, for each partition tested, along with the measured ASTC or NIC value;

5.6.22.2(9) If any tests fail to achieve the required ASTC rating, then another two (2) walls of similar construction assembly will be tested to establish the extent of the problem. Corrective measures will be implemented as required and all failing walls retested; and

5.6.22.2(10) It is the responsibility of the Design-Builder to provide remedial Work and retesting.

5.6.22.3 Post-Construction performance verification tests will be carried out to measure interior noise levels from HVAC systems in 10% of all occupied spaces as listed in Appendix 1D [Acoustic, Vibration, and Noise Control], as follows:

5.6.22.3(1) A test plan that includes the number and location of all tests will be provided to the Authority for approval before testing begins;

5.6.22.3(2) The testing will be focused, though not exclusively, on those spaces located closest to the mechanical spaces serving the various areas of the Facility;

5.6.22.3(3) Testing will be performed after completion of air and water balancing, with all systems operating as expected under normal conditions;

5.6.22.3(4) Where the requirements in Appendix 1D [Acoustic, Vibration, and Noise Control] are not met, measures will be taken to reduce the HVAC noise levels to below the levels specified in Appendix 1D [Acoustic, Vibration, and Noise Control]; and

5.6.22.3(5) Rooms that fail to meet the NC requirements will be re-tested after noise reduction has been applied, and an additional 5% of rooms will be tested.

5.6.22.4 Post-Construction performance verification tests will be carried out to confirm that the building envelope reduces noise ingress from exterior sources, including mechanical systems, emergency generators, road traffic, and rail traffic in accordance with the requirements of Appendix 1D [Acoustic, Vibration, and Noise Control]:

5.6.22.4(1) A test plan that includes the number and location of all tests will be provided to the Authority for approval before testing begins.

5.6.22.4(2) The testing will be focused on those spaces most affected by each of the exterior noise sources.

5.6.22.4(3) Testing will be performed after completion of air and water balancing, with all systems operating as expected under normal conditions and under emergency generator operations.

5.6.22.4(4) Where the requirements in Appendix 1D [Acoustic, Vibration, and Noise Control] are not met, measures will be taken to meet the

requirements of Appendix 1D [Acoustic, Vibration, and Noise Control] in all spaces with similar potential noise issues.

5.6.22.4(5) Rooms that fail to meet the requirements will be re-tested after noise controls have been applied, and an additional 5% of rooms will be tested.

5.6.22.5 Post-Construction performance verification tests will be carried out to measure the reverberation times to demonstrate compliance with Appendix 1D [Acoustic, Vibration, and Noise Control], as follows:

5.6.22.5(1) The testing will include all Critical Acoustic spaces, as identified in Appendix 1D [Acoustic, Vibration, and Noise Control], all conference and meeting rooms with a seating capacity requirement greater than ten (10) chairs, and a minimum of 10% of spaces where maximum RT60 requirements have been specified in Appendix 1D [Acoustic, Vibration, and Noise Control] with an appropriate cross-section of space types;

5.6.22.5(2) A test plan that includes the number and location of all tests will be provided to the Authority for approval before testing begins;

5.6.22.5(3) Where the measured reverberation times fail to meet the requirements set out in Appendix 1D [Acoustic, Vibration, and Noise Control], corrective measures will be taken to achieve the targets, and similar corrective measures will then be applied to all other spaces of the same type; and

5.6.22.5(4) Rooms that fail to meet the RT60 requirements will be re-tested after corrective measures have been taken, and an additional 5% of rooms of that type will be tested.

5.6.22.6 Post-construction performance verification tests will be carried out to measure the exterior noise levels in exterior spaces associated with the Facility and at the property lines of the neighbouring properties to demonstrate compliance with the exterior noise limits set out in Appendix 1D [Acoustics, Vibration, and Noise Control], both for normal operations and for operations with emergency power generation:

5.6.22.6(1) A test plan that includes the number and location of all tests will be provided to the Authority for approval before testing begins;

5.6.22.6(2) Testing will be performed after completion of air and water balancing, with all systems operating as expected under normal conditions and during emergency generator operations;

5.6.22.6(3) The testing will be focused, though not exclusively, on those spaces located closest to the noise sources and their associated intakes/exhausts and other related noise-source paths;

5.6.22.6(4) Where the exterior noise limits in Appendix 1D [Acoustic, Vibration, and Noise Control] are not met, measures will be taken to reduce the HVAC noise levels to below the levels set out in Appendix 1D [Acoustic, Vibration, and Noise Control];

5.6.22.6(5) Outdoor spaces that fail to meet the noise limit requirements will be re-tested after noise reduction has been applied. Further failure to meet the minimum performance requirements will require further noise control and re-testing to demonstrate compliance; and

5.6.22.6(6) If noise issues arise within the first year of the Warranty Period, the Design-Builder will investigate and correct any Defects and provide demonstration of compliance after corrections are installed.

5.6.22.7 Post-construction testing will be carried out to verify compliance with the vibration requirements of Section 5.12.10 and Appendix 1D [Acoustic, Vibration, and Noise Control Measures], as follows:

5.6.22.7(1) Ambient, rail, parking garage activity, and simulated footfall vibration measurements will be taken in 25% of the spaces requiring vibration levels at or below the Operating Theatre criterion as specified in Appendix 1D [Acoustic, Vibration and Noise Control Measure], as well as a sample cross-section of other space and structure types;

5.6.22.7(2) A test plan that includes the number and location of all tests and the intended staged activities (e.g., walking speeds and locations), parking garage activities (location, speed, and vehicle type) and background activities (e.g., mechanical systems, rail vibration) will be provided to the Authority for approval before testing begins;

5.6.22.7(3) Testing of non-mechanical sources will be performed as soon as practical once the structure is complete;

5.6.22.7(4) Testing for mechanical system vibration will be performed after completion of air and water balancing, with all systems operating as expected under normal conditions and under emergency generator operations;

5.6.22.7(5) The spaces selected for measurement will be representative of all spaces and structural configurations;

5.6.22.7(6) Footfall measurements for each space should include heel drops to determine natural frequencies, followed by fast paced walking in corridors and slow paced walking within the room at appropriate paces expected to excite the fundamental modes of the structural bays;

5.6.22.7(7) Parking garage activity should include operation of a vehicle nearest the most vibration-sensitive spaces with measurements taken in the sensitive space; and

5.6.22.7(8) Where the criteria in Appendix 1D [Acoustic, Vibration, and Noise Control Measures] are found to be exceeded, issues will be corrected to meet the design requirements and the spaces will be re-tested along with an additional 10% of similar spaces.

5.6.23 Conveying Equipment (Division 14)

5.6.23.1 Elevators

5.6.23.1(1) Draft elevator Commissioning check sheets will be developed at design stage for inclusion in the Commissioning Plan, then updated as required during Construction.

5.6.23.1(2) Detailed check sheets will be prepared by the elevator Sub-contractor to verify that all aspects of basic elevator operation meet specified requirements, including directional lanterns, position indicators, dispatching, hall buttons, disabled persons' audible/visual indications, ride quality/performance, user training, elevator management system, and FFEO and concurrent operations, such as standby power and MEO.

5.6.23.1(3) All of the above functions will be tested and verified using the check sheets, prior to use by the public.

5.6.23.1(4) All check sheets will be submitted to the CxP for review and inclusion in the Commissioning report.

5.6.23.1(5) Testing and Inspection

5.6.23.1(5)(a) An inspection for life safety and code compliance by the applicable safety authority will be provided for each elevator.

5.6.23.1(5)(b) Any deficiencies noted during the inspection by the applicable safety authority will be completed by the Design-Builder.

5.6.23.1(5)(c) In addition to the inspection by the applicable authority for life safety and code compliance, an inspection for material, workmanship and elevator performance will be carried out by the Design-Builder's elevator Consultant.

5.6.23.1(6) Pre-Test of Elevators (FFEO/Standby Power/MEO).

5.6.23.1(6)(a) A minimum of one (1) site visit will be held for pre-testing of the fire alarm, standby power generator,

and MEO signals, as well as elevator operation under these conditions, with the electrical Subcontractor.

5.6.23.1(6)(b) This will include for activation of various fire alarm initiating devices (heat and smoke detectors) to trigger recall of the elevator(s).

5.6.23.1(6)(c) This will include for activation of the transfer switch signal, as well as pre-transfer signal if applicable, to trigger standby power operation of the elevator(s).

5.6.23.1(6)(d) This will occur after the elevator work on each elevator is completed and will be scheduled by the elevator Sub-Contractor.

5.6.23.1(6)(e) The Design-Builder and the Authority will attend all testing, verification and Commissioning. Coordination and scheduling of this joint attendance will be provided by the CxP.

5.6.23.1(7) Final Test of Elevators (FFEO/Standby Power/MEO)

5.6.23.1(7)(a) A minimum of two (2) site visits will be held for final testing of the fire alarm, standby power generator, and MEO signals, as well as elevator operation under these conditions: a minimum of one (1) visit with the Electrical Subcontractor and the relevant elevator safety authority, and a minimum of one (1) visit with the electrical Subcontractor and the BC Building Code inspector from the local jurisdiction.

5.6.23.1(7)(b) This will include for activation of various fire alarm initiating devices (heat and smoke detectors) to trigger recall of the elevator(s).

5.6.23.1(7)(c) This will include for activation of the transfer switch signal, as well as pre-transfer signal if applicable, to trigger standby power operation of the elevator(s).

5.6.23.1(7)(d) This will occur after the elevator work on each elevator is completed and will be scheduled by the elevator Subcontractor.

5.6.23.1(7)(e) The elevator contractor will also visit site for integrated systems testing with the Commissioning team, which will include operation of elevator under different clinical and failure testing scenarios including integration with emergency power and code blue.

5.6.23.1(8) The CxP will include the above elevator testing items in the Commissioning Schedule, will witness testing, and will include testing documentation in the Commissioning Report.

5.6.23.2 Pneumatic Tube System

5.6.23.2(1) Pneumatic Tube System (PTS) Commissioning will be in accordance with the general Cx process requirements of Section 5.6 and include the additional activities set out below.

5.6.23.2(2) Design-Builder's PTS vendor representative will support the Authority in planning and execution of testing to ensure that sample integrity and blood component/product integrity is maintained when transported through the Pneumatic Tube System.

5.6.23.2(3) CxP Functional Testing will include all aspects of PTS operation, including integration with the building management system.

5.6.24 Fire Suppression (Division 21)

5.6.24.1 Fire protection systems, along with fire safety measures, provide protection to occupants in the Facility. The Commissioning Plan will specify which tests are to be carried out and the timing, sequence, and approval process for the tests.

5.6.24.2 The Commissioning process will address the verification and performance testing of the fire protection systems that detect, alarm against, and control the spread of fire and smoke.

5.6.24.3 All fire protection system elements will be Commissioned. These include the following:

5.6.24.3(1) Fire suppression services, including automatic sprinkler systems; standpipes; portable extinguishers; and special extinguishing media systems;

5.6.24.3(2) Smoke management systems;

5.6.24.3(3) Fire and smoke detection systems, alarm systems, and other annunciators;

5.6.24.3(4) Voice communication and public address systems;

5.6.24.3(5) Fire and smoke separators, including closures and other hardware;

5.6.24.3(6) Egress and evacuation systems;

5.6.24.3(7) Emergency Power Systems; and

5.6.24.3(8) Fire safety and emergency plans.

5.6.24.4 Commissioning of fire protection systems will be completed in accordance with the following standards:

5.6.24.4(1) NFPA 3: Standard for Commissioning of Fire Protection and Life Safety Systems;

5.6.24.4(2) CAN/ULC-S1001 Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems; and

5.6.24.4(3) CAN/CSA Z8001-13 Commissioning of Healthcare Facilities.

5.6.24.5 The CxP will act in the role of Fire Commissioning Agent (FCxP), having the meaning set out in NFPA 3:

5.6.24.5(1) Fire Commissioning Agent (FCxP): A Person or entity identified by the owner who leads, plans, schedules, documents, and coordinates the fire protection and Life Safety Systems Commissioning team and implements the fire protection and Life Safety Systems Commissioning process.

5.6.24.6 The intent of Commissioning as required in the abovementioned NFPA and CSA standards is to supplement, not replace, the requirements of the AHJ and applicable codes.

5.6.24.7 The CxP will witness fire pump start-up and verification and provide a field review report summarizing the results.

5.6.24.8 Acceptance Testing

5.6.24.8(1) Acceptance testing involves a number of activities that must be performed, witnessed, and documented. These activities are as follows:

5.6.24.8(1)(a) Functional test of the system alarm device;

5.6.24.8(1)(b) Trip and water-transit time for dry-pipe systems;

5.6.24.8(1)(c) Trip test for deluge/pre-action systems;

5.6.24.8(1)(d) Pressure-reducing valve test (if present);

5.6.24.8(1)(e) Hydrostatic test; and

5.6.24.8(1)(f) Main drain test.

5.6.24.9 The completion of these tests can be documented on the contractor’s material and test certificate; however, these activities will also be witnessed by the CxP and documented in a field review report.

5.6.24.10 Acceptance testing will be detailed in the Commissioning schedule for each individual Fire protection system.

5.6.25 Plumbing (Division 22)

5.6.25.1 Plumbing systems will be Commissioned. These include the following:

5.6.25.1(1) Incoming municipal water pressure;

5.6.25.1(2) Pressure-reducing valve set points and downstream pressures;

5.6.25.1(3) Domestic water systems – hot water, hot water recirculation and cold water;

5.6.25.1(4) Central and individual tempered water mixing valve set points;

5.6.25.1(5) Balancing of the domestic hot water recirculation systems;

5.6.25.1(6) Setting of temperature limit stops on all shower valves with maximum temperatures recorded for each fixture;

5.6.25.1(7) Plumbing fixtures including adjustments of all flush valves;

5.6.25.1(8) Booster pumps;

5.6.25.1(9) Set points for all control devices;

5.6.25.1(10) Testing and certification of all backflow preventers;

5.6.25.1(11) Medical gas equipment start-up and certification inspections;

5.6.25.1(12) Water purification systems;

5.6.25.1(13) Non-potable and process water system(s);

5.6.25.1(14) Drainage systems – sanitary, storm and drainage vents;

5.6.25.1(15) Sump pump operation and controls, capacity/flow testing, and verification of all alarms; and

5.6.25.1(16) External water distribution and storm water connections.

5.6.25.2 Documentation will be provided for start-up, configuration, adjustment, Functional Testing, and recording of the operational data for all plumbing equipment listed above and for any other equipment applicable to the design.

5.6.25.3 Functional Testing plans will incorporate the performance criteria specified in Table 1 of CAN/CSA Z317.1

5.6.25.4 The CxP will witness major equipment and system start-ups and provide field review reports summarizing each site visit. This will include the following items at a minimum, as applicable:

5.6.25.4(1) Reverse osmosis filtration system;

5.6.25.4(2) Domestic water booster pumps;

5.6.25.4(3) Domestic hot water heaters; and

5.6.25.4(4) Medical air and vacuum equipment.

5.6.26 Mechanical (Division 23)

5.6.26.1 General

5.6.26.1(1) Fire Protection, Plumbing and HVAC Systems will be Commissioned in accordance with CAN/CSA Z8001 and applicable CAN/CSA Z317 series.

5.6.26.1(2) Final system testing will be performed after systems and integrated systems are completely installed and functional.

5.6.26.2 Objectives

5.6.26.2(1) Verify that installed equipment, systems and integrated systems operate in accordance with the Agreement and design criteria and intent.

5.6.26.2(2) Ensure appropriate documentation is compiled into the O&M Manual and Commissioning Report.

5.6.26.2(3) Effectively train Facility Management Staff.

5.6.26.3 The Design-Builder’s trades will assist in the Cx process by operating equipment and systems, troubleshooting and making adjustments as required.

5.6.26.3(1) Systems will be operated in all modes to ascertain that they function correctly, consistently and efficiently in all expected operating modes. Systems will be operated interactively with each other as intended in accordance with the Project Agreement and design criteria.

5.6.26.3(2) During these checks, adjustments will be made to enhance performance to meet the Authority’s operational and functional requirements in accordance with this Agreement.

5.6.26.4 Commissioning phases will include the following:

5.6.26.4(1) Pre-design;

5.6.26.4(2) Design;

5.6.26.4(3) Construction;

5.6.26.4(4) Facility start-up;

5.6.26.4(5) Verification;

5.6.26.4(6) Performance testing;

5.6.26.4(7) Acceptance and interim acceptance; and

5.6.26.4(8) Post-Substantial Completion acceptance.

5.6.26.5 HVAC

5.6.26.5(1) The HVAC systems include all air, water, gas, fuel transfer systems and associated support systems designed to provide heating, cooling and ventilation within the Facility.

5.6.26.5(2) Commissioning will include start-up, verifications, performance testing, post-Substantial Completion evaluation, and documentation of the installation and performance of all HVAC systems. Commissioning should begin with individual pieces of equipment before moving to complete system and should progress from manual operation to fully automatic operation under building automation control.

5.6.26.5(3) During development of the Commissioning Plan and preparation of the check sheets, consideration will be given to the performance criteria specified in Table 1 of CAN/CSA Z317.2.

5.6.26.6 Phase 1 – System and Equipment Readiness

5.6.26.6(1) Follow the standard Commissioning process requirements defined elsewhere in Section 5.6.

5.6.26.6(2) Pre-finishing inspection and testing of critical rooms will be completed in accordance with the recommendations of CSA Z8001, Annex J & K.

5.6.26.6(2)(a) The Design-Builder's CxP and design team will provide documented inspections of any ORs, ICUs, PACUs, and/or special service areas following drywall installation but prior to final finishes.

5.6.26.6(2)(b) The Design-Builder will provide all necessary equipment such as blower door assemblies and pressure and airflow monitoring equipment required to obtain the leakage rate of the room shells prior to closing in the rooms.

5.6.26.6(2)(c) The Design-Builder will perform remedial actions to caulking and sealing as required to ensure that the architectural features of the room that affect air seals and air flow are constructed in accordance with the room design such that the room will meet relative pressurization requirements of the design,

CAN/CSA-Z317.2, and other accreditation guidelines and standards applicable for the type of area being tested.

5.6.26.7 Phase 2 – System Activation, Testing and Balancing

5.6.26.7(1) The CxP will witness major equipment and system start-ups and provide field review reports summarizing each site visit. This will include the following items at a minimum:

5.6.26.7(1)(a) Chillers;

5.6.26.7(1)(b) Heat pumps;

5.6.26.7(1)(c) Heat recovery chillers;

5.6.26.7(1)(d) Steam boilers;

5.6.26.7(1)(e) Hot water boilers;

5.6.26.7(1)(f) Cooling towers; and

5.6.26.7(1)(g) Room pressure monitoring and airflow controls.

5.6.26.7(2) Controls – Refer to subsequent Integrated Automation section.

5.6.26.7(3) Testing and Balancing (TAB)

5.6.26.7(3)(a) At least 90-days prior to the start of TAB, the Design-Builder's TAB agent Subcontractor will produce a TAB plan, which includes the following components:

5.6.26.7.3.(a).1 A list of the test instruments that are planned to be used in the TAB process. Each instrument manufacturer, model number, and test application must be included;

5.6.26.7.3.(a).2 A description of the testing procedure for each HVAC system to be tested, which will list all of the equipment to be tested for each system and the techniques to be used for the testing procedure;

5.6.26.7.3.(a).3 A summary of all control setpoints required by the Design, along with the methodology that will be used to determine each. This will include differential pressure setpoints for hydronic systems and static pressure setpoints and minimum outdoor air damper positions for ventilation systems;

5.6.26.7.3.(a).4 Consideration of the system diversity factor in the determination of the above.;

5.6.26.7.3.(a).5 Procedure for verifying maximum ductwork velocity to meet Schedule 3 requirements;

5.6.26.7.3.(a).6 A list of the Subcontractors that are required to assist with the TAB process, along with the expectations of each of the Subcontractors to successfully complete a total system balance;

5.6.26.7.3.(a).7 Expectations of the controls Subcontractor, including the required level of completion/control of BMS software, system access, and the development of global overrides for system maximum performance testing;

5.6.26.7.3.(a).8 An outline of the required Construction level of completion prior to starting the TAB process; and

5.6.26.7.3.(a).9 A realistic estimate of the time required to complete the TAB process, broken out by each major system.

5.6.26.7(3)(b) The Design-Builder will organize an On-Site meeting with the TAB agent and the Authority prior to the start of TAB to review the TAB plan.

5.6.26.7(3)(c) The CxP will review air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.

5.6.26.7(3)(d) Air and water balancing will be completed with reports submitted prior to proceeding with Functional Testing of the associated systems.

5.6.26.8 Phase 3 – Verification of System Performance

5.6.26.8(1) Functional Testing

5.6.26.8(1)(a) Functional Testing plans will incorporate the performance criteria specified in Table 1 of CAN/CSA Z317.2.

5.6.26.8(1)(b) During Functional Testing, systems will be operated at full capacity in various modes to determine if they function correctly and consistently at peak efficiency. Systems will operate interactively with each other as intended in accordance with the contract documents and design criteria.

5.6.26.8(1)(c) The Outbreak Control Zones will be Commissioned, balanced and demonstrated to the Authority in real

time as part of the verification process prior to Substantial Completion.

5.6.26.8(1)(d) Steam system Functional Testing will include all stages of heating, up to and including full load, using steam venting as required, to validate operation of the full sequence of operations for the steam plant.

5.6.26.8(1)(e) Functional Testing plans will include details of expected available load and methods for false loading.

5.6.26.8(1)(f) Functional Testing results must clearly identify any aspects of operation that could not be tested at full operating capacity. Seasonal testing will then be scheduled to complete full load testing during the first year of operation.

5.6.26.8(2) Seasonal Testing

5.6.26.8(2)(a) Regardless of the results of the initial Functional Testing completed during the Construction period, the following systems will undergo seasonal testing to ensure that functionality has been verified during through a complete range of operating conditions and loads:

- 5.6.26.8.2.(a).1 Hydronic heating system;
- 5.6.26.8.2.(a).2 Chilled and condenser water systems;
- 5.6.26.8.2.(a).3 Heat recovery systems;
- 5.6.26.8.2.(a).4 Air handling units; and
- 5.6.26.8.2.(a).5 HVAC zone controls / terminal units.

5.6.26.8(2)(b) Seasonal testing will include review of the following:

- 5.6.26.8.2.(b).1 Discussion with building operations team to gather feedback on any known issues or challenges in operation, and occupant complaints. Any items reported will be included in the scope of seasonal review;
- 5.6.26.8.2.(b).2 HVAC equipment start-up, failover and lead/lag switchover during peak heating/cooling conditions;
- 5.6.26.8.2.(b).3 Available capacity during peak heating/cooling load conditions;
- 5.6.26.8.2.(b).4 Equipment turndown capability, on/off cycling;
- 5.6.26.8.2.(b).5 Staging of heat recovery, free cooling, and boiler/chiller;
- 5.6.26.8.2.(b).6 Range of variable flow systems pump/fan modulation;

5.6.26.8.2.(b).7 Review of BMS trend reports and alarms; and

5.6.26.8.2.(b).8 Any remaining open Commissioning issues log items.

5.6.27 Integrated Automation (Division 25)

5.6.27.1 Controls Integration Meetings

5.6.27.1(1) The Design-Builder will organize a series of controls integration review meetings with the design team, BMS contractor, CxP, Authority, and CxA to review control strategies, integration and overall design intent.

5.6.27.1(2) Meetings will be held at the following milestones:

5.6.27.1(2)(a) During the Construction Documents phase;

5.6.27.1(2)(b) During BMS controls Submittal Review Procedure; and

5.6.27.1(2)(c) After finalized BMS controls Submittal, prior to Functional Testing.

5.6.27.2 Prior to the Functional Testing phase, CxP will perform periodic On-Site reviews to witness BMS Commissioning during pre-functional checkout and provide field review reports summarizing each site visit. This will include the following items at a minimum:

5.6.27.2(1) Integration with equipment local controllers

5.6.27.2(2) Sensor and actuator sample calibration checks

5.6.27.2(3) BMS Graphics and Trend Log readiness for Functional Testing

5.6.27.3 The BMS Subcontractor will submit a completed end-to-end point checkout report and verification of programming functionality for a given system prior to Functional Testing by the CxP.

5.6.27.4 The BMS Subcontractor will configure multi-trend reports for each system prior to Functional Testing by the CxP to support analysis of system operation.

5.6.27.5 Multi-trend log reports will include groups of dependent operating parameters such as those set out in the examples below:

5.6.27.5(1) Outdoor and return air damper positions, heating and cooling control valve positions and outdoor, return and supply air temperatures;

5.6.27.5(2) Lead/Lag pump speeds, bypass control valve positions, end of line differential pressure reading and setpoint and

5.6.27.5(3) Terminal unit damper position, control valve position, supply air temperature, and radiant panel control valve position.

5.6.27.6 The Design-Builder will provide a BMS that is free of alarms and manual overrides and integrated with the Authority's existing system, prior to final acceptance by the Authority.

5.6.28 AFDDR Approach

5.6.28.1 AFDDR will be provided and configured by the Design-Builder in consultation with the Authority;

5.6.28.2 The AFDDR software will be configured and deployed in consultation with the Authority and made available for use by the Commissioning team toward the end of Construction with reports to the satisfaction of the Authority through two years after the date of Substantial Completion.

5.6.28.3 The CxP will participate in this approach as follows:

5.6.28.3(1) Conduct a detailed review of control sequences, metering systems, and their integration with AFDDR. This is to involve at a minimum the CxP, the Design-Builder's mechanical designer, electrical designer, controls contractor, mechanical contractor, electrical contractor, and AFDDR system integrator. One review session will be held prior to shop drawing development, and one meeting will be held after shop drawings have been reviewed;

5.6.28.3(2) Bench testing of controls: all BMS control sequences will be tested virtually, witnessed by the CxP prior to implementation on Site. This will include simulating sensor performance to observe control system response to ensure logic follows the sequence of operations. Provide testing at the vendor's system lab with integration components to demonstrate full functionality;

5.6.28.3(3) CxP will facilitate the development of AFDDR logic and rules. The CxP will facilitate a BMS/AFDDR integration meeting with the Commissioning team during the development of the AFDDR requirements;

5.6.28.3(4) CxP will consult facilities management personnel on AFDDR logic and rules to prioritize which are important and which may not be needed;

5.6.28.3(5) Implementation of AFDDR logic and rules is to be completed by the AFDDR provider;

5.6.28.3(6) The AFDDR provider is required to have its system in place and ready to pull in data points as soon as the BMS or other control system components come online;

5.6.28.3(7) The AFDDR system will be Commissioned by the AFDDR provider and overseen and reviewed by the CxP. This will include checking that points are mapped over to the AFDDR system properly, and that the AFDDR system reports are accurate. Samples/mock-ups of each system will be checked and verified prior to deployment and use of the AFDDR system;

5.6.28.3(8) The AFDDR system will become active as the Building Systems come online. The AFDDR system will be used as a Commissioning tool by the CxP to supplement on-Site physical checks;

5.6.28.3(9) Automated test scripts will be implemented and facilitated by the CxP for testing of distributed or repetitious systems. This is to be used to supplement but not replace hands-on testing. This may include, for example, running automated test scripts for VAV boxes, where the AFDDR system will cause VAV boxes to open and provide fault if there is no increase in airflow, or open heating coil valves and provide a fault if there is no increase in supply air temperature;

5.6.28.3(10) Automated test scripts will be reviewed by the Cx team to ensure that there is no unintended damage to equipment; e.g., in the example above, only a subset of VAV's would be tested at the same time, so as to not trigger a rapid change in system air flow rate that could cause damage to ductwork;

5.6.28.3(11) CxP will utilize the AFDDR system as a tool for its reviews and to inform the CxA reporting during the warranty period. Development of the scope and frequency of reporting will be determined in consultation with the Authority; and

5.6.28.3(12) AFDDR system reporting will used as part of the MBCx plan described in Section 5.6.15.

5.6.29 Electrical (Division 26)

5.6.29.1 Electrical Commissioning will be carried out on complete and fully integrated systems in compliance with CAN/CSA Z8001, CSA Z32, and other applicable codes and standards.

5.6.29.2 The extent of Commissioning will be as called for under this section of the specifications and under other specific sections.

5.6.29.3 Commissioning will include system verification of the following:

5.6.29.3(1) Operation;

5.6.29.3(2) Workmanship;

5.6.29.3(3) Conformance of equipment and materials to the specifications;

5.6.29.3(4) Record Documentation;

5.6.29.3(5) O&M manuals and instructions;

5.6.29.3(6) Documentation in the reporting of testing and adjustment; and

5.6.29.3(7) Commissioning.

5.6.29.4 Commissioning will include Factory Acceptance Testing (FAT) and Factory Site Acceptance Testing (SAT) and witnessing by CxA, representative(s) from the Authority, and the Design-Builder's electrical engineer for the following:

5.6.29.4(1) Emergency Power Generation System (FAT and SAT);

5.6.29.4(2) High Voltage Automatic Transfer Switches (FAT and SAT);

5.6.29.4(3) Clinical & IM/IT UPS (FAT and SAT);

5.6.29.4(4) Power Transformers (FAT); and

5.6.29.4(5) 25kV and 12.5kV switchgear (FAT).

5.6.29.5 Electrical Systems to be Commissioned and demonstrated will include the following:

5.6.29.5(1) High voltage electrical distribution (Utility and emergency power);

5.6.29.5(2) HV, LV Switchgear;

5.6.29.5(3) Power Transformers;

5.6.29.5(4) CDPs;

5.6.29.5(5) HV Automatic transfer switches;

5.6.29.5(6) UPS systems;

5.6.29.5(7) Emergency Power System, including generators, paralleling and control switchgear system, including fuel systems and fuel supply/return;

5.6.29.5(8) Generator load bank and load bank connections;

5.6.29.5(9) Distribution transformers;

5.6.29.5(10) Branch circuit panelboards;

5.6.29.5(11) Isolated power systems;

5.6.29.5(12) Feeder cables and connections from Utility and generators down to the CDP level are to be Commissioned (including megger

testing and infrared scanning under the full rated circuit ampacity);

5.6.29.5(13) Building ground electrode;

5.6.29.5(14) Patient reference ground;

5.6.29.5(15) Receptacles;

5.6.29.5(16) MCCs;

5.6.29.5(17) Lighting control systems;

5.6.29.5(18) Emergency unit equipment;

5.6.29.5(19) Branch circuit wiring;

5.6.29.5(20) Electrical systems identification;

5.6.29.5(21) Lightning protection;

5.6.29.5(22) UPS systems;

5.6.29.5(23) Automatic power factor correction and harmonic correction systems;

5.6.29.5(24) Phase balance and polarity;

5.6.29.5(25) Power quality and monitoring, including power factor correction and harmonic mitigation;

5.6.29.5(26) Operation of circuit breakers, interlocking schemes, ground fault monitoring, line isolation monitoring, etc.;

5.6.29.5(27) CSA Z32 testing; and

5.6.29.5(28) Electric vehicle charging equipment.

5.6.29.6 Emergency Generator and Automatic Transfer Switches

5.6.29.6(1) The CxP will prepare the emergency generator and automatic transfer switch checklists and submit them to the Authority for review. Checklists will be prepared by the CxP during the Design phase and during the installation and start-up phase.

5.6.29.6(2) Commissioning Plan will include details regarding:

5.6.29.6(2)(a) Site acceptance test plans for the master control system, including all paralleling and load management control.

5.6.29.6(2)(b) Test script and check sheets will be provided to detail all how all sequences of operation will be tested, including redundancies and failure scenarios and use of load banks to facilitate testing.

5.6.29.6(2)(c) Details will be provided on how the master control system reporting will be used for acceptance testing and configured for ongoing maintenance and testing by the Authority. Representative sample master control system reports to be provided for review.

5.6.29.6(2)(d) Operational Test and Maximum Site Design Load Test (in accordance with CSA 282, Part 10).

5.6.29.7 Electrical Sub-Metering

5.6.29.7(1) Vendor representative will perform Commissioning of electrical sub-metering equipment.

5.6.29.7(2) The Commissioning Report to be submitted will include a record of meter installation, a complete list of all devices installed, configuration of IP addresses, labels, PT and CT ratios, and configuration of interface with BMS system (Fieldserver or similar) or outside monitoring and/or collection of metering data.

5.6.29.8 Lighting Controls

5.6.29.8(1) Pre-functional checkout for the lighting control system will be performed and documented by a qualified manufacturer's representative. Test reports documentation will include:

5.6.29.8(1)(a) As-built controls diagrams and/or device schedules, including device number, device type, installed location (room name and #), and record of as-Commissioned settings;

5.6.29.8(1)(b) A control narrative describing the operation of the system as programmed. The narrative must include a description of the control strategies used for typical zones, occupancy sensor and daylighting settings, programmed schedule groups, and details on any integration with BMS, security, fire alarm, AV or other systems; and

5.6.29.8(1)(c) A list of any issues noted during Commissioning.

5.6.29.8(2) Functional Testing of lighting controls will be completed and documented by the CxP following the requirements of ASHRAE 90.1 for Independent Functional Testing.

5.6.29.9 The CxP will witness major equipment and system start-ups and provide field review reports summarizing each site visit. This will include the following items at a minimum:

5.6.29.9(1) Generator and ATS;

5.6.29.9(2) Emergency electrical power supply operational test and maximum site design load test (in accordance with CSA 282, Part 10);

5.6.29.9(3) Energy management system;

5.6.29.9(4) Electrical sub-metering;

5.6.29.9(5) UPS; and

5.6.29.9(6) Lighting controls.

5.6.30 Food Services Equipment (Including Walk-in Cold Rooms, Freezers and Refrigerators)

5.6.30.1 Ensure that all Equipment is operational and safe for use. Perform all tests, adjustments and balancing prior to Equipment demonstrations and instructions.

5.6.30.2 Provide a thermal scan of all walk-in refrigerator and freezer rooms (walls, doors and ceiling panels) to ensure airtight seams and penetrations. Provide a report to indicate that the installation matches the energy efficiency performance of all panels and joints as set out in the manufacturer’s construction standards.

5.6.30.3 Use qualified personnel acceptable to and approved by the appropriate Design-Builder design consultant, named in Appendix 1L [Commissioning Roles and Responsibilities], to conduct tests.

5.6.30.4 Tests that fail to verify acceptable performance of Equipment and systems will be repeated after corrective measures are carried out. Repeat the tests until acceptable performance levels are achieved.

5.6.30.5 Provide competent instruction in the use of the Equipment, using Equipment specialists. Instructions will consist of and include:

5.6.30.5(1) Classroom sessions in the use of O&M manuals;

5.6.30.5(2) "Hands on" Equipment operation and maintenance for all modes of operation and adjustments; and

5.6.30.5(3) Procedures for dealing with Equipment failure, abnormal operation or emergency situations.

5.6.30.6 Commissioning will be consistent with the overall Project requirements as referenced in the conditions of this Agreement.

5.6.30.6(1) Fire Suppression System

5.6.30.6(1)(a) All as required to constitute a fully approved system installed in accordance with NFPA96, 17A, ULC/ORD 1254.6 and AHJ; and

5.6.30.6(1)(b) Test: Complete system to be tested, Commissioned and certified.

5.6.30.6(2) Exhaust Hood

5.6.30.6(2)(a) All as required to constitute a fully approved system installed in accordance with NFPA96, 17A, and AHJ; and

5.6.30.6(2)(b) Test: Complete system to be tested, Commissioned and certified.

5.6.31 Factory Acceptance Testing Requirements

5.6.31.1 Minimum Factory Acceptance Testing Requirements are identified in Appendix 1Z [Electrical Factory Acceptance Testing Requirements].

5.6.32 Communications (Division 27)

5.6.32.1 In consultation with the Authority, incorporate Division 27 (communications) into the Commissioning Plan. Refer to Appendix 1L [Commissioning Roles and Responsibilities] for a summary of the systems included in the Commissioning process. Please note that the list of systems included in Appendix 1L [Commissioning Roles and Responsibilities] is derived from CSA Z8001 and is not intended to be exhaustive. The Design-Builder will ensure that all CSA Z8001 systems applicable to the Project are included in the Commissioning process, even if not listed in Appendix 1L [Commissioning Roles and Responsibilities].

5.6.32.2 The CxP will review the communications equipment’s compatibility with the infrastructure in the building (power, data, thermal requirements, etc.).

5.6.32.3 The CxP will include communications equipment Commissioning in the overall Commissioning schedule.

5.6.32.4 The CxP will include communications equipment in the overall integrated systems test plan.

5.6.32.5 The Design-Builder will coordinate a series of collaborative meetings with Authority stakeholders (including Clinical, IM/IT, Integrated Protection Services / Security) and Design-Builder design team and vendors, at mid-Construction stage, to review functional requirements for Division 27 systems prior to Commissioning to ensure a common understanding of design intent and test plans. The Commissioning Plan documentation will be updated as required based on these meetings.

5.6.32.6 The CxP will work with the Design-Builder and vendors to develop pre-functional checkout documentation for each system that captures the full functionality,

including integration with other Building Systems to verify system readiness for Functional Testing with the CxP.

5.6.32.7 Communication Rooms

5.6.32.7(1) The Design-Builder will develop Communications Room readiness functional checklists that will verify Communications Room construction, cleanliness and communication installation. Communications Room readiness checklists will be completed prior to the Design-Builder's request to turn Communications Rooms over to the Authority for deployment of IM/IT equipment. At a minimum, the CxP will verify that functional requirements for the following are successfully met:

5.6.32.7(1)(a) Communication Pathways and Tray Installation;

5.6.32.7(1)(b) Doors;

5.6.32.7(1)(c) Security;

5.6.32.7(1)(d) Flooring;

5.6.32.7(1)(e) Signage;

5.6.32.7(1)(f) Smoke Detector, Heat Detector, Suppression Systems;

5.6.32.7(1)(g) Wall Covering;

5.6.32.7(1)(h) Equipment Racks/Cabinets Installation;

5.6.32.7(1)(i) IM/IT Rack Mounted UPS;

5.6.32.7(1)(j) Emergency and Utility Power Outlets;

5.6.32.7(1)(k) Grounding; and

5.6.32.7(1)(l) Cable Certification Test Results.

5.6.32.7(2) The CxP will review all communication cable and fiber cable testing results as they are submitted and report on progress. Progress reporting documents will facilitate tracking of progressive test report submissions based on how the Work is completed. This should include, at a minimum, a breakdown by individual ethernet cable and fiber systems for individual areas of the Facility and/or Communications Rooms.

5.6.32.8 Intercom

5.6.32.8(1) A pre-functional checklist will ensure that the following functions, at a minimum, are successfully tested for every device:

5.6.32.8(1)(a) Device number, device type, installed location (room name and number), and drawing reference are verified;

5.6.32.8(1)(b) The extension number at each intercom station is checked and the directory verified;

5.6.32.8(1)(c) Station to station call is placed;

5.6.32.8(1)(d) Sub-station to master station call is placed;

5.6.32.8(1)(e) From master station, call to individual sub-station is placed;

5.6.32.8(1)(f) An all-station call is placed;

5.6.32.8(1)(g) Clarity of audio at each instance is checked;

5.6.32.8(1)(h) Video from intercom captures clear image of caller at master intercom station;

5.6.32.8(1)(i) All interconnections with other systems are checked; and

5.6.32.8(1)(j) Door release is operating successfully without generating door forced open alarm in access control system.

5.6.32.8(2) Prior to the Functional Testing phase, the CxP will perform periodic On-Site reviews to witness intercom Commissioning during pre-functional checkout and provide field review reports summarizing each site visit. This will include the following items, at a minimum:

5.6.32.8(2)(a) Intercom door station installation;

5.6.32.8(2)(b) Intercom master station installation;

5.6.32.8(2)(c) Intercom headend installation;

5.6.32.8(2)(d) Intercom cable installation and termination;

5.6.32.8(2)(e) Intercom labelling and device identification; and

5.6.32.8(2)(f) Intercom integration with Building Systems.

5.6.32.8(3) The CxP will confirm all specified functionalities including integrations as part of Functional Testing.

5.6.32.9 Public Address

5.6.32.9(1) A pre-functional checklist will ensure that the following functions, at a minimum, are successfully tested for every device:

5.6.32.9(1)(a) Device number, device type, installed location (room name and number), and drawing reference are verified;

5.6.32.9(1)(b) Public address announcements are clear and free of distortion; and

5.6.32.9(1)(c) Speaker decibel levels are within defined levels.

5.6.32.9(2) Prior to the Functional Testing phase, the CxP will perform periodic On-Site reviews to witness public address Commissioning during pre-functional checkout and provide field review reports summarizing each site visit. This will include the following items at a minimum:

5.6.32.9(2)(a) Public address speaker installation;

5.6.32.9(2)(b) Public address headend installation;

5.6.32.9(2)(c) Public address cable installation and terminations; and

5.6.32.9(2)(d) Public address labelling and device identification.

5.6.32.9(3) The CxP will confirm all specified functionalities including integrations as part of Functional Testing.

5.6.32.10 CATV/IPTV

5.6.32.10(1) A pre-functional checklist will ensure that the following functions, at a minimum, are successfully tested for every device:

5.6.32.10(1)(a) Available channels can be viewed without distortion with clear and synchronized audio; and

5.6.32.10(1)(b) The CxP will review CATV outlets for provision of cable types and quantity in the Facility in accordance with the Authority’s requirements for all rooms designated to have CATV.

5.6.32.11 Nurse Call

5.6.32.11(1) A pre-functional checklist will ensure that the following functions, at a minimum, are successfully tested for every device:

5.6.32.11(1)(a) Device number, device type, installed location (room name and number), and drawing reference are verified;

5.6.32.11(1)(b) The correct nurse call device(s) are installed in the correct locations;

5.6.32.11(1)(c) An accurate nurse call label is displayed on the master station when an alarm is generated;

5.6.32.11(1)(d) The dome light illumination matches the type of nurse call alarm generated; and

5.6.32.11(1)(e) The Wayfinding dome light illumination matches the defined response pathway for the nurse call alarm location.

5.6.32.11(2) The CxP will consult with the Authority (including stakeholders such as FMO, IM/IT, clinical staff and security) for review of nurse call Functional Testing plans to ensure that all test plans are acceptable to the Authority.

5.6.32.11(3) The CxP will include nurse call Wayfinding verification in the nurse call Functional Testing plan.

5.6.32.11(4) The CxP will coordinate with the Authority to facilitate participation by the Authority's code blue response team in nurse call Functional Testing.

5.6.32.11(5) Prior to the Functional Testing phase, the CxP will perform periodic On-Site reviews to witness nurse call Commissioning during pre-functional checkout and provide field review reports to summarize each site visit. This will include the following items, at a minimum:

5.6.32.11(5)(a) Care team base will have clear Line of Sight to Patient room nurse call dome lights and Wayfinding dome lights;

5.6.32.11(5)(b) Patient room and corridor nurse call device installation;

5.6.32.11(5)(c) Care team base nurse call master station installation;

5.6.32.11(5)(d) Nurse call cabling and termination; and

5.6.32.11(5)(e) Accuracy of nurse call alarm location naming.

5.6.32.11(6) The CxP will confirm all specified functionalities including integrations as part of Functional Testing.

5.6.32.12 Audio Visual / Multi-Media

5.6.32.12(1) The installing Subcontractor or vendor will be responsible for fully documented pre-functional checkout of all devices and functionalities for each space in the Facility where AV/Multimedia devices are present.

5.6.32.12(2) The CxP will be responsible for providing tracking of Subcontractor and vendor deliverables on a room-by-room level as part of the Cx Plan.

5.6.32.12(3) The CxP will confirm, at a minimum, the following as part of Functional Testing:

5.6.32.12(3)(a) Speaker and microphones produce clear audio with no cracking or humming noise;

5.6.32.12(3)(b) Displays are free of distortion and are set at the correct resolution;

5.6.32.12(3)(c) Video conferencing is free of lag, and audio is synchronized with video;

5.6.32.12(3)(d) Multimedia device controllers are in place with accurate GUI displays according to room type;

5.6.32.12(3)(e) GUI controls and all modes of operation are functioning to design intent; and

5.6.32.12(3)(f) All defined Building System integrations are functioning to design intent.

5.6.32.13 Campus Perimeter Pathway System

5.6.32.13(1) Inspection and testing activities for the CPPS will be included in the Commissioning Plan and Cx Schedule, including camera inspections and mandrel tests, at a minimum. Tracking and review of test reports will be included in CxP scope.

5.6.33 Electronic Safety and Security (Division 28)

5.6.33.1 In consultation with the Authority, incorporate Division 28 (Electronic Safety and Security) into the Commissioning Plan. Refer to Appendix 1L [Commissioning Roles and Responsibilities] for a summary of the systems included in the Commissioning process. Please note that the list of systems included in Appendix 1L [Commissioning Roles and Responsibilities] is derived from CSA Z8001 and is not intended to be exhaustive. The Design-Builder will ensure that all CSA Z8001 systems applicable to the Project are included in the Commissioning process, even if not listed in Appendix 1L [Commissioning Roles and Responsibilities].

5.6.33.2 The CxP will review the compatibility of electronic security equipment with the Facility infrastructure (power, data, thermal requirements, etc.).

5.6.33.3 The CxP will include electronic security equipment Commissioning in the overall Commissioning schedule.

5.6.33.4 The CxP will include electronic security equipment in the overall integrated systems test plan.

5.6.33.5 The Design-Builder will coordinate a series of collaborative meetings with Authority stakeholders (including FMO, Clinical, IM/IT, Integrated Protection Services / Security), and Design-Builder design team and vendors, at mid-Construction stage to review functional requirements for Division 28 systems prior to Commissioning to ensure a common understanding of design intent and test plans. Commissioning Plan documentation will be updated as required based on these meetings.

5.6.33.6 Access Controls

5.6.33.6(1) A pre-functional checklist will ensure that the following functions, at a minimum, are successfully tested for every device:

5.6.33.6(1)(a) Device number, device type, installed location (room name and number), and drawing reference are verified;

5.6.33.6(1)(b) Correct access control devices are installed and tested for each door type;

5.6.33.6(1)(c) Access control hold-open and forced-open alarms have been confirmed;

5.6.33.6(1)(d) Report on access control transactions for each door is produced by the Design-Builder for review by the CxP;

5.6.33.6(1)(e) Door hardware has been installed and functional according to door type;

5.6.33.6(1)(f) Defined functionality according to door type has been captured and successfully tested; and

5.6.33.6(1)(g) Integration with Building Systems has been verified during pre-functional testing according to door type.

5.6.33.6(2) Prior to the Functional Testing phase, the CxP will perform periodic On-Site reviews to witness access control system Commissioning during pre-functional checkout and provide field review reports summarizing each site visit. This will include the following items, at a minimum:

5.6.33.6(2)(a) Door device installation;

5.6.33.6(2)(b) Cable installation and labelling;

5.6.33.6(2)(c) Cabinet & power supply installation; and

5.6.33.6(2)(d) Integration with door hardware and Building Systems;

5.6.33.6(3) The CxP will confirm all specified functionalities including integrations as part of Functional Testing.

5.6.33.7 Intrusion Detection

5.6.33.7(1) A pre-functional checklist will ensure that the following functions, at a minimum, are successfully tested for every device:

5.6.33.7(1)(a) Device number, device type, installed location (room name and number), and drawing reference are verified;

5.6.33.7(1)(b) Intrusion detection devices have been installed and tested for each partition;

5.6.33.7(1)(c) Intrusion detection keypad successfully arms and disarms all partitions associated with keypad;

5.6.33.7(1)(d) Intrusion delayed arming and exiting has been programmed and tested;

5.6.33.7(1)(e) Central monitoring report is produced by the Design-Builder, and the CxP has reviewed alarm signals received and naming; and

5.6.33.7(1)(f) Integration with Building Systems has been verified during pre-functional testing.

5.6.33.7(2) Prior to Functional Testing phase, the CxP will perform periodic On-Site reviews to witness intrusion Commissioning during pre-functional checkout and provide field review reports summarizing each site visit. This will include the following items, at a minimum:

5.6.33.7(2)(a) Intrusion field detection device installation;

5.6.33.7(2)(b) Intrusion panel installation;

5.6.33.7(2)(c) Intrusion cable installation and termination;

5.6.33.7(2)(d) Cable labelling and device identification; and

5.6.33.7(2)(e) Integration with Building Systems.

5.6.33.7(3) The CxP will confirm all specified functionalities including integrations as part of Functional Testing.

5.6.33.8 CCTV / Video Surveillance

5.6.33.8(1) The Commissioning program will include CCTV, Clinical Cameras, OR Cameras, Videoconferencing Cameras and any other camera types or systems as applicable to the Design.

5.6.33.8(2) A functional checklist will ensure the following functions, at a minimum, are successfully tested for every device:

5.6.33.8(2)(a) Device number, device type, installed location (room name and number), and drawing reference are verified; and

5.6.33.8(2)(b) Operational verification including ‘pan-tilt-zoom’ functions & field of view adjustments, as applicable.

5.6.33.8(3) Prior to the Functional Testing phase, the CxP will perform periodic On-Site reviews to witness video surveillance Commissioning during pre-functional checkout and provide field review reports summarizing each site visit. This will include the following items, at a minimum:

5.6.33.8(3)(a) Camera installations;

5.6.33.8(3)(b) Cable labelling and camera identification;

5.6.33.8(3)(c) Camera cable installation and terminations; and

5.6.33.8(3)(d) Review of field of views with security for blind spots.

5.6.33.8(4) CxP Functional Testing will include, at a minimum:

5.6.33.8(4)(a) The CxP’s review of the accuracy of camera type according to installed location;

5.6.33.8(4)(b) The CxP’s coordination with the Authority’s IPS / security team to ensure that live and recorded views are available; and

5.6.33.8(4)(c) The CxP’s coordination with the Authority’s IPS / security team to confirm the field of view and focus of cameras.

5.6.33.8(5) The CxP will consult with the Authority (including stakeholders such as FMO and IPS / security) to ensure that the Design-Builder’s video retention calculation satisfies IPS requirements for resolution, frame rate and retention period.

5.6.33.9 Panic Duress

5.6.33.9(1) A pre-functional checklist will ensure the following functions are successfully tested for every device:

5.6.33.9(1)(a) Device number, device type, installed location (room name and number), and drawing reference are verified;

5.6.33.9(1)(b) Activated panic duress alarm generates audio-visual notification;

5.6.33.9(1)(c) Panic duress type is accurate according to location; and

5.6.33.9(1)(d) Integration with Building Systems have been verified during pre-functional testing.

5.6.33.9(2) Prior to the Functional Testing phase, the CxP will perform periodic On-Site reviews to witness panic duress Commissioning during pre-functional checkout and provide field review reports summarizing each site visit. This will include the following items, at a minimum:

5.6.33.9(2)(a) Panic duress button installation and accessibility;

5.6.33.9(2)(b) Panic duress cable installation and termination;

5.6.33.9(2)(c) Panic duress device identification; and

5.6.33.9(2)(d) Integration with Building Systems.

5.6.33.9(3) Pre-functional testing results and ULC monitoring station reports submitted by Design-Builder for panic duress for review by CxP for accuracy of panic duress alarm location and naming.

5.6.33.9(4) CxP will confirm all specified functionalities including integrations as part of Functional Testing.

5.6.33.10 Fire Alarm System

5.6.33.10(1) Commissioning of the fire alarm system will include verification, testing and demonstration of the system in accordance with the applicable portions of CAN/ULC-S537, CAN/ULC-S1001, CAN/ULC-S524, CSA C282, and other recognized installation and test codes.

5.6.33.10(2) Commissioning of the fire alarm system will include the integration of other systems such as elevator, nurse call, access control, public address, smoke control and smoke venting, fire suppression, emergency generators, emergency lighting, central monitoring station, and any other systems that are to be connected to the fire alarm system for monitoring or control purposes, including the provision of Record Documentation.

5.6.33.10(3) The fire alarm integration matrix and narrative sequence of operation will be provided by the Design-Builder's design team to facilitate development of systems integration test plans by the CxP and ILSS test plans by the CxA.

5.6.33.10(4) ILSS testing will be carried out in accordance with CAN/ULC S1001 and as defined elsewhere in Section 5.6.13.4(7).

5.6.33.10(5) Provide a schedule and sequence of tests and demonstration on the system. Complete all Commissioning procedures, including prior to applying for occupancy permit.

5.7 Architecture

5.7.1 Form and Character

5.7.1.1 The architectural Design of the Facility will incorporate the following requirements:

5.7.1.1(1) The Design will create a positive Patient environment that enables Staff to deliver complex clinical processes in a non-institutional environment;

5.7.1.1(2) The Design will promote simplicity to create a Facility that can be easily understood by all its users both in its form and layout;

5.7.1.1(3) Maximize glazing in exit stairs for views to the exterior, safety and orientation to the surrounding neighborhood;

5.7.1.1(4) The Facility will be highly articulated to break down its scale, utilizing such components as glazing, canopies, varying cladding patterns/design, as well as exposed structural elements;

5.7.1.1(5) The Design will reinforce the recognition a single main entry that is shared by both Core Hospital and Cancer Centre as part of an integrated Facility;

5.7.1.1(6) The Design will feature material changes at major height transitions in the massing and express the functional distinction between Components such as inpatient floors and the surgical floor;

5.7.1.1(7) Emphasize the modular, recurrent elements of Appendix 1A [Clinical Specifications and Functional Space Requirements] in the massing and materials to achieve articulation, visual interest, and human scale;

5.7.1.1(8) The scale of the Facility will be progressive, as the Patient or visitor transitions from the larger public spaces to the smaller private treatment zones;

5.7.1.1(9) The Facility will be designed and orientated to maximize daylighting and views. Daylighting and views will assist with Wayfinding and promote a therapeutic environment of well-being;

5.7.1.1(10) The Facility will respond appropriately to the environmental forces of sun, wind, and precipitation; and

5.7.1.1(11) The Facility will be integrated with the exterior environment to create cohesive indoor/outdoor connectivity at the public entrance areas and include a clear base to visually connect the building to grade;

5.7.1.2 Design will prevent views from the exterior into privacy sensitive spaces, including Patient Rooms, spaces where care or treatment is being administered to Patients, Staff offices or similar spaces. Provision of translucent film or similar are not an acceptable means of preventing views in.

5.7.1.3 Rooftop Penthouse and Architectural Screens

5.7.1.3(1) All mechanical and electrical equipment located on the top floor(s) will be housed in a heated, enclosed penthouse providing full weather protection.

5.7.1.3(2) The Energy Centre rooftop cooling towers will be concealed from view from grade and the lower floors of the Facility through architectural screens.

5.7.1.3(3) Miscellaneous rooftop equipment such as fans, and other equipment located at-grade, will be concealed from view with architectural screens. For equipment located at-grade, landscaping may be an acceptable method to provide screening on a case-by-case basis as approved by the Authority.

5.7.1.3(4) Architectural screens will:

5.7.1.3(4)(a) hide equipment from view by neighboring properties and/or Facility occupants;

5.7.1.3(4)(b) be clad with architectural materials consistent with those used in the Facility; and

5.7.1.3(4)(c) provide adequate openings, clearances and ventilation (air flow) to ensure proper functioning and operation of the mechanical systems which they conceal.

5.7.1.4 Exterior Building Materials and Colour

5.7.1.4(1) The Design will:

5.7.1.4(1)(a) Include variation and articulation of the exterior facade through varied use of the materials described in Section 5.7.1.4(4);

5.7.1.4(1)(b) Minimize extensive unbroken exterior wall areas or surfaces;

5.7.1.4(1)(c) Have an animated exterior that includes textures and colours to add visual interest for the Patients, visitors and Staff; and

5.7.1.4(1)(d) Include lighter materials on the upper levels of the building, variations of glazing sizes and create patterns to reduce scale and massing of the Facility.

5.7.1.4(2) Materials will be durable and high quality; refer to Section 3.6 Sustainability.

5.7.1.4(3) Materials will reflect the traditional character of the area; refer to the Cloverdale Town Centre Guidelines.

5.7.1.4(4) The Authority considers the following exterior materials as appropriate:

5.7.1.4(4)(a) Clay Brick Units and Stone Masonry Units; refer to 6.4.1 Section 04 22 00;

5.7.1.4(4)(b) Architectural Cast-in-Place Concrete; refer to 6.3.2 Section 03 33 00;

5.7.1.4(4)(c) Architectural Precast Concrete; refer to 6.3.4 Section 03 45 00;

5.7.1.4(4)(d) Aluminum Curtain Wall; refer to 6.8.16 Section 08 44 00;

5.7.1.4(4)(e) Aluminum Composite Material; refer to 6.7.12 Section 07 42 13;

5.7.1.4(4)(f) Metal Plate Cladding; refer to 6.7.13 Section 07 42 16; and

5.7.1.4(4)(g) Wood Faced Phenolic Panels; refer to 6.7.16 Section 07 42 43.

5.7.1.4(5) Exterior materials the Authority will consider in limited areas on a case-by-case basis include:

5.7.1.4(5)(a) Cementitious Cladding; refer to 6.7.13.3(1) Section 07 42 42; and

5.7.1.4(5)(b) Metal Siding; refer to 6.7.18 Section 07 46 19.

5.7.1.4(6) Unacceptable materials include stucco, exposed concrete blocks, vinyl siding, large expanses of non-Architectural Concrete, mirrored glass, and neon lighting.

5.7.1.4(7) Exterior wall cladding materials will not utilize dark colours and to be applied through the use of thermally-broken, galvanized concealed fasteners unless noted otherwise or approved by the Authority.

5.7.1.4(8) Wall panels will be of sufficient thickness, complete with control and expansion joints, to mitigate material deformities due to structural and thermal movement within the wall assembly. Warping, oil-canning and/or mechanical modifications, which may alter its physical appearance and diminish its intended performance, are not permitted.

5.7.1.4(9) At all conditions where dissimilar metals are in contact, provide separators to prevent galvanic corrosion including aluminum window and curtain walls.

5.7.1.4(10) Facade transparency and views into non-clinical, public activities will be provided, especially at-grade levels and large waiting areas.

5.7.1.5 Access to Daylight and Views

5.7.1.5(1) General Requirements:

5.7.1.5(1)(a) Windows refer to openings complete with glazing meeting the requirements as set out in Section 6.8.

5.7.1.5(1)(b) Size, configure, and adequately construct windows for areas that require daylight, views and/or natural ventilation.

5.7.1.5(1)(c) Provide Borrowed Light deep into the Facility, either through interior windows to occupied rooms that do not have exterior windows or through other means. The intent is to borrow light to create a more comfortable and less closed-in environment that will benefit Staff and Patients alike.

5.7.1.5(1)(d) In addition to the requirements set out in Section 5.7.1.5(2), if a room or space is located on an exterior wall, and in the option of the Authority, the occupants will benefit from glazing, they will be provided with a window including areas such as Offices.

5.7.1.5(1)(e) Coordinate glazing heights with adjacent wall protection, handrails, and other accessories to achieve functional and aesthetic cohesiveness.

5.7.1.5(2) Direct Natural Light

5.7.1.5(2)(a) A space has Direct Natural Light where the following conditions are satisfied:

5.7.1.5.2.(a).1 The space will have an exterior window;

5.7.1.5.2.(a).2 A light radius will be measured horizontally from the centreline of the exterior window;

5.7.1.5.2.(a).3 For spaces having rectangular geometry, the centre of the space will fall within an 8 m light radius, or a 10 m light radius if the area is over 70 NSM; and

5.7.1.5.2.(a).4 For spaces having non-rectangular geometry, half or more of the total area of the space will fall within an 8 m light radius, or a 10 m light radius if the area is over 70 NSM.

5.7.1.5.2.(a).5 Where spaces are separated by curtains or partial walls and part of a larger open area such Chair Bays and Stretcher Bays, the aggregate total area will be used for the purposes of calculating Direct Natural Light.

5.7.1.5(3) Borrowed Light from Exterior Windows

5.7.1.5(3)(a) A space has Borrowed Light from exterior windows where the following conditions are satisfied:

5.7.1.5.3.(a).1 The space will have at least one (1) window facing in the direction of an exterior window;

5.7.1.5.3.(a).2 A light radius in a straight line will be measured horizontally from the centreline of an exterior window, extending through an interior window within the same room which has the exterior window, and connecting to an interior window within the space receiving the Borrowed Light;

5.7.1.5.3.(a).3 For spaces having rectangular geometry, the centre of the space will fall within an 8 m light radius within a 10 m light radius if the area is over 70 NSM;

5.7.1.5.3.(a).4 For spaces having non-rectangular geometry, half or more of the total area of the space will fall within an 8 m light radius, or a 10 m light radius if the area is over 70 NSM;

5.7.1.5.3.(a).5 Window(s) in doors, or fully glazed doors, where allowable, may be considered a

window for the purposes of Borrowed Light; and

5.7.1.5.3.(a).6 For the purposes of determining Direct Natural Light or Borrowed Light, exterior windows facing into courtyards are acceptable, provided no courtyard dimension is less than 7.5 m.

5.7.1.5(4) Borrowed Light from Clerestory Windows

5.7.1.5(4)(a) A space has Borrowed Light from clerestory windows where the following conditions are satisfied;

5.7.1.5.4.(a).1 There will be a clerestory window having its sill higher than 1.5 m AFF, or a window(s) in the space facing in the direction of a clerestory window;

5.7.1.5.4.(a).2 A light limit will be measured horizontally from the perimeter of the clerestory window;

5.7.1.5.4.(a).3 For spaces having rectangular geometry, the centre of the space will fall within a 6 m light limit;

5.7.1.5.4.(a).4 For spaces having non-rectangular geometry, half or more of the total area of the space will fall within a 6 m light limit; and

5.7.1.5.4.(a).5 Window(s) in doors, or fully glazed doors, may be considered a window for the purposes of Borrowed Light.

5.7.1.5(5) The Design-Builder will apply the following principles in the Design of the Facility to address access to daylight and views:

5.7.1.5(5)(a) Arrange circulation routes and occupied spaces to maximize opportunities for glazing;

5.7.1.5(5)(b) Select glazing size and placement consistent with the space use or function; and

5.7.1.5(5)(c) Include glazing of the largest possible size consistent with Project sustainability and space use objectives.

5.7.1.5(6) Provide the following minimum requirements for access to daylight and views:

5.7.1.5(6)(a) All principal horizontal circulation routes will include natural lighting strategies and access to views in the form of windows; provide windows at the ends of long corridors;

5.7.1.5(6)(b) Provide glazed doors at entrances to exterior public or Secure Outdoors Spaces;

5.7.1.5(6)(c) Exterior windows in Inpatient Unit including the 24-Bed Unit, 12-Bed Unit, Medical-Oncology and 12-Bed High Acuity Unit as follows:

5.7.1.5.6.(c).1 the maximum sill height to be 900 mm; and

5.7.1.5.6.(c).2 window head to extend to the underside of the ceiling.

5.7.1.5(6)(d) For Inpatient Unit including the 24-Bed Unit, 12-Bed Unit, Medical-Oncology and 12-Bed High Acuity Unit, the minimum width of the exterior window glazing including the frame will be:

5.7.1.5.6.(d).1 2.4 m for Patient Room - AIR - Bariatric and Patient Room - AIR - Bariatric - HAU;

5.7.1.5.6.(d).2 1.35 m for Patient Room - HAU and Patient Room - Double; and

5.7.1.5.6.(d).3 1.20-1.30 m for Patient Room - Private, Patient Room - Private - Shielded.

5.7.1.5(6)(e) Skylights will not be permitted.

5.7.1.5(7) Provide Direct Natural Light and Borrowed Light in compliance with CSA Z8000 and in accordance with the following table:

Component	Space	Direct Natural Light	Borrowed Light
A. Ambulatory Care			
B. Inpatient Unit	Patient Room – Private (B1.01)	x	
	Patient Room – Double (B1.02)	x	
	Patient Room – AIR – Bariatric (B1.04)	x	
	Patient Room – Private – Shielded (B2.03)	x	
	Patient Room – HAU (B3.01)	x	
	Lounge – Family/Visitor (B4.01)	x	
	Rehabilitation Therapy Room (B4.05a)		x
	Lounge – Staff (B4.09)	x	
C. Emergency	Vestibule – Walk-In Entry (C1.01)	x	
	Waiting Area (C1.04)	x	
	Patient Check-In – ED (C1.08)		x
	Secure Room (C2.15)	x	
D. Perioperative	Lounge – Staff (D7.15)	x	
E. Laboratory	Lounge – Staff (E7.06)	x	
F. Medical Imaging	Workroom – Biomed (F7.08)	x	
	Lounge – Staff (F8.10)	x	
G. OACU	Workroom – Telephone Triage/Screening Support (G3.01)	x	

Component	Space	Direct Natural Light	Borrowed Light
	Workroom – Nursing (G3.02)	x	
	Office - Shared (G3.03)		x
H. Clinical Trials	Workroom – Clinical Research Nursing (H1.02)	x	
	Workroom – Data Coordinators (H1.03)	x	
I. Systemic Therapy	Chair Bay – Infusion (I2.04)	x	
	Stretcher Bay – Holding – Bariatric (I2.05)		x
K. Radiation Therapy Planning	Workroom – Physics Lab (K1.01)		x
	Lab Workroom – Research/Development Lab (K1.02)		x
	Workroom – Physics Computer Technologist (K1.03)	x	
	Workroom – Dosimetry (K2.01)	x	
M. Functional Imaging			
N. IPT	Workroom – Respiratory Therapy (N2.04)	x	
	Workroom – IPT (N3.01)	x	
O. Biomedical Engineering	Workroom – Biomed (O1.02)	x	
P. MDR	Lounge – Staff (P4.04)	x	
R. Pharmacy Services	IV Staging and Prep/Checking (R3.02)	x	
	Workroom – Pharmacy (R4.03)	x	
	Lounge – Staff (R4.05)	x	
T. Public Spaces	Waiting Area (T1.02.08)	x	
	Reception – Cancer Centre (T2.01.01)		x
	Waiting Area (T2.01.02)		x
	Resource Centre – Patient/Family (T2.03)	x	
	Look Good Feel Good Room (T2.04)	x	
	Gathering Area (T4.02)	x	
	Sacred Space (T4.04)	x	
U. Administration	Workroom, HIM – FH (U5.01)	x	
	Workroom – Clerks – CC (U5.06)	x	
	Workroom – Clerical – CC (U5.07)		x
	Meeting Room – EOC (U6.04)	x	
	Lounge – Staff (U7.01)	x	
W. Back-of-House	Lounge – Staff (W4.13)	x	
Y. Staff Facilities	Exercise/Wellness Room (Y1.13)	x	
	Lounge – Staff (Y1.16)	x	
	Lounge – Study Stations and Book Collection – UBC (Y3.01)	x	
	Workroom – CC Medical Staff Facilities (Y4.02)	x	
	Lounge – Staff (Y5.01)	x	
Energy Centre	Control Room (EC1.1)		x
	Office-Private (EC1.2)	x	
	Meeting Room – 8-seat (EC1.3)	x	
	Steam Plant (EC2.1)	x	

Component	Space	Direct Natural Light	Borrowed Light
	Heating Plant (EC2.2)	x	

5.7.2 Building Envelope

5.7.2.1 Basic Requirements:

5.7.2.1(1) Provide a building envelope which meets the requirements of Schedule 5 [Energy Guarantee].

5.7.2.1(2) Provide a building envelope with enhanced resilience to protect the interior from projected climate extremes. Refer to Section 3.7 Climate Resilience.

5.7.2.1(3) Provide a building envelope which prevents the accumulation and stagnation of rain, snow, ice and dirt on the horizontal and vertical surfaces.

5.7.2.1(4) Provide a building envelope which sheds water, snow and ice safely from exterior surfaces so they are not trapped in the assembly where they may cause deterioration or staining or present a danger to the safety of any person.

5.7.2.1(5) Design roof drainage with scuppers or suitable overflows to function as contingency drainage to mitigate accumulation of rain on roofs should the primary drainage system fail. (ref. NBC 2015 Commentary H Rain Loads).

5.7.2.1(6) Provide a building envelope with a predicted Design Life that will meet or exceed the 50 years design service life as defined in CSA S478.

5.7.2.1(6)(a) For components and assemblies whose categories of failure are 5, 6, or 7 in Table 3 in CSA S478, use a Design Life equal to the design service life for the Facility; and

5.7.2.1(6)(b) For components and assemblies whose category of failure is 4 in Table 3 in CSA S478, use a Design Life equal to at least half of the design service life of the Facility.

5.7.2.1(7) Where component and assembly Design Life are shorter than the design service life of the Facility, ensure they can be readily replaced.

5.7.2.1(8) Provide a building envelope to ensure indoor noise criteria are met as specified in Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

5.7.2.1(9) Ensure the building envelope will accommodate the high humidity service conditions inside the Facility.

5.7.2.1(10) Design the building envelope and fenestration in coordination with the HVAC systems design, to minimize risk of condensation on interior surfaces, and to factor extreme cold weather. Building envelope assemblies are to be designed to control vapour diffusion as set out in the BC Building Code. Condensation in building envelope assemblies to be limited to Rain Screen cavities designed to drain. Vapour barriers will be used to prevent diffusion of vapour into building envelope assemblies or parts of assemblies where condensation would occur and cause deleterious effects.

5.7.2.1(11) Design of building envelope assemblies will factor performance degradation of insulating materials, so that during the design service life of the building, performance of controlling heat loss and heat gain remains within design parameters.

5.7.2.1(12) Ensure the building envelope assemblies and interfaces minimize thermal bridging.

5.7.2.1(13) Ensure continuity and appropriate termination of air, moisture, thermal, and vapour barriers.

5.7.2.1(14) Ensure the building envelope is insulated primarily exterior to the structural back-up wall.

5.7.2.1(15) Accommodate differential movement due to temperature variations, and structural movement.

5.7.2.1(16) Back-up walls for outer cladding will consist of concrete masonry units, poured in place reinforced concrete or structural metal framing system. Design for deflection of interior finishes will conform to BC Building Code in all conditions.

5.7.2.1(17) Prevent galvanic corrosion by providing suitable separation between different metals and ensure compatibility between different components in contact with each other.

5.7.2.1(18) For all components exposed to weather, fabricate joints to exclude water, and provide weep holes where water may accumulate.

5.7.2.1(19) Waterproofing will be provided to prevent water ingress and resist hydrostatic pressure in accordance with Geotechnical Consultant and the Design-Builder’s Geotechnical Report.

5.7.2.2 Rain Screen Principles

5.7.2.2(1) All exterior wall assemblies, fenestration and interfaces will be designed in accordance with Rain Screen Principles, as described in publications of the National Research Council Canada including the following:

5.7.2.2(1)(a) Drain all accumulated water to the exterior of the Facility and to provide a means for drying of any accumulated moisture within the cladding assembly;

5.7.2.2(1)(b) Materials will be installed to all shed precipitation;

5.7.2.2(1)(c) Prevent moisture penetration through the exterior of the wall assembly;

5.7.2.2(1)(d) Flashings, drips or overhangs, will be sufficient to deflect accumulated water away from the Facility face, at all:

5.7.2.2.1.(d).1 Changes in plane;
5.7.2.2.1.(d).2 Intersections of walls and roofs;
5.7.2.2.1.(d).3 Changes in cladding material; and
5.7.2.2.1.(d).4 Window and door heads or sills.

5.7.2.2(1)(e) Provide a continuous air space of minimum 25 mm clear width; and

5.7.2.2(1)(f) Provide vents at top and bottom of the walls that allow any moisture to drain out and allow fresh air to pass through. Provide screens to keep insects out.

5.7.2.3 Roofs

5.7.2.3(1) Provide high performance roofing systems:

5.7.2.3(1)(a) Built-Up Roof (BUR) assembly with SBS-modified bitumen membrane for conventional roofs;

5.7.2.3(1)(b) Inverted-membrane roof assembly with rubberized asphalt for accessible terrace and green type roofs;

5.7.2.3(1)(c) All roofing systems will conform to RoofStar Guarantee Standards of the Roofing Contractors Association of British Columbia (RCABC); and

5.7.2.3(1)(d) Provide RoofStar RCABC written guarantees issued in the name of the Authority, signed jointly by the applicator and manufacturer, for Membrane Roof Systems: SBS-modified Bitumen, and Hot-applied Rubberized Asphalt.

5.7.2.3(2) Access will be provided to all roof areas and elevated work platforms in accordance with Fraser Health Fall Protection and Prevention Requirements for Facility Design.

5.7.2.3(3) Provide continuous clear width, smooth surface, rooftop access pathways as set out in Section 5.1.2.3.

5.7.2.3(4) Any means of roof access such as doors will have suitable hardware that is lockable and integrated with the access control system; refer to Section 7.9.4 Access Control.

5.7.2.3(5) Provide parapets on all main roofs which are minimum 1067 mm high (42”) with structure meeting guard requirements as set out in the BCBC or as required by Section 6.11.7.1(2). Refer to Fraser Health Fall Protection and Prevention Requirements for Facility Design for additional requirements.

5.7.2.3(6) Where roof parapet guards are demonstrated to be impracticable, guardrails meeting the requirements of the Occupational Health and Safety Regulation (OHS Regulation) are to be provided on a case-by-case basis as approved by the Authority.

5.7.2.3(7) Where guardrails are demonstrated to be impracticable, anchors for fall restraint and fall arrest systems meeting the requirements of OHS Regulation are to be provided on a case-by-case basis as approved by the Authority, anchor locations will be:

5.7.2.3(7)(a) Sufficient, functional and appropriate for use by workers to perform building maintenance to all high areas that are without a guard or guardrail; and

5.7.2.3(7)(b) Located to allow a worker to secure a lifeline outside the control zone (fall hazard area), a safe distance of at least 2 m (6.5 ft) away from unguarded edges of the building and structures.

5.7.2.4 Electrochromic Glass

5.7.2.4(1) Provide dynamic glass insulating glass units which change the appearance of the glass from clear to tinted based on controller commands.

5.7.2.4(2) Provide dynamic glass insulating glass units for a minimum of half the total exterior glazing.

5.7.2.4(3) Dynamic glass insulating glass units to be located on the predominantly south and west facing building façades in accordance with the energy requirements, refer to Schedule 5 [Energy Guarantee].

5.7.2.4(4) Provide all glass, wiring, controls, programming of controls, and system Commissioning, refer to Section 6.8.18.2(2)(k) electrochromic glass.

5.7.3 Secure Outdoor Space

5.7.3.1 Secure Outdoor Space means exterior space designed for the purpose of Patient, visitor or Staff respite which provides access to the outdoors, security, safety, fresh air, views and other amenities as described in this Schedule.

5.7.3.2 Unless otherwise required to meet LEED requirements, provide the following Secure Outdoor Spaces for Patients and visitors:

5.7.3.2(1) A minimum of one (1) sized at approximately 150 NSM with seating for 20 people.

5.7.3.3 Unless otherwise required to meet LEED requirements, provide the following Secure Outdoor Spaces for Staff:

5.7.3.3(1) A minimum of five (5) with aggregate total of 250 NSM (each approximately 50 NSM) for Staff distributed throughout the Facility with seating for a total of 40 people.

5.7.3.4 Secure Outdoor Spaces will meet the following requirements:

5.7.3.4(1) General Requirements:

5.7.3.4(1)(a) Will be fully accessible for Persons with Disabilities including entry lips and thresholds to facilitate wheelchair access;

5.7.3.4(1)(b) Provide a minimum of one (1) handrail between the entrance and a seat for Patient’s experiencing difficulties with strength or balance;

5.7.3.4(1)(c) Will not be located at-grade;

5.7.3.4(1)(d) Will be located with Convenient Access from the Staff and Patient Service Elevators and Lounge – Staff, where designed for Staff use;

5.7.3.4(1)(e) Will be located with Convenient Access from the Core Hospital Public Passenger Elevators and Lounge - Family/Visitor, where designed for Patient and visitor use;

5.7.3.4(1)(f) Will not permit views into private spaces including Patient Rooms or where treatment is being administered, refer to Section 5.7.1.2;

5.7.3.4(1)(g) Provide signage within the Facility to alert occupants of the Secure Outdoor Spaces, refer to Appendix 1R [Wayfinding Standards and Requirements];

5.7.3.4(1)(h) Provide an approximately 1.8 m wide continuous walking circuit or wandering loop to accommodate Patients with intravenous equipment, gurneys, and wheelchairs or walkers; and

5.7.3.4(1)(i) Provide two (2) hose bibbs which are secured, concealed, and designed such that they can only activated by Staff.

5.7.3.4(2) Safety and Security Requirements:

5.7.3.4(2)(a) Will have clear Line of Sight to all areas from the Facility entry point to eliminate any areas with people can hide;

5.7.3.4(2)(b) Maximize the amount of glazing from the Facility's public spaces and point(s) of entry to the Secure Outdoor Areas;

5.7.3.4(2)(c) Will not have sharp edges on any exposed surfaces. All exposed edges will be rounded to minimum 6 mm radius;

5.7.3.4(2)(d) Contain materials, including sealants, that do not pose ingestion or choking hazards;

5.7.3.4(2)(e) Contain materials that cannot be thrown or wielded in anyway that will cause bodily harm, or damage to the Facility;

5.7.3.4(2)(f) All hardware elements, including electrical receptacles will be Tamper Resistant and non-removable;

5.7.3.4(2)(g) All overhead structures and overhangs will be designed to be Ligature Resistant and non-climbable; and

5.7.3.4(2)(h) Will not contain design elements which create head and/or neck entrapments.

5.7.3.4(3) Seating and Weather Protection Requirements:

5.7.3.4(3)(a) Provide gathering nodes with group seating areas for approximately 4-6 people with seats that accommodate 1-2 people each;

5.7.3.4(3)(b) Seating areas will encourage conversation;

5.7.3.4(3)(c) Provide areas of solitude;

5.7.3.4(3)(d) Provide areas for reading, resting, meditation, contemplation and reflection;

5.7.3.4(3)(e) Seating material will be a comfortable material that does not get excessively hot or cold and facilitates the shedding of water. Do not use concrete, aluminum and steel seats; refer to Section 8.2.4.2(2)(c).

5.7.3.4(3)(f) Provide seating with back rests and surfaces that have rounded corners with no sharp edges; and

5.7.3.4(3)(g) Provide covered areas over gathering nodes for protection from the elements.

5.7.3.4(4) Landscape Requirements:

5.7.3.4(4)(a) Provide safe and appropriate landscape plantings that support spaces for gathering, quiet contemplation, gardening, walking, exercising and other therapeutic activities;

5.7.3.4(4)(b) Except where prohibited due to the Firesmart setback as set out in Section 8.2.3.20, provide coniferous trees to reduce the amount of leaves falling to the walking surface which can pose slipping and fall hazards to Staff and Patients while also reducing maintenance for the Authority.

5.7.3.4(4)(c) Plants that are sharp, poisonous, climbable, or otherwise dangerous, or that can potentially cause allergic reactions are not permitted;

5.7.3.4(4)(d) Provide a permanent, high efficiency, automatically timed and condition controlled, irrigation system for all plantings.

5.7.3.4(4)(e) Provide outdoor plantings and furnishings that are safe for occupants and will not allow for opportunities of hiding;

5.7.3.4(4)(f) Paving will be of an even, slip-resistant surface that reduces glare such as sandblasted concrete, articulated by features such as saw cut joints and coloured concrete. Loose and hard granular materials such as pea gravel will not be permitted;

5.7.3.4(4)(g) Planters or other structures will be placed a minimum of 2.0 m away from continuous glass security screens or other safety guards;

5.7.3.4(4)(h) Pavement edging will prevent those using wheelchairs from rolling into planting beds;

5.7.3.4(4)(i) Pavement expansion joints will be no more than 3 mm in width to prevent the wheels of equipment getting caught and stuck;

5.7.3.4(4)(j) Provide visual relief and interest in vertical and horizontal dimensions, such as plant material with seasonal interest, elements with bright colours, and views to the greater surrounding landscape; and

5.7.3.4(4)(k) Provide landscape accent lighting to afford nighttime interest and enhanced views from interior spaces. Do not use bright lights.

5.7.3.5 Continuous Glass Security Barriers

5.7.3.5(1) All Secure Outdoor Spaces will be provided with continuous glass security barriers.

5.7.3.5(2) Continuous glass security barriers will:

5.7.3.5(2)(a) be designed by a Professional Engineer to withstand impacts and external forces such as wind without breakage and in accordance with BCBC;

5.7.3.5(2)(b) be transparent with fully tempered glass including laminated interlayers as determined by the Professional Engineer;

5.7.3.5(2)(c) not include externally applied films which can be scratched, damaged or discolour over time;

5.7.3.5(2)(d) be designed to prevent unauthorized entry;

5.7.3.5(2)(e) have a minimum height of either;

5.7.3.5.2.(e).1 3.7 m AFF or full height (to underside of structure above) for Patient and visitor areas; and

5.7.3.5.2.(e).2 1.8 m AFF for Staff area.

5.7.3.5(2)(f) be non-climbable, including restrictions at corners, junctions and interfaces with other structures; and

5.7.3.5(2)(g) be Ligature Resistant.

5.7.4 Facility Configuration and Internal Circulation

5.7.4.1 Facility Entrances

5.7.4.1(1) The main entrance will be highly visible to visitors arriving to the Site from James Hill Drive and have an intimate, warm and welcoming character. Once inside, the Design will provide visitors clear and open access to the areas where they will find information about their visit, such as these listed in order of priority:

5.7.4.1(1)(a) Display - Electronic Wayfinding System;

5.7.4.1(1)(b) Information/Security Station;

5.7.4.1(1)(c) Reception - Cancer Centre;

5.7.4.1(1)(d) Alcove - Self-Registration Kiosk; and

5.7.4.1(1)(e) Resource Centre - Patient/Family.

5.7.4.1(2) Pedestrian interest and comfort at the Vestibule - Main Entrance and Vestibule - Walk-In Entry will be provided through specifically designed seating, signage, lighting and features that enhance a feeling of invitation, acceptance, normality and de-stigmatization.

5.7.4.1(3) Provide a convenience stair with Convenient Access to the Vestibule - Main Entrance; refer to Section 5.7.4.2(2).

5.7.4.1(4) The main entrance spaces will be acoustically treated to control excessive noise and sound reverberation that would prevent effective communications in the space, allow the spread of noise to adjacent noise sensitive interior spaces or make spending time in the space uncomfortable.

5.7.4.1(5) Provide two (2) public telephones and two (2) direct line telephones to taxi services at the Vestibule - Main Entrance and Vestibule - Walk-In Entry. Ensure at least one (1) telephone is accessible to Persons with Disabilities.

5.7.4.1(6) All access and egress points from the Facility’s exterior, including those used for maintenance, will be protected from snow and rain by canopies or building overhangs that extend a minimum 1.2 m beyond the face of the Facility and on both sides of the opening a minimum of 600 mm.

5.7.4.1(7) Provide the following entrances with illuminated signs designating the name of the entrance on the canopy or surface mounted to the Facility:

5.7.4.1(7)(a) Main Entrance Covered Drop-Off;

5.7.4.1(7)(b) Emergency Component Patient Arrival and Check-In Vestibule - Walk-In Entry; and

5.7.4.1(7)(c) Other locations as determined in consultation with the Authority.

5.7.4.1(8) Provide visible places to sit, protected from the prevailing winds near both the interior and exterior of entrances.

5.7.4.1(9) Entrance designs will create positive and calming first impressions for Patients and families.

5.7.4.1(10) Entrance vestibules will provide visibility from the exterior, from the interior immediately in front of the vestibule, and from occupied spaces such as waiting areas adjacent to the vestibule.

5.7.4.1(11) In addition to entrance vestibules listed in Appendix 1A [Clinical Specifications and Functional Space Requirements], the Design-Builder will provide all entrances vestibules to meet the functional needs of the Facility and this Schedule.

5.7.4.1(12) Orient the entrances to minimize wind exposure inside the Facility. The Vestibule - Main Entrance and Vestibule - Walk-In Entry will be configured, such as in a L or T shape, and sized such that only one set of doors will open at one time in order to preserve the airlock effect for climate control and protection from the prevailing winds. Ensure adequate distance between the sets of doors to allow stretchers and wheelchairs and attendants to fit lengthwise into the vestibule. Provide a heated air curtain system over the exterior doors to control the temperature loss during winter months. No rotating doors are permitted. The Authority may consider entrance vestibules configured for a straight line of travel provided that the vestibule doors are adequately spaced to preserve the airlock effect and other measures are taken, such as the offset of doors, to offer protection from prevailing winds.

5.7.4.1(13) Pedestrian interest and comfort at entries will be provided through specifically designed seating, signage, lighting and features that signal the Facility's use.

5.7.4.1(14) Provide wheelchair alcoves visible and accessible to the public at all public entrance vestibules such as Vestibule - Main Entrance, Vestibule - Patient Transfer and Vestibule - Walk-In Entry; refer to Section 5.15.4.2.

5.7.4.1(15) Entryways and doors will be illuminated using light levels that are comfortable when entering and exiting.

5.7.4.1(16) Provide permanent recessed entrance mats extending 3.0 m minimum length in the direction of travel at the following locations:

5.7.4.1(16)(a) Vestibule - Main Entrance;

5.7.4.1(16)(b) Vestibule - Patient Transfer;

5.7.4.1(16)(c) Vestibule - Walk-In Entry;

5.7.4.1(16)(d) Parking Shuttle Passenger Elevator Lobby Vestibules; and

5.7.4.1(16)(e) Entrances into the Facility from Loading Dock.

5.7.4.1(17) Provide permanent recessed entrance mats extending 1.2 m minimum length in the direction of travel at the following locations:

5.7.4.1(17)(a) Entry points to the Facility from the Secure Outdoor Spaces;

5.7.4.1(17)(b) All Energy Centre entrances; and

5.7.4.1(17)(c) All other entry points to the Facility including from any occupied roof areas.

5.7.4.1(18) Acceptable entryway systems include permanently installed grates, grills and slotted systems that allow cleaning underneath the system, complete with drains connected to the Facility storm water removal system.

5.7.4.2 Stairs

5.7.4.2(1) Exit Stairs

5.7.4.2(1)(a) Locate exit stairs strategically to promote the use of stairs over elevators.

5.7.4.2(1)(b) Locate exit stairs with Convenient Access from circulation routes and in accordance with Section 5.10.1.5.

5.7.4.2(1)(c) Stair locations will not negatively impact future planning flexibility or constrain views.

5.7.4.2(1)(d) Provide windows for daylight and views from exterior walls of stairwells for orientation, amenity and safety by deterring undesirable and criminal activity or behaviour. Provide adequate lighting into stairwells for security at night.

5.7.4.2(1)(e) Provide stairwell Design that facilitates the use of evacuation sleds, excluding exit stairwells from the underground parking.

5.7.4.2(1)(f) The discharge elevation from stairwells will be designed to mitigate flooding and will have a minimum elevation of 6.0 m, refer to Section 5.2.1.

5.7.4.2(2) Convenience Stair

5.7.4.2(2)(a) Provide a convenience stair within the Public Spaces Component, located adjacent to the CH Public Passenger Elevators and CC Public Passenger Elevators for Patients, visitors and Staff.

5.7.4.2(2)(b) The convenience stair will:

- 5.7.4.2.2.(b).1 be designed architecturally for visual interest;
- 5.7.4.2.2.(b).2 extend between the main floor and level 2;
- 5.7.4.2.2.(b).3 have a two-storey high Ceiling Space;
- 5.7.4.2.2.(b).4 be designed to promote usage and reduce elevator travel;
- 5.7.4.2.2.(b).5 be complete with glazing for views to adjoining public areas;
- 5.7.4.2.2.(b).6 be minimum 1.8 m wide with landings to allow two-way flow of Patients, visitors and Staff;
- 5.7.4.2.2.(b).7 have finishes similar to the floor levels they serve; and
- 5.7.4.2.2.(b).8 be designed to prevent Patients, visitors and Staff using the stair from viewing into confidential areas such as behind Reception areas.

5.7.4.2(3) Safety of Stairs and Areas Open to Below

5.7.4.2(3)(a) Where horizontal gaps at the switchback between flights of stairs in a stairwell exceed 400 mm, provide steel (painted or stainless steel), or glass guardrails extending full height from the landing or stairs to the underside of the one above to prevent public, Patients or Staff from using them for self-harm.

5.7.4.2(3)(b) Stairwells will not allow for individuals to hide in the landing areas, and solid walls will not be used to divide flights of stairs.

5.7.4.2(3)(c) Where floor areas are open to the floor area below, provide full height floor-to-ceiling glazing to prevent public, Patients or Staff from self-harm.

5.7.4.2(3)(d) Provide guards in stairwells as required by BCBC at window openings.

5.7.4.2(3)(e) Provide architectural guardrails for the convenience stair consisting of glass and stainless steel which are designed to prevent public, Patients or Staff from self-harm by extending a minimum height of 1.5 m above the stair tread or as otherwise required by the Authority based on the Design.

5.7.4.3 Corridors

5.7.4.3(1) Wherever Equipment, wheelchairs, stretchers, beds, pallets and carts are expected to move throughout the Facility, provide corridor widths which are clear, unencumbered and organized to reduce unnecessary turning movements.

5.7.4.3(2) The presence of mobility aids including canes, crutches, walkers, wheelchairs, stretchers and motorized chairs/scooters will be anticipated in all areas where Patient contact will occur. All access points, doorways and circulation spaces will be sufficiently wide to accommodate mobility aids in these areas.

5.7.4.3(3) Provide a 3.0 m wide corridor connecting the Staff and Patient Service Elevator vestibule or lobby to the corridor circulation system as set out in Section 5.7.4.3(11)(c).

5.7.4.3(4) Design corridors to provide separation of flows such that clean incoming materials and soiled outgoing materials do not cross paths, wherever possible.

5.7.4.3(5) Soiled materials leaving the Staff and Patient Service Elevators and being transported to the soiled loading dock will not cross paths with clean materials being received at the clean loading dock such as food being delivered to Patient Food Services Receiving & Storage or linens being delivered to the Clean Cart Staging.

5.7.4.3(6) Where possible, design corridors to have chamfered, 45-degree corners with the angled portion of the wall a minimum 1.5 m long measured from corner to corner, to allow ease of movement for stretchers, beds and accompanying medical Staff and equipment.

5.7.4.3(7) Provide alcoves in corridors for storage of Equipment as described in Appendix 1A [Clinical Specifications and Functional Space Requirements], The alcoves will be dispersed to allow corridors to be kept clear of all Equipment and supplies.

5.7.4.3(8) Where possible, inpatient unit corridors will have alcoves designed as rest areas for Patients to promote mobility and activity.

5.7.4.3(9) Alcoves will be designed for the Equipment and function described in Appendix 1A [Clinical Specifications and Functional Space Requirements] and Appendix 1H [Equipment and Furniture], such that no items required to be stored in the alcove will project into, or in any way reduce, the minimum corridor width.

5.7.4.3(10) Doors will not swing into corridors and reduce the required minimum width, except for where alcoves in corridors are required to have doors.

5.7.4.3(11) Corridors will meet the following minimum clear width requirements:

5.7.4.3(11)(a) 2.4 m unless noted otherwise;

5.7.4.3(11)(b) 1.8 m where serving only administrative functions or similar areas where beds, stretchers and carts are not being transported;

5.7.4.3(11)(c) 3.0 m where connecting the loading dock to the following areas:

5.7.4.3.11.(c).1 Food Services Component;
5.7.4.3.11.(c).2 FMO/AM Component including those which lead to and in front of all workshops;
5.7.4.3.11.(c).3 Materials Management Component;
5.7.4.3.11.(c).4 Service Entrance Component; and
5.7.4.3.11.(c).5 Environmental Services Component.

5.7.4.3(11)(d) 2.4 m wide where corridors on floor levels lead to knock-out panels and the point of connection to Future Expansion.

5.7.4.3(11)(e) 3.0 m where connecting the Main Entrance Spaces, Public Spaces – CC, Retail Spaces and the Public Passenger Elevators.

5.7.4.3(11)(f) 3.0 m where connecting the FMO/AM Component to the Energy Centre.

5.7.4.4 Elevator Lobbies and Vestibules

5.7.4.4(1) Provide continuous clear space in front of all elevators for staging or Staff, Patients, visitors and services. The clear space is in addition to the corridor circulation width requirements described in this Schedule.

5.7.4.4(2) Provide continuous clear depth in front of the elevators, for the full width of the elevator grouping, as follows:

5.7.4.4(2)(a) 3.5 m for Staff and Patient Service Elevators;

5.7.4.4(2)(b) 2.4 m for Public Passenger Elevators;

5.7.4.4(2)(c) 2.4 m for Parking Shuttle Passenger Elevators; and

5.7.4.4(2)(d) 4.0 m for Freight Elevators

5.7.4.4(3) Where elevators open into a shared vestibule from two-sides, provide continuous clear depth in front of the elevators, for the full width of the elevator grouping, as follows:

5.7.4.4(3)(a) 4.0 m for Staff and Patient Service Elevators;

5.7.4.4(3)(b) 3.0 m for Public Passenger Elevators; and

5.7.4.4(3)(c) 3.0 m for Parking Shuttle Passenger Elevators.

5.7.4.5 EMI Requirements

5.7.4.5(1) Refer to Appendix 1H [Equipment and Furniture] and locate sensitive Equipment at sufficient distance from EMI and radio frequency interference-producing equipment and vibrating equipment such as elevators.

5.7.4.5(2) The Design-Builder is responsible for mitigation of all EMI interference from external sources (e.g. moving ferrous objects) and external AC magnetic field sources such as power feeders and transformers for the MRIs.

5.7.4.6 Equipment Manoeuvrability

5.7.4.6(1) Ensure that all Equipment such as stretchers, wheelchairs, beds, pallets, food carts, linen carts, waste carts, etc. will satisfactorily maneuver in the areas, particularly vestibules and corridors, where such devices and Equipment are expected to be circulating through, arriving at, or staged within.

5.7.4.6(2) Provide unobstructed, level access routes from the outside of the Facility to facilitate Equipment delivery, removal and future replacement such as the Treatment Bunker Interior. The exact location outside of the Facility, may it be from the loading docks or otherwise, will be as determined in consultation with the Authority through the Review Procedure. Refer to Appendix 1H [Equipment and Furniture] for larger Equipment items such as linear accelerators, MRI, and CT. Adhere to the weight, packaging and crate sizes as set out in the manufacturer’s specifications. The Design-Builder will provide unobstructed, level

access routes for Equipment described for the future conversions as set out in Section 5.1.3.

5.7.4.6(3) Corridor doors will be minimum 2438 mm (8’-0”) high where serving as Equipment access routes such as:

5.7.4.6(3)(a) From the loading dock to either the Staff and Patient Service Elevators or Energy Centre Freight Elevator; and

5.7.4.6(3)(b) From the Staff and Patient Service Elevators or Energy Centre Freight Elevator to where the Equipment is required in the Facility.

5.7.4.7 Floor Demarcation

5.7.4.7(1) Provide floor demarcations to designate various zones around Patient beds and stretchers such as Patient Room - Private – Shielded, Operating Rooms, Gowning Room, MRI Imaging Rooms and other spaces as required by the Authority to indicate safety zones, Equipment clearances and other similar requirements. Floor demarcations will be achieved through variation in the floor finish material colour selection or as otherwise determined in consultation with the Authority through the Review Procedure.

5.7.5 Interior Walls and Partitions

5.7.5.1 General Requirements

5.7.5.1(1) Use interior walls and partition systems that provide acoustic separations as required for the specific functions to be carried out in the spaces affected, and in accordance with the requirements of Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

5.7.5.1(2) Seismic resistance capabilities will conform to the requirements of CSA S832-06 Guidelines for Seismic Risk Reduction of Operational and Functional Components of Buildings.

5.7.5.1(3) All interior walls and partitions, including the gypsum board on both sides, will extend full height from floor to underside of the structure above, unless noted otherwise.

5.7.5.1(4) Ensure proper sealing of all walls above and below the ceiling to maintain relative pressurization requirements of the HVAC system requirements in accordance with CAN/CSA-Z317.2.

5.7.5.1(5) Provided interior walls and partitions with materials and finishes as set out in Appendix 1B [Minimum Room Requirements].

5.7.5.1(6) Interior wall and partition assemblies including finishes will comply with the following requirements:

5.7.5.1(6)(a) Able to withstand repeated routine cleaning with hospital-grade disinfectants;

5.7.5.1(6)(b) Comply with infection prevention and control requirements as relevant for the particular or specific function as determined by the Authority and Infection Control Practitioner;

5.7.5.1(6)(c) Resist damage due to normal wear and resist damage due to collision in high traffic areas; and

5.7.5.1(6)(d) Have a smooth and non-abrasive finish behind handrails attached to walls.

5.7.5.1(7) Provide ARGB to minimum 1.2 m AFF with GB above in all corridors throughout the Facility UNO, including where Patient beds, wheelchairs, stretchers, Equipment, and service vehicles including carts are transported. Provide GB where corridors are serving only administrative functions such as offices and open workstations.

5.7.5.2 Special Requirements

5.7.5.2(1) Provide wall finishes that are free of fissures, open joints, or crevices that can retain or permit passage of dirt particles in the following areas:

5.7.5.2(1)(a) Operating Rooms;

5.7.5.2(1)(b) Procedure Rooms;

5.7.5.2(1)(c) Airborne Isolation Rooms;

5.7.5.2(1)(d) 12-Bed High Acuity Unit;

5.7.5.2(1)(e) Rooms and areas used for sterile processing or sterile storage;

5.7.5.2(1)(f) MDR and Component R. Pharmacy Services and J. Oncology Pharmacy with the exception of Administration Areas; and

5.7.5.2(1)(g) as otherwise required to comply with CSA Z8000 and NAPRA.

5.7.5.2(2) Where ensuite washrooms serve a Patient Room or similar space with an x-y gantry ceiling lift system, construct the ensuite washrooms with pony walls (partial height walls) for a seamless

transition of the x-y gantry ceiling lift system to/from the ensuite washroom and the adjoining space. Refer to Section 6.11.5.2(2)(a) for coverage requirement and Fraser Health Standard Patient Handling Equipment for Facility Design and Procurement. The height of the pony walls AFF will be uniform, as required to accommodate the ensuite door assembly, x-y gantry ceiling lift system, and as determined in consultation with the Authority.

5.7.5.3 Interior Wall Framing

5.7.5.3(1) Use non-load bearing steel studs for interior partitions and furring with no axial load other than its own weight, the weight of attached finishes, and lateral loads of interior pressure differences and seismic loads.

5.7.5.3(2) Construct steel stud framing to accommodate electrical, plumbing and other services in the partition cavity, and to support fixtures, wall cabinets, medical Equipment and other such wall-mounted items. Provide reinforcement and backing.

5.7.5.3(3) Design will account for the differences in air pressure that may result on opposite sides of the wall or partition due to factors such as wind and other lateral pressures, stack effects, or mechanically-induced air pressurization.

5.7.5.3(4) Design wall assemblies to accommodate construction tolerances, deflection of Facility structural members, and the required clearances.

5.7.6 Wall Backing

5.7.6.1 At a minimum, provide wall backing as follows:

5.7.6.1(1) Full width of the wall from 1.0 m to 1.8 m AFF in alcoves around hand hygiene sinks;

5.7.6.1(2) As required to support Millwork, washroom accessories, and any wall-mounted items listed in:

5.7.6.1(2)(a) Appendix 1H [Equipment and Furniture];

5.7.6.1(2)(b) Appendix 1I [Food Services Equipment List];

5.7.6.1(2)(c) Appendix 1J [Equipment List IM/IT]; and

5.7.6.1(2)(d) Appendix 1B [Minimum Room Requirements].

5.7.6.1(3) Full wall width from 300 mm AFF to 300 mm below the Ceiling Height on all walls in the U6.01 Workroom – Command Centre and U6.04 Meeting Room – EOC.

5.7.6.1(4) Full width of the wall around chemical dispensing systems, plumbed emergency washing facilities, eyewashes and showers;

5.7.6.1(5) In the wall behind the head of the Patient's bed, stretcher or recliner from 200 mm AFF, for vertical headwalls, or 800 mm AFF, for horizontal headwalls and in spaces without headwalls, to a minimum height of 2.1 m AFF to align with the top of the door frame, with width requirements as follows:

5.7.6.1(5)(a) For all Patient Rooms with headwalls, to the full width of the wall behind the head of the Patient's bed, stretcher or recliner;

5.7.6.1(5)(b) For all other rooms/spaces with headwalls, extending a minimum of 600 mm beyond each side of the headwall; and

5.7.6.1(5)(c) For rooms without headwalls, extending a minimum of 600 mm beyond each side of the Patient bed, stretcher or recliner, or as reviewed with the Authority.

5.7.6.1(6) As required to support hangers for Patient walkers or mobility aids in Patient Rooms;

5.7.6.1(7) At all ABHR dispenser locations;

5.7.6.1(8) At all dosimeter storage racks;

5.7.6.1(9) At all coat hook and door hardware locations; and

5.7.6.1(10) Full wall width and from 300 mm to 2.1 m AFF on all walls with wall-mounted items in the following rooms or areas:

5.7.6.1(10)(a) Housekeeping Rooms;

5.7.6.1(10)(b) Medication Rooms, except that no wall backing is required on the area of wall behind a floor-mounted medication dispensing system;

5.7.6.1(10)(c) Storage - Clean Supply;

5.7.6.1(10)(d) Soiled Utility Rooms;

5.7.6.1(10)(e) Soiled Holding Rooms;

5.7.6.1(10)(f) Rehabilitation Therapy Room;

5.7.6.1(10)(g) Exercise/Wellness Room;

5.7.6.1(10)(h) Storage Rooms;

5.7.6.1(10)(i) Alcove-Scrub Stations;

5.7.6.1(10)(j) All spaces within the Patient Food Services area;

5.7.6.1(10)(k) All spaces within MDR, with the exception of administration areas; and

5.7.6.1(10)(l) All spaces within the FMO/AM shop areas.

5.7.6.1(11) As required to support wall-mounted holders for pocket dosimeter in the following areas:

5.7.6.1(11)(a) M1.13 Anteroom – Production;

5.7.6.1(11)(b) M2.23 Quality Control Room – Small Clean Room;

5.7.6.1(11)(c) K1.11 Workstation; and

5.7.6.1(11)(d) K1.04 Electronics Shop – RT System Technologists.

5.7.6.1(12) As required to support wall-mounted dispensers for non-paper, non-shedding towels in the following areas:

5.7.6.1(12)(a) E3.01.14 Alcove – PPE;

5.7.6.1(12)(b) E4.01.03 Alcove – PPE;

5.7.6.1(12)(c) E5.01.06 Alcove – PPE;

5.7.6.1(12)(d) R3.03 Anteroom – Sterile Compounding;

5.7.6.1(12)(e) R3.05 Anteroom – Hazardous Drug;

5.7.6.1(12)(f) J3.01 Dispensing (Preparation Room);

5.7.6.1(12)(g) J2.01 Anteroom – Gowning;

5.7.6.1(12)(h) J2.07 Workroom – ISO 8 – Controlled IV Setup;

5.7.6.1(12)(i) J2.04 Anteroom – ISO 7 – Sterile Compounding;

5.7.6.1(12)(j) M1.22 Quality Control Room – Clean Room;

5.7.6.1(12)(k) M1.23 Quality Control Room – Small Clean Room; and

5.7.6.1(12)(l) M1.25 Airlock.

5.7.6.2 Provide wall backing to support wall-mounted multimedia devices, digital Wayfinding and digital signage, including future locations where only rough-ins are required.

5.7.6.3 Provide wall channels, mounting hardware and wall backing for all wall mounted Patient monitoring devices as set out in Appendix 1H [Equipment and Furniture].

5.7.7 Ceilings

5.7.7.1 Design ceilings to accommodate ceiling-mounted Equipment as set out in Appendix 1H [Equipment and Furniture] and as set out in Appendix 1A [Clinical Specifications and Functional Space Requirements].

5.7.7.2 Provide ceiling system support grids in the MRI Imaging Rooms which are of non-ferrous materials only, refer to Appendix 1H [Equipment and Furniture].

5.7.7.3 Provide ceilings in spaces described in Appendix 1A [Clinical Specifications and Functional Space Requirements] in accordance with Appendix 1B [Minimum Room Requirements].

5.7.7.4 Provide ceiling lighting grid and ceiling mounts for roll photo backdrops and other specialty ceiling systems and feature as required by the Authority in the Media Services Component.

5.7.7.5 Ceilings will be constructed without fissures, open joints, or crevices that can retain or permit passage of dirt particles or steam and condensation. Ceiling penetrations will be properly sealed to prevent the entrance of air, insects and rodents.

5.7.7.6 Ceilings will limit the passage of particles from both above the ceiling plane and adjacent space into the clinical environment.

5.7.7.7 Ceilings in mechanical and electrical service rooms will be open, unless required otherwise by BCBC. FERs immediately under a roof will have a 2hr fire resistance rated ceiling or as otherwise required to meet BCBC. Refer to Section 7.8.9 Communications Rooms for ceiling requirements in Communications Rooms.

5.7.7.8 Design and select ceiling systems and ceiling finishes to comply with the following criteria:

5.7.7.8(1) Repeated routine cleaning, maintenance and infection prevention and control;

5.7.7.8(2) Repeated removal and re-installation to gain access above without chipping, cracking or delaminating;

5.7.7.8(3) Flexibility and access to the spaces above;

5.7.7.8(4) Compatibility with mechanical, plumbing, electrical, communications services and fixtures; and

5.7.7.8(5) Aesthetic and design qualities to provide a healing environment for the Patients, Staff and public.

5.7.7.9 Ceilings in spaces referred to as restricted space or semi-restricted space in the Appendix 1A [Clinical Specifications and Functional Space Requirements] will be monolithic and constructed with solid surfacing materials or GB as a seamless and unbroken surface. Service access panels will be limited to the number of booms for servicing. Service access panels will be clipped and sealed to maintain the seal after replacement to prevent the transmission of Contaminants into or out of the occupied space.

5.7.7.10 Suspended acoustic ceiling tile systems utilized in areas where HVAC pressurization, humidity, steam and moisture will be encountered will have a proven use for such conditions including food preparation, sterilization, AIR and ISO clean room areas; refer to 6.9.2 Section 09 51 23 – Suspended Acoustic Ceiling Tiles and Appendix 1B [Minimum Room Requirements]. Ceiling access will be provided for maintenance of pipes and fixtures.

5.7.7.11 All piping, duct work, and structure will be covered by a finished ceiling in location where dust fallout would present a potential problem. All overhead piping and ductwork in dining or food handling areas will be concealed behind a solid finished ceiling. Exposed services are not permitted in public lobbies, waiting areas and Patient accessible areas.

5.7.7.12 Provide fittings, attachments and internal bracing/backing as required to accommodate and support ceiling-mounted clinical and non-clinical fixtures and Equipment, including Equipment in Multimedia Rooms and other applicable rooms.

5.7.7.13 Ceilings will allow access to Building Systems and Equipment where necessary, except at those spaces as indicated elsewhere in this Schedule.

5.7.7.14 Provide architectural ceilings consisting of decorative linear ceiling system or other architectural elements including lighting and GB bulkheads. Refer to Section 6.9 Finishes (Division 9) for ceiling systems.

5.7.7.15 Architectural ceilings will serve as a contrasting feature to enhance the thematic décor, lighting and provide visual cues at gathering areas and points of transition along the Staff, public or Patient’s journey within the Facility. Areas where the Authority would expect architectural ceilings to be applied include the following:

5.7.7.15(1) Public Passenger Elevator lobbies;

5.7.7.15(2) Reception Desks;

5.7.7.15(3) Kiosks;

5.7.7.15(4) Waiting areas and Lounges;

5.7.7.15(5) Main Entrance Lobby Component; and

5.7.7.15(6) where Front-of-House corridors intersect.

5.7.7.16 For areas in MDR, provide dedicated, modular ceiling plates above each workstation or packaging table to meet the following requirements:

5.7.7.16(1) Each will be designed such that the cables and cords used do not impact circulation between workstations or span and drape between workstations; and

5.7.7.16(2) Each will have power, data and laboratory air above the workstation in the quantities described in this Schedule.

5.7.7.17 X-Y Gantry Ceiling Lift Requirements

5.7.7.17(1) Refer to Section 6.11.5 for recessed x-y gantry ceiling lift requirements to be coordinated with the ceiling design.

5.7.7.17(2) Tracks, rails and pipes located in the traffic path for Patients in beds and/or on stretchers will not be less than 2.6 m above the finished floor.

5.7.7.17(3) The space between the ceiling and the structure above will be designed and constructed so that location of fixtures and services (such as luminaires, sprinklers, ducts, pipes, etc.) will not require removal or relocation for future installation of x-y gantry ceiling lifts and their required support layouts; refer to Section 5.1.1.5.

5.7.7.17(4) X-Y gantry ceiling lifts will be fully compatible with lift motors selected by Authority, without use of adapters.

5.7.7.17(5) The Design-Builder will maximize x-y gantry ceiling lift coverage toward the perimeter of the room (and ensuites where the room has an adjoining washroom) such that Patients can be supported within, and beyond the confines of the bed/stretcher to allow for in-bed/stretcher positioning, point-to-point transfers from the bed to a chair or stretcher, post-fall assistance or assisted ambulation.

5.7.7.17(6) Ensure space is allotted for ceiling lift motor parking and handset/carry bar holder in a location that is accessible, but not obtrusive to Staff.

5.7.7.18 Trapeze and Hoist Bars

5.7.7.18(1) Provide all required structural supports, ceiling mounts and other such items for complete installation of Authority provided hoists or trapeze bars which will be used for assisting Patients in the following areas:

5.7.7.18(1)(a) Treatment Bunker Interior;

5.7.7.18(1)(b) Imaging Room - CT – Simulation;

5.7.7.18(1)(c) Imaging Room - MRI – Simulation; and

5.7.7.18(1)(d) Ultrasound Procedure Room - TRUS

5.7.8 Headwalls

5.7.8.1 All headwalls are the responsibility of Design-Builder and will meet the functional requirements of the Authority.

5.7.8.2 The Design-Builder will provide headwalls at locations where medical gas outlets are indicated in Appendix 1B [Minimum Room Requirements] and where devices are described in Appendix 1N [Electrical and Communications Matrix]. Refer to Section 6.11.4 Section 11 70 00 – Healthcare Equipment.

5.7.8.3 The Design-Builder will have the headwall manufacturer's qualified representative present in person at all meetings where headwalls are to be reviewed with the Authority.

5.7.9 Safe Boxes

5.7.9.1 Provide a safe box in all Patient wardrobes.

5.7.9.2 Safe boxes will be integrated and securely fastened to the Millwork piece they are required to be placed in.

5.7.9.3 Provide Millwork or specialty casework to conceal all safe boxes from public view.

5.7.10 Dosimeter Storage Racks

5.7.10.1 Provide dosimeter storage racks in the following locations:

5.7.10.1(1) M1.13 Anteroom Production;

5.7.10.1(2) M2.23 Quality Control Room – Small Clean Room;

5.7.10.1(3) K1.11 Workstation; and

5.7.10.1(4) K1.04 Electronics Shop – RT System Technologists.

5.7.10.2 Acceptable Products: Landauer Badge Boards or alternative as approved by the Authority.

5.7.10.3 Quantities and sizes to be determined in consultation with the Authority:

5.7.10.3(1) Small (14" H x 17.5" W) holds up to 14 badges;

5.7.10.3(2) Medium (17.5" H x 27.5" W) holds up to 30 badges; and

5.7.10.3(3) Large (24" H x 27.5" W) holds up to 45 badges.

5.7.11 Ceiling Height Requirements

5.7.11.1 Ceilings height will be no less than 2.75 m above the finished floor in all areas except for the following:

5.7.11.1(1) Ceiling Height in normally unoccupied areas such as alcoves, storage rooms for supplies and Soiled Utility rooms will not be less than 2.4 m above the finished floor;

5.7.11.1(2) Ceiling Height in rooms or spaces 40.0 NSM or greater will be not less than 3.0 m;

5.7.11.1(3) Ceiling Height in areas which are intended for people to gather such as Waiting Areas, Reception, Retail display areas, and elevator vestibules will be not less than 3.0 m;

5.7.11.1(4) Ceiling Height in the T1.02.08 Waiting Area and T2.01.02 Waiting Area are encouraged to be double-height or approximately 4.8 m, wherever possible;

5.7.11.1(5) Ceiling Height in the Spiritual Care Suite will be not less than 3.5 m;

5.7.11.1(6) Ceiling Height in U6.01 Workroom – Command Centre and U6.04 Meeting Room – EOC will be not less than 3.6 m;

5.7.11.1(7) Ceiling Height in the sally-port will be as required to accommodate the highest design vehicle described in Section 4.16.2.4;

5.7.11.1(8) Ceiling Heights in Operating Rooms, Procedure Rooms, Imaging Rooms, Guided Interventional Room – CT, Treatment Bunker Interior and Trauma Room will be of a height to accommodate the requirements of Appendix 1H [Equipment and Furniture] and will not be less than 3.0 m unless otherwise required to be higher by the Authority based on the Equipment or other ceiling mounted devices;

5.7.11.1(9) Ceiling Heights in all Workrooms and Workshops will not be less than 3.0 m unless otherwise required to be higher by the Authority;

5.7.11.1(10) Ceiling Heights in all Care Team Stations will not be less than 2.9 m unless otherwise required to be higher to accommodate Equipment refer to Appendix 1J [Equipment List IM/IT];

5.7.11.1(11) Ceiling Height in the Secure Room will be not less than 3.0 m;

5.7.11.1(12) Ensuite washrooms will have a Ceiling Height equivalent to the adjoining Patient Room; and

5.7.11.1(13) Refer to Section 6.11.3.3(2) for the Ceiling Height requirements in Patient Food Services.

5.7.12 Flooring and Floor Finishes

5.7.12.1 The Design-Builder will provide flooring that is complementary and integral to the functional and aesthetic requirements of the interior space.

5.7.12.2 Flooring will not be installed over materials that contain moisture content which exceeds that recommended by the flooring manufacturer.

5.7.12.3 Use static dissipative flooring material in accordance with Appendix 1B [Minimum Room Requirements]; refer to Section 7.8.9.7(2)(o) for floor coverings in Communications Rooms.

5.7.12.4 Provide flash cove floor base (integral coved base) at all locations with vinyl or rubber flooring. Flash cove base will be straight cut, with cove former, finished with metal J-cap and apply silicone caulking to any gaps. Height of flash cove floor base (integral coved base) will be in accordance with CSA Z8000 unless otherwise approved by the Authority.

5.7.12.5 Provide homogeneous resilient sheet flooring throughout the Facility including corridors unless noted otherwise; refer to Section 6.9.7.2(2)(c).

5.7.12.6 Provide rubber sheet flooring refer to Section 6.9.7.2(5), in corridors which serve and/or interconnect the following Components;

5.7.12.6(1) X. Patient Food Services;

5.7.12.6(2) W1 Service Entrance;

5.7.12.6(3) W2 Environmental Services (EVS);

5.7.12.6(4) W3 Materials Management;

5.7.12.6(5) W4 FMO/AM; and

5.7.12.6(6) W5 IM/IT.

5.7.12.7 Refer to Section 6.11.3.8(2) for Patient Food Services flooring requirements.

5.7.12.8 Provide wet-room safety vinyl sheet flooring in all wet rooms such as:

5.7.12.8(1) All rooms and spaces as set out in Appendix 1B [Minimum Room Requirements] including those with any of the following:

5.7.12.8(1)(a) Utility / process sink;

5.7.12.8(1)(b) Shower;

5.7.12.8(1)(c) Tub;

5.7.12.8(1)(d) Eyewash station;

5.7.12.8(1)(e) Eyewash/shower station;

5.7.12.8(1)(f) Emergency shower; and/or

5.7.12.8(1)(g) Wall-mounted drench hose.

5.7.12.8(2) All Washrooms, Washroom/Showers and Ensuite - Patient Rooms;

5.7.12.8(3) All Equipment Holding and Disposal areas;

5.7.12.8(4) Soiled Utility Rooms;

5.7.12.8(5) Soiled Holding;

5.7.12.8(6) Laundry rooms and areas;

5.7.12.8(7) Decontamination Room;

5.7.12.8(8) Refrigerated and Frozen Storage Rooms;

5.7.12.8(9) Patient Food Services;

5.7.12.8(10) Decontamination zone in MDR;

5.7.12.8(11) Housekeeping Rooms; and

5.7.12.8(12) All specimen handling areas.

5.7.12.9 Floors that have floor drains will slope positively to drain without any water ponding.

5.7.12.10 Top of rubber athletic flooring will be level with adjacent floor finishes. The Design-Builder will prepare the subfloor surface with a depression to suit manufacturer’s specifications.

5.7.12.11 The Design-Builder will provide flooring:

5.7.12.11(1) To suit types and concentration of pedestrian and/or vehicular /wheel traffic to be anticipated; use heavy-duty materials for flooring on which wheeled or service vehicle traffic is anticipated and to which wear and damage may result;

5.7.12.11(2) That is impact-absorbing in areas requiring footfall impact noise control such as in areas where Patients are receiving care or treatment;

5.7.12.11(3) To meet the acoustic performance criteria set out in Appendix 1D [Acoustic, Vibration, and Noise Control Measures];

5.7.12.11(4) To withstand repeated routine cleaning, maintenance and infection prevention and control including the frequency and quality of joints;

5.7.12.11(5) Designed for ease of replacement when required by the Authority;

5.7.12.11(6) That is imperviousness to concentrations of moisture anticipated to be on the floors and duration of that moisture; and

5.7.12.11(7) That has durability and resistance to concentrated service traffic including pedestrian, Equipment, AGV's, carts, pallets and logistics traffic. Refer to Appendix 1H [Equipment and Furniture] for large, heavy pieces of Equipment such as linear accelerators, CT scanners and MRIs.

5.7.12.12 Aesthetic and design qualities requirements include:

5.7.12.12(1) Provide flooring which promotes the requirement to create a healing environment within the Facility for the benefit of Patients, Staff and public; and

5.7.12.12(2) Which complies with the following elder-friendly evidence-based design principles for the purposes of safety and Wayfinding including:

5.7.12.12(2)(a) Provide a 30-degree difference of LRV between surfaces of floors-to-walls and doors-to-walls;

5.7.12.12(2)(b) Adjoining flooring materials will not contrast more than 10 degrees of LRV;

5.7.12.12(2)(c) Do not place blue and green together as older adults may have difficulty distinguishing these colours;

5.7.12.12(2)(d) Do not use flecked, striped and patterned floors; and

5.7.12.12(2)(e) Do not use highly reflective flooring or reflective trims or transitions.

5.7.13 Surfaces

5.7.13.1 Provide surfaces with the following characteristics, consistent with their functional purpose:

5.7.13.1(1) resistant to graffiti in public areas such as washrooms;

5.7.13.1(2) resistant to microbial spread and growth;

5.7.13.1(3) non-porous and smooth;

5.7.13.1(4) durable;

5.7.13.1(5) seamless;

5.7.13.1(6) resilient and impact resistant;

5.7.13.1(7) non-toxic/ non-allergenic;

5.7.13.1(8) matte finish presenting minimal glare;

5.7.13.1(9) without bold patterns or flecked colours;

5.7.13.1(10) constructed in a way that will not absorb or harbour moisture;

5.7.13.1(11) water impermeable in areas where water or dampness can occur; and

5.7.13.1(12) cleanable with the disinfectants and cleaning products to be used in the Facility.

5.7.13.2 Pharmacy ISO Requirements

5.7.13.2(1) The Design-Builder will provide surfaces including floors, walls, ceilings, sealants, Millwork and specialty casework which meet NAPRA, USP 797 and 800 standards including:

5.7.13.2(1)(a) Surfaces of ceilings, walls and floors will be smooth, impervious, free from cracks and crevices and non-shedding;

5.7.13.2(1)(b) Surfaces will be resistant to damage by disinfectant agents;

5.7.13.2(1)(c) Junctures of ceilings to walls will be coved or caulked to prevent cracks or crevices where dirt can accumulate;

5.7.13.2(1)(d) Floors will be in accordance with Appendix 1B [Minimum Room Requirements]; and

5.7.13.2(1)(e) Finishes which comply with the ISO Cleanroom classification for which they will be installed.

5.7.13.3 Laboratory Requirements

5.7.13.3(1) Provide surfaces including floors, walls, ceilings, sealants, Millwork and laboratory casework which meet the following requirements:

5.7.13.3(1)(a) For Component E. Laboratory meet all Biosafety Guidelines for CL2 facilities; and

5.7.13.3(1)(b) For Component M. Functional Imaging meet all cGMP grade/ISO classification requirements, refer to Appendix 1A [Clinical Specifications and Functional Space Requirements].

5.7.13.3(2) Doors, frames, Millwork, laboratory casework and workbench tops will be non-absorptive.

5.7.13.3(3) Surfaces will provide impact resistance in accordance with laboratory function.

5.7.13.3(4) Surfaces will be continuous and compatible with adjacent and overlapping materials.

5.7.13.3(5) Walls and floor finishes will have fully welded seams.

5.7.13.3(6) Provide continuous seal between floors and walls.

5.7.13.3(7) Provide flash cove floor base.

5.7.13.3(8) Interior surfaces will minimize movement of gases and liquid through perimeter membrane.

5.7.13.3(9) Interior coatings will be gas and chemical resistant in accordance with laboratory function.

5.7.13.3(10) Workbenches and bench tops will have no open seams.

5.7.13.3(11) All penetrations to be sealed with non-shrinking sealant at containment barrier.

5.7.13.3(12) Windows positioned on containment barrier will be sealed in place.

5.7.13.3(13) Window glazing material will provide required level of security.

5.7.13.4 Anti-Graffiti Requirements

5.7.13.4(1) Provide anti-graffiti coatings in locations such as:

5.7.13.4(1)(a) Accessible areas of the exterior surface of the building envelope;

5.7.13.4(1)(b) Washroom and change cubicle partitions; and

5.7.13.4(1)(c) Other high-risk locations as determined in consultation with the Authority.

5.7.13.5 Wall Protection in Food Services Areas

5.7.13.5(1) Wall protection in the Patient Food Services will be comprised of extruded semi-rigid PVCu sheets that create a heat-formable hygienic wall system that reduces the growth of harmful bacteria and microorganisms. Provide welded seams to prevent water and mould penetration. When integrated with a coved flooring system, a seamless, impervious and watertight solution can be achieved.

5.7.13.6 Painting and Protective Coatings

5.7.13.6(1) Paint all exposed conduit and services in the underground parking, and any electrical panelboards in Facility corridors to match the adjacent surface for a finished appearance.

5.7.13.6(2) For specific requirements for paint finishes in Communications Rooms and Multimedia Rooms, refer to Section 7.8 Communications (Division 27) of this Schedule.

5.7.13.7 Wetwall Solid Surface Panels and Accessories

5.7.13.7(1) In shower areas, provide wetwall solid surface panels which extend to cover the shower spray zone. Provide matching, cast recessed shampoo and soap holder in all Patient showers, refer to Section 6.10.7.2(6).

5.7.13.8 Provide an acrylic solid surface to protect the ledge continuously along all horizontal GB surfaces, pony walls, window sills, or similar. Sub-surface material will be plywood; no particle board will be permitted.

5.7.14 Specialities

5.7.14.1 Magnetic Whiteboards

5.7.14.1(1) Provide and install magnetic whiteboards in rooms and spaces as described in Appendix 1B [Minimum Room Requirement].

5.7.14.1(2) Provide magnetic whiteboards of the following sizes and quantities:

5.7.14.1(2)(a) One (1) at 600 mm x 915 mm where rooms or spaces are equal to or less than 10 NSM;

5.7.14.1(2)(b) One (1) at 1.22 m x 1.83 m where rooms or spaces greater than 10 NSM but less than 25 NSM, and

5.7.14.1(2)(c) Two (2) at 1.22 m x 2.4 m where rooms or spaces are equal to or greater than 25 NSM.

5.7.14.2 Coat Hooks, Hangers and Brackets

5.7.14.2(1) Provide coat hooks in accordance with Appendix 1B [Minimum Room Requirements].

5.7.14.2(2) Provide wall-mounted lead apron racks in accordance with Appendix 1H [Equipment and Furniture] complete with wall backing; refer to Section 5.7.6.1(2).

5.7.14.2(3) Provide a double coat hook where the areas listed above are equal to or less than 10 NSM in Appendix 1A [Clinical

Specifications and Functional Space Requirements]. For all other instances, provide a hook strip with multiple hooks along a single strip. Provide hooks equal to the anticipated number of occupants expected in the room at one time.

5.7.14.2(4) Provide hangers within each Patient Room to support Patient walkers and other mobility aids.

5.7.14.2(5) Provide two (2) laser goggles/eye protection hooks outside all Operating Rooms. Exact location as determined with the Authority based on the Design.

5.7.14.2(6) Provide mop and broom brackets with a minimum of five (5) holding positions in each Housekeeping Closet.

5.7.14.2(7) Provide wall-mounted hooks for all other miscellaneous items such as slings and exercise mats in the B4.05 Rehabilitation Therapy Room and Y1.13 Exercise/Wellness Room.

5.7.14.2(8) Provide stainless steel coat rod and shelf in all Patient wardrobes or similar areas.

5.7.14.2(9) Provide coat hooks and hook strips with 2 mm thick back plate of type 304, satin-finish stainless steel.

5.7.14.3 Washroom and Change Cubicle Partitions

5.7.14.3(1) Provide compartments and cubicles including toilet partitions, change cubicles and other compartments and cubicles requiring privacy and security.

5.7.14.3(2) Where multiple showers are grouped, they will be separated with wall assemblies, not cubicle partitions. Shower stalls will be designed with a wet area for showering and dry area for changing. Provide a small bench and coat hooks in each shower stall.

5.7.14.3(3) Urinals will have side panels on both sides unless adjacent to wall. Walls adjacent to urinals and toilets will be covered with wet wall panel system.

5.7.14.3(4) All washroom urinal and change room partitions are to be made with full-height channels at all mounting locations. Privacy channels will be provided to eliminate gaps between all panels and doors.

5.7.14.3(5) For compartment/cubicle doors, use material matching the partitions and include permanent, purpose-made hardware.

Design doors and hardware to provide access for Persons with Disabilities.

5.7.14.4 Typical Room Accessories

5.7.14.4(1) Provide a solid acrylic surface shelf for personal belongings (e.g. purse, handbag, toiletries) in Staff washrooms.

5.7.14.4(2) Provide shoe racks or cubbies in all Staff locker rooms, change areas, T4.01 Vestibule - Spiritual Care Entry and other areas as described in Appendix 1A [Clinical Specifications and Functional Space Requirements]. The quantity will correspond equally to the number of lockers, visitors or Staff the space is intended to serve. In Staff areas such as MRD and Perioperative Components, shoe racks or cubbies will be distributed within the room and located to minimize travel distances.

5.7.14.4(3) Provide a stainless steel coat rod and shelf in all coat closets and similar garment storage spaces.

5.7.14.4(4) Provide benches in Staff showers and locker rooms.

5.7.14.5 Corner Guards, Handrails and Wall Protection

5.7.14.5(1) Provide wall protection, corner guards, handrails and other such items in accordance with Appendix 1B [Minimum Room Requirements].

5.7.14.5(2) Provide corner guards and wall protection consisting of FRL and PVC-free rigid sheets throughout the Facility in all corridors where Patient beds, wheelchairs, stretchers, Equipment, and service vehicles including carts are transported. FRL to be colour matched with Millwork and used in areas where Staff, Patients or visitors will circulate. PVC-free rigid sheets to be used in service areas such as the Back-of-House Component.

5.7.14.5(3) Wall protection to be coordinated with the interior design, refer to Section 5.15.1.

5.7.14.5(4) Provide durable and appropriate trim or edging along the top of the wall protection as determined in consultation with the Authority.

5.7.14.5(5) Corner guards and wall protection height to be aligned horizontally at a minimum 1.35 m AFF unless noted otherwise. Provide corner guards with no wall protection where corridors are serving only administrative areas such as offices and open workstations.

5.7.14.5(6) Provide heavy duty corner guards in all Back-of-House service corridors consisting of 16-gauge stainless steel with 125 mm legs. Heavy duty corner guards will be provided at other locations where pallet jacks, AGV's and logistics traffic is expected.

5.7.14.5(7) Install minimum 19 mm X 19 mm stainless steel corner guards to the full height of Millwork and specialty casework that will be exposed to mobile Equipment movements.

5.7.14.5(8) For floor or wall-mounted sinks, provide a wetroom vinyl wallcovering that extends up to a minimum height of 1.60 m AFF and a minimum width of 600 mm on either side of the sink centreline, unless noted otherwise.

5.7.14.5(9) For counter mounted or integral sinks, provide a wetroom vinyl wallcovering that extends up 600 mm above the top of counter or in the case of upper cabinets, to underside of cabinets above. The minimum width will be 600 mm on either side of the sink centreline or as required to protect the adjacent wall surfaces from water. For emergency showers and eyewash stations, the wetroom vinyl wallcovering will extend full height of the wall and 200 mm beyond the curtain track or 600 mm beyond the spray area.

5.7.14.5(10) Provide handrails throughout the Facility in all corridors, except within Back of House and Staff only service corridors without public/Patient access. Handrails will meet the needs of the visually impaired, comply with Elder-Friendly principles and be of a colour that contrasts with the floor and wall for ease of location and use.

5.7.14.5(11) Chair rails will be provided in accordance with Appendix 1B [Minimum Room Requirements] and all other locations where chairs would otherwise reasonably cause damage to the wall. Width to be minimum 200 mm; top of rail to be 980 mm AFF.

5.7.14.5(12) Bed bumper (bed locators) to be provided in accordance with Appendix 1B [Minimum Room Requirements] and all other locations where movable gurneys, beds or stretchers are to be used and all other locations where gurneys, beds or stretchers would otherwise reasonably cause damage to the wall.

5.7.14.5(13) Coordinate height and fit with gurney or stretcher model and all associated Equipment. Coordinate bed bumper design with wall protection system.

5.7.14.6 Door Edge and Door Frame Protection

5.7.14.6(1) For doors required in rooms or spaces listed in Appendix 1A [Clinical Specifications and Functional Space Requirements] refer

to Appendix 1B [Minimum Room Requirements] for door edge and door frame protection requirements.

5.7.14.6(2) For all other doors, provide door and frame protection meeting the requirements of Type 2- High to protect door edges and door frames from damage where Patients, wheelchairs, stretchers, Equipment, and service vehicles including carts can reasonably be expected to cause damage.

5.7.14.6(3) Provide door and frame protection as follows:

5.7.14.6(3)(a) Type 1 - Low

5.7.14.6.3.(a).1 1 Ea. Kickplate 80A 254 mm (10”) x door width less 51 mm (2”) 630 GS for single door; and

5.7.14.6.3.(a).2 2 Ea. Kickplate 80A 254 mm (10”) x door width less 38 mm (1.5”) 630 GS for double doors.

5.7.14.6(3)(b) Type 2- High

5.7.14.6.3.(b).1 Single door -protection to 1219 mm (4’) AFF;

5.7.14.6.3.(b).2 Armor plate 80A x door width less 51 mm (2”) 630 GS;

5.7.14.6.3.(b).3 Door Edge Guards GSH butted type to suit door 630 GS;

5.7.14.6.3.(b).4 Door Frame Guards GSH 50N 630 GS;

5.7.14.6.3.(b).5 Double door protection to 864 mm (34”) AFF;

5.7.14.6.3.(b).6 2 Ea. Armor plate 80A x door width less 38 mm (1.5”) 630 GS;

5.7.14.6.3.(b).7 2 Ea. Door Edge Guards GSH butted type to suit door 630 GS; and

5.7.14.6.3.(b).8 2 Ea. Door Frame Guards GSH 50N 630 GS.

5.7.14.7 Lockers

5.7.14.7(1) Provide a sloped top at all locker locations.

5.7.14.7(2) Provide lockers in the type and quantities as set out in Appendix 1B [Minimum Room Requirements]; refer to Section 6.10.8 Section 10 51 00 – Lockers.

5.7.14.8 Mail Slots

5.7.14.8(1) Provide mail slots in T2.06 Mailroom – CC and Y2.01 Workroom - Medical Staff in the quantity required by the Authority that are a minimum of 25 mm wide, 350 mm high and 400 mm deep.

5.7.14.9 Mirrors

5.7.14.9(1) General Requirements

5.7.14.9(1)(a) The quantity, locations and positioning of all mirrors will meet the Authority's operational and functional requirements.

5.7.14.9(2) The Design-Builder will:

5.7.14.9(2)(a) Provide portable mirrors of minimum 610 mm W x 460 mm D x 1.78 m H with two (2) swivel castors in all rehabilitation areas including;

5.7.14.9.2.(a).1 B4.05 – Rehabilitation Therapy Room; and

5.7.14.9.2.(a).2 Y1.13 – Exercise/Wellness Room.

5.7.14.9(2)(b) Provide wall-mounted mirrors in all the following areas;

5.7.14.9.2.(b).1 All Ensuites;

5.7.14.9.2.(b).2 All Washrooms;

5.7.14.9.2.(b).3 All Treatment Bunker Interiors;

5.7.14.9.2.(b).4 All Locker Rooms; and

5.7.14.9.2.(b).5 All Change Cubicles.

5.7.15 Line of Sight

5.7.15.1 Line of Sight means the ability to see what is important from where a person is located; the implications to the Design include the general layout, use of low walls and furniture, low equipment, glazed walls, signage, screens, lighting fixtures, cameras and other wall or ceiling mounted equipment, straight corridors and doorways that line up.

5.7.15.2 Location and design of interior walls and columns will minimize disruption of Line of Sight.

5.7.15.3 Line of Sight will be determined in consultation with the Authority and includes the ability for a person to see:

5.7.15.3(1) For the general public, from main entry points and important circulation paths to elevator doors;

5.7.15.3(2) For Staff, from the location where Staff normally perform their work, centreline of inner entrance doors at the Entry Vestibule, or centre of the Lobby/Waiting Area; and

5.7.15.3(3) For areas where Patients are receiving care or treatment, to all four corners of the space where possible, centre point of entrance doors, and head of the Patient bed.

5.7.15.4 Refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] for additional Line of Sight requirements.

5.7.16 Acoustics and Noise Control

5.7.16.1 An Acoustic and Vibration Consultant will be retained by the Design-Builder to address the acoustic and noise control measures necessary to provide a:

5.7.16.1(1) healing environment for Patients;

5.7.16.1(2) safe and comfortable environment for Staff; and

5.7.16.1(3) confidentiality where it is required, refer to Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

5.7.16.2 The Design and Construction of the Facility will be in accordance with the requirements described in Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

5.7.16.3 The Design-Builder will meet all STC requirements of Table 1 – Minimum STC Ratings of Demising Walls and Floor/Ceiling Assemblies as well as the ASTC or NIC compliance tests required in Appendix 1D [Acoustic, Vibration, and Noise Control Measures]. As not all possible adjacency combinations are listed in Table 1, the Acoustic and Vibration Consultant will propose STC ratings for any such new adjacency combinations for approval by the Authority, based on similar adjacency combinations, room type, functionality, intent, and purpose of the room.

5.7.16.4 Provide the following minimum acoustic and noise control measures:

5.7.16.4(1) attenuation of sound within public, Patient and Staff environments;

5.7.16.4(2) sound isolation between the exterior and interior spaces;

5.7.16.4(3) sound isolation between interior spaces within the Facility at both horizontal and vertical separations;

5.7.16.4(4) sound and vibration control of Facility services and equipment noises and sound isolation of Facility service rooms;

5.7.16.4(5) sound isolation and acoustic controls as required for specialty rooms such as Multimedia Rooms and Spiritual Care Suite;

5.7.16.4(6) sound attenuation (noise control) for Equipment within rooms; and

5.7.16.4(7) sound masking system referred to in Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

5.7.16.5 Wall penetrations will meet the following requirements:

5.7.16.5(1) Back-to-back penetrations (e.g., electrical boxes, Telecommunications Outlets, medical gas outlets, shower/bath valve assembly, etc.) in acoustic rated partitions (STC 45 or higher) will be in separate stud cavities or spaced a minimum of 400 mm apart within a common stud cavity filled with batt

insulation; if these conditions are not met, then all of the boxes on at least one (1) side of the wall within the common stud cavity will be wrapped with acoustic rated putty patches or boxed and sealed with the equivalent GB layers as the partition they penetrate;

5.7.16.5(2) Be sealed with non-setting acoustical sealant. This includes all mechanical, electrical, and plumbing;

5.7.16.5(3) Piping passing through any acoustic rated partition, including for shower heads, toilets, faucets etc., will not contact the wall and the gap will be sealed with an acoustic rated caulking; and

5.7.16.5(4) Recessed cabinets and bathtubs will be boxed and sealed with the equivalent GB layers as the partition they penetrate and the remaining gap in the stud wall will be filled with batt insulation.

5.7.16.6 The configuration of ducts and rigid conduits will be such that they do not act as tubes to transmit sound from one area to another. At common supply and return ducts, provide sound attenuation liners at the diffuser and/or grill to maintain the acoustical requirements set out in Appendix 1D [Acoustic, Vibration, and Noise Control Measures]. Seal around conduits where they penetrate walls.

5.7.16.7 Isolate structure-borne vibrations and sound with resilient mountings (appropriate vibration isolators) on vibrating equipment to minimize sound transfer to structural materials. Provide ducts, pipes, and conduits with resilient, non-rigid boots or flexible couplings where they connect to vibrating equipment and isolate them from the structure with resilient gaskets and sealant where they pass through walls, floors, or other surfaces.

5.7.16.8 Use acoustic barriers, vibration isolators, and carefully selected exterior equipment to prevent exterior noise from exceeding noise bylaws and to limit re-entrant noise to the Facility.

5.7.16.9 Provide acoustic barriers around Facility exterior activities that include loading bay vehicle activity and idling, to prevent noise that neighbours may find offensive.

5.7.16.10 Acoustic Treatment

5.7.16.10(1) Sounds absorptive materials (acoustic surfaces) will be employed to control the reverberation and transmission of sound within and beyond the room or space in which it is created.

5.7.16.10(2) All normally occupied spaces will incorporate acoustic surfaces to achieve a design reverberation time equal to, or less than, those indicated in Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

5.7.16.11 Ceilings

5.7.16.11(1) Provide suspended acoustic ceiling tile with a minimum NRC rating of 0.70 and minimum CAC rating of 35 throughout the Facility, except where equivalent alternate treatment is provided, or where prohibited by cleanroom requirements.

5.7.16.12 Doors

5.7.16.12(1) Provide doors which meet the requirements listed in Appendix 1D [Acoustic, Vibration, and Noise Control Measures] including the minimum STC ratings in Table 3 and door assignments in Table 5.

5.7.16.13 Glazing

5.7.16.13(1) For acoustic requirements for interior glazing refer to Appendix 1D [Acoustic, Vibration, Vibration, and Noise Control Measures].

5.7.16.14 Mechanical systems and equipment:

5.7.16.14(1) Mechanical systems will be designed such that background sound levels within the Facility do not exceed levels specified in Table 6 of Appendix 1D [Acoustic, Vibration, and Noise Control Measures]

5.7.16.14(2) Additionally, the Design-Builder will meet the following requirements:

5.7.16.14(2)(a) Ducts, rigid conduits, or other paths that may acoustically connect two spaces are not permitted. Where required, they will be sealed appropriately to maintain the sound isolation requirements between spaces; and

5.7.16.14(2)(b) Where supply and/or return air ducts are common to (i.e. serve) adjacent rooms, provide appropriate sound attenuation duct lining at the diffuser and/or grill to maintain the STC of the wall assemblies involved. Seal around any duct or conduit penetrations.

5.7.16.14(3) To prevent the flanking transmission of sound, return air openings/grills serving adjacent rooms will be spaced as far apart as possible, and specifically will not be located close on either side of a demising wall.

5.7.16.14(4) Insulation jackets (acoustic duct lining) will be utilized as appropriate at supply air diffusers to reduce sound entering space from the plenum.

5.7.16.14(5) Supply air diffusers will be selected so that turbulent airflow noise levels generated by the diffusers will be less than 10 points below the NC range specified for that room type in Appendix 1D [Acoustic, Vibration, and Noise Control Measures], Table 6.

5.7.16.14(6) Provide vibrating equipment with appropriate resilient mountings to sufficiently suppress structure-borne sound and vibration transfer to adjacent or nearby noise and/or vibration sensitive spaces.

5.7.16.14(7) Provide ducts, pipes, and conduits with resilient, non-rigid boots or flexible couplings where they leave vibrating equipment; and isolate them from supporting structures with resilient hangers/gaskets and apply acoustical sealant where they pass through walls, floors, or other surfaces of the Facility.

5.7.16.14(8) Noise producing equipment will not be located within corridors or in rooms or alcoves that open onto the corridor.

5.7.16.14(9) When testing sound levels from HVAC equipment, the units will be fully operational. Refer to Appendix 1D [Acoustic, Vibration, and Noise Control Measures] for room Noise Criteria (NC) ratings.

5.7.16.14(10) Exterior noise from mechanical and electrical equipment, whether operating continuously, quasi continuously or intermittently but regularly, will not, individually, or collectively, cause noise levels to exceed the requirements of Appendix 1D [Acoustic, Vibration, and Noise Control Measures] or Surrey Noise Control Bylaw 7044.

5.7.16.15 Sound Masking

5.7.16.15(1) Where sound isolation will be compromised due to construction limitations caused by conflicts in partition requirements and/or particularly low background sound levels and/or in open work areas, the option for a sound masking system to enhance privacy will be presented to the Authority for consideration. Sound masking will be at no additional cost to the Authority. The Design-Builder will have its Acoustic and Vibration Consultant provide documentation highlighting the need and intended areas for the sounds masking system to be used.

5.7.16.15(2) Refer to Appendix 1D [Acoustic, Vibration, and Noise Control Measures] for additional sound masking requirements.

5.7.16.16 Maintenance Walkways and Interstitial Floors

5.7.16.16(1) Provide maintenance walkways and interstitial floors which minimize noise transfer to the spaces below. Minimal sound

transmission from tools and speech (depending upon the ceiling type and activity) is permissible, but structural noise will not be transferred.

5.7.16.16(2) Maintenance walkways and interstitial floors will be supported directly from the structure above and will have no connections or coupling to any other components in the interstitial/ceiling space.

5.7.16.16(3) Maintenance walkways and interstitial floors will include concrete topping; refer to Section 5.12.

5.7.16.16(4) Footfall noise on the maintenance walkways and interstitial floors will be inaudible in the spaces below.

5.7.17 Green Roofs

5.7.17.1 The Design-Builder will provide intensive and/or extensive green roof as follows:

5.7.17.1(1) As required to meet LEED Gold certification and/or the City of Surrey's Cloverdale-McLellan Integrated Stormwater Management Plan (ISMP).

5.7.18 Loading Docks

5.7.18.1 The loading dock will provide functional use and engineering controls to ensure the health, safety and security of persons at, or in nearby spaces in accordance with Fraser Health Design Requirements for Loading Docks.

5.7.18.2 Provide protection from inclement weather with a canopy that extends the full length and width of the loading dock and extends a minimum of 300 mm beyond the edge of the loading dock. Fabric canopies are not acceptable.

5.7.18.3 The compactor tippers and any associated catwalk/bridge required for access to the Equipment, will be flat and level to facilitate wheeled cart movement to and from the compactors and be protected from inclement weather such that a person operating the Equipment is sheltered.

5.7.18.4 Provide all safety controls such as machine guards, barriers around machinery pathways and aprons as referenced in the Fraser Health Design Requirements for Loading Docks.

5.7.18.5 Provide a drip tray/pan located where the compactor hoses exit the compressor and enter into the cylinder, connect to mechanical drainage systems, refer to Section 7.4.2.16(4).

5.7.18.6 Provide a clean, elevated loading dock to accommodate the following:

5.7.18.6(1) two (2) loading bays sized to accommodate WB-20 trucks;

5.7.18.6(2) one (1) loading bay sized to accommodate WB-20 trucks for clean linen supply;

5.7.18.6(3) one (1) loading bay sized to accommodate up to a 7 m long straight delivery truck; and

5.7.18.6(4) two (2) small truck/courier car parking bays directly off the dock ramp for Convenient Access to the dock.

5.7.18.7 Provide a soiled, elevated loading dock to accommodate the following:

5.7.18.7(1) one (1) loading bay sized to accommodate WB-20 trucks for soiled linen supply;

5.7.18.7(2) one (1) loading bay sized to accommodate up to a 7-m long straight delivery truck;

5.7.18.7(3) one (1) recycling compactors with dock level tilt cart dumpers, power pack, refer to Appendix 1H [Equipment and Furniture];

5.7.18.7(4) one (1) waste compactors with dock level tilt cart dumpers, power pack, refer to Appendix 1H [Equipment and Furniture];

5.7.18.7(5) one (1) cardboard compactor with dock level tilt cart dumpers, power pack, refer to Appendix 1H [Equipment and Furniture]; and

5.7.18.7(6) one (1) cart/can wash that is located between the clean and soiled dock, eliminating cross contamination.

5.7.18.8 Design the loading dock as two (2) separate, but proximally located docks with;

5.7.18.8(1) a clean loading dock; and

5.7.18.8(2) a soiled loading dock.

5.7.18.9 Provide separation between the clean and soiled docks consisting of a minimum horizontal distance of approximately 9 m (one structural bay), which may include physical walls with high-speed service doors in a pass-through arrangement to enable flexibility in the use of the two (2) docks during downtime operations and will suit the functional requirements of the Authority to ensure separation of flows as described in Section 5.7.4.

5.7.18.10 The maximum gradient in the loading zone where trucks maneuver into and out of the loading bays will be maximum 2% slope.

5.7.18.11 Loading dock will:

5.7.18.11(1) have a uniform height or elevation of approximately of 1.3 m or as otherwise required to accommodate the types of vehicles and compactors in this Agreement;

5.7.18.11(2) have dock bumpers and all required safety equipment including fall protection at each bay;

5.7.18.11(3) have dock levellers and dock lift; refer to Section 6.11.1;

5.7.18.11(4) have a dock surface sloped positively away from the Facility to allow for drainage during wash down;

5.7.18.11(5) have a minimum two (2) hose bibbs;

5.7.18.11(6) be minimum 8.0 m wide, with a minimum clear height of 7.31 m to accommodate the container removal requirements;

5.7.18.11(7) accommodate the movement of pallet jacks for loading and unloading of deliveries from the loading dock to the receiving and breakdown areas within the Back-of-House Component; and

5.7.18.11(8) include a minimum 0.5 m horizontal clearance between a vehicle turning path and any other structural components and/or vehicles inside the loading area.

5.7.18.12 Consult with Authority for the types of equipment/containers used for loading/unloading and confirm that the loading dock will be functional with the necessary turning radius when the dock equipment (levelers or lifts) are in operation.

5.7.18.13 Reduction in clear height described in Section 5.7.18.11(6) may be acceptable if it can be demonstrated to the satisfaction of the Authority and AHJ that a lesser height will not negatively impact Facility operations.

5.7.18.14 Provide high-speed service doors with access control at each Vestibule - Loading Dock connecting the Facility to the loading dock where materials and services are being transported, with a minimum of:

5.7.18.14(1) one (1) at the clean dock; and

5.7.18.14(2) one (1) at the soiled dock.

5.7.18.15 High-speed service doors will span the full width of the corridor to maximize material transports through the opening. Each location will include a set of exterior double doors that can be held open during normal hours of operation and closed/locked via access control after hours to provide a secure perimeter along the entire loading dock platform.

5.7.18.16 Provide overhead coiling doors between the following spaces and the loading dock of sufficient size to enable the services as described in Appendix 1A [Clinical Specifications and Functional Space Requirements]; refer to 6.8.5 Section 08 33 23 – Overhead Coiling Doors.

5.7.18.16(1) Staging Area

5.7.18.16(2) Workshop – Carpentry

5.7.18.16(3) Workshop - Metal/Welding/Plumbing

5.7.18.16(4) Workshop – Main

5.7.18.16(5) Bin Wash Station

5.7.19 Bird Control Measures

5.7.19.1 The Design-Builder will provide bird control measures, such as bird netting or other deterrents as determined with the Authority, at all Facility entrances and at-grade service areas to deter birds from perching on exterior building components such as canopies and other associated infrastructure.

5.7.20 Traffic Coatings and Sealers

5.7.20.1 Provide vehicular traffic coatings on all suspended concrete slabs such as in the underground parking,

5.7.20.2 Provide water repellant sealer on concrete slab on grade such as in the underground parking levels.

5.7.20.3 Provide waterproof flooring and wear course in all wet service areas such as within the Energy Centre and mechanical rooms; refer to Section 6.9.11.

5.7.21 Door Requirements

5.7.21.1 This section is to be read in conjunction with Appendix 1B [Minimum Room Requirements] and Section 6.8

5.7.21.2 For door acoustical requirements, refer to Appendix 1D [Acoustic, Vibration and Noise Control Measures].

5.7.21.3 Unless noted otherwise, doors will not swing into corridors, obstruct traffic flow or reduce the minimum required corridor width.

5.7.21.4 Provide metal doors and frames for service or Back-of-House entrances to Components due to high traffic of transfers and equipment/supply movements.

5.7.21.5 Provide glazing in interior and exterior doors to allow for proper security, Line of Sight, and as a means of achieving Direct Natural Light or Borrowed Light.

5.7.21.6 The Patient entrance into each Operating Room will be configured in relation to the alcoves located outside of the room, such as Alcove-Scrub Station and Alcove-Stretcher Storage, to create a recessed space within the room of appropriate width to allow each panel of the double doors to fold when open against the party wall shared with an alcove, ensuring that the door panel does not swing into useable space inside the room.

5.7.21.7 The Design-Builder will ensure doors are obtained from one (1) source by a single manufacturer.

5.7.21.8 Minimum Size Requirements for Doors

5.7.21.8(1) The door widths described in Appendix 1B [Minimum Room Requirements] are minimum door slab width and height dimensions for swing doors and minimum clear opening width dimensions for sliding doors in a sliding position (not in a break-away position), and will be widened as follows:

5.7.21.8(1)(a) To allow Equipment or supplies to be easily moved in and out of the space;

5.7.21.8(1)(b) To allow Patients and visitors in wheelchairs or other mobility aids to easily move in and out of the space;

5.7.21.8(1)(c) To enable multiple Staff to accompany a Patient on a stretcher where required; and

5.7.21.8(1)(d) As otherwise required by the Authority to meet the functional requirements based on the Design.

5.7.21.8(2) Unless noted otherwise, provide double 914 mm (3’-0”) doors into all mechanical rooms and Electrical Rooms. Provide a minimum of 2134 mm (7’-0”) high door unless otherwise required by the Authority for access to services or other purposes where height is restricted, or greater height is required. For SERs, a minimum 914 mm (3’-0”) x 2134 mm (7’-0”) single door is acceptable provided the Design-Builder demonstrates the largest piece of equipment contained within the SER can fit though the door opening.

5.7.21.9 Where security grilles are described in the Appendix 1B [Minimum Room Requirements], the Design-Builder will provide grilles system as required by the Authority based on the Design in accordance with:

5.7.21.9(1) Section 08 33 13 – Coiling Counter Doors;

5.7.21.9(2) Section 08 33 26 – Overhead Coiling Grilles; and/or

5.7.21.9(3) Section 08 33 36 – Side Folding Grilles.

5.7.22 Flag Poles

5.7.22.1 Provide two (2) flag poles located near the main entrance or other public focal point of the Site.

5.7.22.2 Locate the flag poles away from surrounding structures and trees such that when flags are flown at full and half mast, the flag evades any interference when fully unfurled.

5.7.22.3 Provide flag poles with internal halyards complete with locking cover to prevent tampering and theft.

5.7.22.4 Provide flag poles that are accessible for routine raising and lowering with a paved or concrete pathway leading to and surrounding the base for access.

5.7.22.5 Provide flag poles complete with:

5.7.22.5(1) Gold colour anodized finial;

5.7.22.5(2) Rotating truck;

5.7.22.5(3) Two (2) snap hooks;

5.7.22.5(4) Counterweight;

5.7.22.5(5) Retainer ring;

5.7.22.5(6) Internal cam cleat;

5.7.22.5(7) Gold anodized collar;

5.7.22.5(8) Shoe base (Fixed);

5.7.22.5(9) Anchor cage;

5.7.22.5(10) Tilting base;

5.7.22.5(11) Lightning rod kit; and

5.7.22.5(12) Sizes: as determined in consultation with the Authority.

5.7.22.6 Manufacturer: Flags Unlimited Corporation or alternative as approved by the Authority.

5.7.23 Trenching

5.7.23.1 Provide all required trenches within the structural concrete floor system whether on-grade or suspended, as required to accommodate the Equipment, conduit and all other infrastructure in accordance with the manufacturer's or vendor's requirements between the following areas:

5.7.23.1(1) Between the Treatment Bunker Interior and the Control Room - Treatment Bunker;

5.7.23.1(2) Between the Cyclotron Vault and the hot cells; and

5.7.23.1(3) As otherwise required between spaces for a complete installation of the Equipment; refer to Appendix 1H [Equipment and Furniture].

5.7.23.2 Provide all service access panels at the floor level complete with radiation shielding in accordance with 6.13.1.2 Section 13 49 00 – Radiation Shielding Systems. The exact design and location of service access panels along the

trenching will be determined in consultation with the Authority through the Review Procedure.

5.7.23.3 Group conduit and pipe runs in close proximity to each other and install in straight lines parallel with the building grid lines.

5.8 Secure Room Requirements

5.8.1 The Secure Room will meet the requirements as set out in the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

5.8.2 Design will prevent Patients from being able to reach the ceiling to hide items or tamper with fixtures even if standing on the toilet fixture or other fixed elements. All projections including mechanical, communications, and electrical devices in Secure Room will be ceiling mounted or located such that no device can be accessed or tampered with by the assistance from any equipment, device or projection, such as a water closet.

5.8.3 Coat hooks, towel bars or shelves to store items are not permitted.

5.8.4 Secure Room door will swing outward 180 degrees into the Anteroom so that the door does not create an impediment to admitting a Patient. Provide a straight path from the Anteroom door into the Secure Room with both doors able to be fully open.

5.8.5 Wall assemblies will meet the requirement as set out Appendix 1D [Acoustic, Vibration and Noise Control Measures].

5.8.6 Provide the ability for Staff to observe all four corners of the Secure Room from the door window.

5.8.7 Provide the Secure Room with an exterior window complete with integral blinds controlled from the Secure Room anteroom.

5.8.8 Floor will have a gradual slope to a floor drain in order to facilitate cleaning while ensuring that the Patient can lie relatively flat.

5.8.9 Floor finish will be resistant to damage and composed of a material that provides cushioning to decrease the risk of injury to the Patient in the event of body slamming or falling onto the floor.

5.8.10 Padded Surfaces

5.8.10.1 Provide protective surface padding system for walls, doors and frames.

5.8.10.2 Surface padding system to be minimum 38 mm thick, installed to minimum 2.44 m AFF level with padding flush to coved base.

5.8.10.3 Door padding panels will be composed of a padded material system adhered to a 19 mm thick fire-resistant plywood backing board..

5.8.10.4 Provide openings in door padding for glazed observation openings and food slots.

5.8.10.5 Application of protective surface padding will be performed by an applicator with a minimum of five (5) years' experience in the successful fabrication and installation of surface padding system.

5.8.11 For structural support of the Secure Room door and to protect the integrity of the adjacent wall in resisting and distributing forces caused by door use, provide the following:

5.8.11.1 Vertically install one (1) 15 mm steel rebar from slab to ceiling in the first void of the wall opening on each side of the door;

5.8.11.2 Horizontally install one (1) 15 mm steel rebar in the lintel blocks;

5.8.11.3 The bar will be bent to engage the blocks to each side of the door opening a minimum vertical distance of 457 mm;

5.8.11.4 Tie the horizontal and vertical rebar together;

5.8.11.5 Fully grout walls for 457 mm around the perimeter of the door opening with a high yield mortar;

5.8.11.6 High yield mortar will also be used to fill any voids containing rebar;

5.8.11.7 Fill the wall voids adjacent to the lintel; and

5.8.11.8 Position rebar to avoid conflict with door hardware installation.

5.9 Bariatric Design

5.9.1 General Requirements

5.9.1.1 For the purposes of this document, bariatric individuals are those within the range of 160 kg to 500 kg (350 lbs to 1100 lbs).

5.9.1.2 Entrances serving accessible parking spaces will be accessible to bariatric Patients and visitors, and persons using wheeled mobility devices.

5.9.1.3 Provide a bariatric path of travel for the public from the Facility entry(s) to all rooms and spaces used by bariatric Patients. Within that path of travel, doors (including elevators) will have a minimum width of 1.22 m unless otherwise required by this Schedule.

5.9.1.4 Rooms for bariatric Patient use will have the required space and Equipment for safe, efficient, and effective management of bariatric Patient needs.

5.9.1.5 Bariatric specific room locations will minimize distances that Staff must push and maneuver bariatric Equipment. Access points, doorways and circulation spaces to bariatric specific rooms will accommodate bariatric wheelchairs/stretchers.

5.9.2 Bariatric Room Requirements

5.9.2.1 Bariatric inpatient bedrooms will comply with CSA Z8000 7.8.8 Accommodation of Bariatric Persons, and the Authority Bariatric Room Design Guidelines;

5.9.2.2 Provide clear space to accommodate large mobility aids and other portable equipment as well as family space;

5.9.2.3 Service connections (e.g. medical gas, electrical) will be spaced farther apart to accommodate a wider bariatric bed;

5.9.2.4 Provide an x-y gantry ceiling lift and track system. Design ceiling to accommodate the x-y gantry ceiling lift and track system. Refer to Section 6.11.5; and

5.9.2.5 The room will be equipped with handrails that can support at least 500 kg.

5.9.3 Ensuite washrooms for bariatric Patients will be designed with the following features:

5.9.3.1 Acrylic solid surface shelf above or near the sink;

5.9.3.2 Floor mounted toilets with a load bearing capacity of 454 kg / 1000 lbs, refer to Section 7.3.1.3 Plumbing;

5.9.3.3 Floor mounted toilet located directly in line with washroom door;

5.9.3.4 Toilet paper dispenser mounted in a location where it can be easily reached by a bariatric Patient;

5.9.3.5 Equipped with grab bars that are sized and positioned for use by a bariatric person and can support 363 kg downward force. Grab bars all extend behind and beside the toilet; and

5.9.3.6 Shower area that:

5.9.3.6(1) is open to the toilet area, with no floor lip, and with floor sloped to a drain;

5.9.3.6(2) is equipped with a moveable/portable shower seat; and

5.9.3.6(3) is equipped with a handheld shower wand system rated for use as a safety grab bar fastened securely to support and function as a safety grab bar. The base will be height adjustable with magnetic shower wand to base connection.

5.9.3.7 Bariatric Requirements for Doors

5.9.3.7(1) Swing doors for bariatric Patients will have a clear floor area beside the latch edge that extends the full height of the door, for 940 mm on the pull side and 640 mm on the push side.

5.9.3.7(2) Provide a clear dimension extending 2.4 m on the pull side and 1.725 m on the push side for bariatric Patient Rooms and 1.8 m on the pull side and 1.725 m on the push side for all other bariatric doors.

5.10 Areas of Refuge

5.10.1 The Design-Builder will provide Areas of Refuge to meet the requirements as set out in the BCBC and this Schedule. These will include compartments containing rooms such as Outbreak Control Zones, Operating Rooms, recovery areas and high acuity care units, from which it is impracticable to move Patients in an emergency, which for this Project will include:

5.10.1.1 C. Emergency Department

5.10.1.1(1) Decontamination Room; and

5.10.1.1(2) Trauma Room.

5.10.1.2 B. Inpatient Unit (12-Bed High Acuity Unit)

5.10.1.2(1) Patient Room - Private – HAU; and

5.10.1.2(2) Patient Room – AIR – Bariatric – HAU.

5.10.1.3 B. Inpatient Unit (12-Bed, Medical-Oncology)

5.10.1.3(1) Patient Room - Private – Shielded.

5.10.1.4 D. Perioperative

5.10.1.4(1) Operating Room;

5.10.1.4(2) Operating Room – HDR;

5.10.1.4(3) Control Room – HDR;

5.10.1.4(4) Procedure Room – General;

5.10.1.4(5) Procedure Room – Endoscopic; and

5.10.1.4(6) Stretcher Bay – ACU.

5.10.1.5 All Outbreak Control Zones

5.10.2 Emergency Access to Floor Areas

5.10.2.1 Doors providing access to floor areas from exit stairs through a travel distance up or down of not more than 2 storeys to an unlocked door as set out in the BCBC will not be permitted on dedicated mechanical floors or floors containing the Perioperative Component.

5.11 External Ambulance Canopy/Vehicle Bay

5.11.1 Provide a completely covered, at-grade External Ambulance Canopy/Vehicle Bay for ambulance vehicles with a nose-in arrangement with bypass lane. The canopy will extend

beyond the edge of the vehicles and stretcher travel paths, to provide weather protection for Staff and Patient exiting the vehicle and entering the Emergency department.

5.11.2 Provide clearance on each side of the vehicle so that a stretcher, in its fully extended position with Staff around it, can be manoeuvred between the structure and the doors of the vehicle in their fully open position.

5.11.3 Pavement will be sloped to drain minimum 2% away from the Facility.

5.11.4 Emergency Exterior Decontamination Area

5.11.4.1 Provide an emergency exterior decontamination area within the External Ambulance Canopy/Vehicle Bay meeting the following requirements:

5.11.4.1(1) Designed in accordance with FHA Emergency Department Decontamination and Isolation Suite Design Standard; and CSA Z8000 requirements as set out in Section 2.4.5;

5.11.4.1(2) Provide two (2) duplex hospital-grade vital power outlets in weatherproof concealed enclosures around the inside perimeter of the External Ambulance Canopy/Vehicle Bay;

5.11.4.1(3) Provide two (2) tempered water shower assemblies to serve as decontamination showers. The water from these showers will drain exclusively to the External Ambulance Canopy/Vehicle Bay oil interceptor and decontamination waste storage system, refer to Section 7.1.31.2(6). Each of the shower assemblies will be housed in a stainless-steel surface mounted enclosure with a shower head and shut-off valve. Provide drop-down curtains for each shower;

5.11.4.1(4) The shower assembly will be supplied with tempered water from the central mixing valve. The entire tempered water system will be totally drainable after each use. The tempered water system will be fed from a central thermostatic mixing valve located in a secure location near the External Ambulance Canopy/Vehicle Bay. An electrically operated solenoid valve will be located upstream of the mixing valve with a mushroom style activation switch located near the shower location;

5.11.4.1(5) Provide a minimum of two (2) hose bibbs, hoses and tempered water hose reels, complete with adequate floor drains, distributed to allow for spraying down of the area and ambulances at all bays. Each hose reel will hold a 15 m hose with a fine spray nozzle attached;

5.11.4.1(6) Ensure that the External Ambulance Canopy/Vehicle Bay pavement surface is appropriate for use as an emergency exterior decontamination area including decontamination showers and required cleaning procedures; and

5.11.4.1(7) Provide rough-in for electric radiant heating for the shower area.

5.12 Structural Design

5.12.1 Structural Design Principles

5.12.1.1 Design-Builder's Structural Engineer-of-Record will have demonstrated experience in undertaking the structural design of buildings similar in size and complexity to the Facility and will have designated structural engineer "Struct. Eng" standing with EGBC.

5.12.1.2 The structural design, including minimum design loads, general provisions, and material specifications, will satisfy the requirements of the current BCBC that is in effect at the time of the Building Permit submission, local bylaws, other applicable or referenced Design standards, loading criteria required by equipment suppliers or construction technique and the loading and performance requirements detailed in this Section.

5.12.1.3 Prior to issuance of the IFC and starting Construction of the Facility, Design-Builder's Structural Engineer-of-Record will have a qualified second Professional Engineer perform an independent review of the structural design satisfying the requirements of the Engineers and Geo-scientists of British Columbia Quality Permit to Practice requirements.

5.12.1.4 Design-Builder's Structural Engineer-of-Record will perform field review of the Construction at sufficient frequency and review of the reports of the applicable inspection and testing agencies to verify that the building structures of the Facility have been built in substantial conformance to the approved IFC structural drawings and any authorized amendments thereto.

5.12.1.5 Design-Builder will carry out the Construction, including any site and foundation works, excavation, backfill, shoring and engineered backfill, so that construction-caused settlement or vibration of the existing adjacent facilities over the term of the agreement will be minimized.

5.12.1.6 Design-Builder will carry out a pre-condition survey of the facilities and existing services adjacent to the Construction, which may be affected by the Construction work, prior to the commencement of the Construction work, refer to Section 2.7.10.

5.12.1.7 Design-Builder will develop a monitoring program of the adjacent facilities, existing services and existing surface features and provide adequate settlement monitoring benchmarks as required at locations determined in consultation with the Authority through the Review Procedure.

5.12.1.8 Protect the existing surface features and existing underground Utilities from damage while Construction is in progress. In event of damage, immediately make repairs to the satisfaction of the Authority.

5.12.1.9 The structural design of the Facility will be to an Importance Category of 'post-disaster'. Related Importance Factors as defined in the current BCBC will be applied to seismic, wind and snow loads.

5.12.1.10 The Energy Centre will be constructed as an independent structure adjacent to the Core Hospital and Cancer Centre structure but not connected to it.

5.12.1.11 The use of BC wood and wood products will be considered in the design of the building.

5.12.1.12 A Geotechnical Consultant will be part of the Design-Build project team to provide recommendations for the design of foundations, slabs on grade, and superstructure, including seismic design parameters.

5.12.1.13 Design-Builder will provide copies of the structural and geotechnical field reviews on a bi-weekly basis to the Authority.

5.12.2 Structural Analysis Methods

5.12.2.1 Perform the structural analysis of the Facility generally in accordance with the provisions of BCBC, Section 4.1.8.7; however, and as a minimum, it is essential that a Linear Dynamic Analysis Procedure (Model Response Spectrum Method) in accordance with the provisions of BCBC, Section 4.1.8.12, be used.

5.12.2.2 The structural analysis of the Facility will include a three-dimensional analysis accounting for all vertical and lateral loads together with all applicable load combinations, carried out using a computer software program consistent with Good Industry Practice.

5.12.3 Site Preparation and Sub Structures

5.12.3.1 Facility foundation systems will provide adequate support to the superstructure while limiting total settlement to less than 25 mm with differential settlement between columns less than L/500 (with L being the column spacings) for the Facility structure and serviceability over the Design Life of the Facility.

5.12.3.2 A supplementary geotechnical investigation will be required and provided by the Design-Builder to specify foundation Design parameters.

5.12.3.3 Facility foundation systems and site preparation Design will be in accordance with recommendations from the Design-Builder's Geotechnical Consultant. Facility foundations will be designed by the Design-Builder's Structural Engineer-of-Record.

5.12.3.4 During site preparation and Construction, the Design-Builder's Geotechnical Consultant will provide site reviews and on-going testing to confirm the general intent of the foundation and site preparation specification and Design recommendations, including densification, are carried out.

5.12.4 Structural Systems

5.12.4.1 For the Facility the preferred structural system for the suspended floors and main roof consists of cast-in-place concrete flat slab construction. Any other proposed system will provide similar performance for flexibility or change, vibration resistance, fire rating, acoustic separation, ceiling space available for services, and overall building height.

5.12.4.2 The preferred structural system for the Energy Centre is structural steel frame utilizing 76 mm composite steel decking with a minimum 90 mm concrete topping for the floors.

5.12.4.3 The structural system will make provisions to allow for the installation, serving and future replacement of any specialized Equipment and its components including the SPECT, cyclotron and hot cells, CT Scan, MRI, Linear Acceleration and PET/CT; refer to Appendix 1H [Equipment and Furniture]. All floors and elevators along the routes of the delivery, servicing and replacement of the Equipment and Building Systems will be designed with capacities adequate for the loading of the Equipment and Building Systems. Provide floor plans for all the above system replacement component delivery, i.e., corridor, doors, elevations, etc., identifying which meet the specification of minimum delivery routes sizes and capacity as required by the system equipment suppliers.

5.12.4.4 Provide an interstitial floor above the cyclotron vault shielding complete with a minimum 3 m x 5 m roof hatch, refer to Section 5.1.2.5.

5.12.4.5 Facility lateral seismic and wind loads will be resisted by strategically placed reinforced concrete shear walls that encompass both stairwells and elevator shafts. Discrete shear walls within interior spaces are permitted, as set out in Section 5.1.1.1(8). Steel lateral force resisting system is acceptable as an alternative for the Energy Centre.

5.12.4.6 Roofs may be structural steel or concrete slab construction. Structural steel roofs can be part of the Facility Design and massing strategy to reduce settlements. Structural steel beams and/or open web steel joists may be used at roof areas directly above mechanical rooms. They are not permitted anywhere else.

5.12.4.7 The preferred system for the mechanical roof is 76 mm minimum steel roof deck on structural steel beams to accommodate the hanging of mechanical piping, etc. or alternative as approved by the Authority.

5.12.4.8 The Facility foundations are to be founded a minimum of 600 mm, or at a depth recommended by the Design-Builder’s Geotechnical Consultant, whichever is greatest, below finish grade to provide for frost protection.

5.12.4.9 The foundation for the new Bulk Medical Gas Storage Facility will include a concrete pad and its supporting base adequately designed to support the tanks and the oxygen truck to fuel the tanks.

5.12.5 Seismic Separation

5.12.5.1 Design the structure to be completely independent from any current or planned future adjacent structures by seismic isolation joint that takes into account the lateral drifts of both structures in accordance with the provisions of the BCBC.

5.12.6 Seismic Isolation (Alternative Approach)

5.12.6.1 Definitions

5.12.6.1(1) “Seismic Isolation” means an alternative seismic design concept that consists of installing an isolation system with low horizontal stiffness, thereby substantially increasing the fundamental period of the structure.

5.12.6.1(2) “Isolation System” means a collection of structural elements at the level of the isolation interface that includes all individual isolator units, all structural elements that transfer force between elements of the isolation system, all connections to other structural elements, and may also include a wind-resisting system, energy-dissipation devices, and a displacement restraint system.

5.12.6.1(3) “Seismically Isolated Structure” means the upper portion of the structure above the isolation system, the isolation system, and the portion of the structure below the isolation system.

5.12.6.1(4) “Isolator Unit” means a structural element of the isolation system that permits large lateral deformations under lateral earthquake design forces and is characterized by vertical-load-carrying capability, and lateral restraint (sufficient elastic stiffness) under non-seismic service lateral loads.

5.12.6.1(5) “Isolation Interface” means the boundary between the isolated upper portion of the structure above the isolation system and the lower portion of the structure below the isolation system.

5.12.6.2 Seismic Isolation System

5.12.6.2(1) All spaces within the Facility will be located above Isolation Interface.

5.12.6.2(2) Seismic Isolator type: Friction pendulum bearing or lead-rubber bearing type systems will be used. Combinations of different Isolator types are not permitted.

5.12.6.2(3) Seismic Isolator System will be sized to not interfere with required functionality of the Facility as specified in this Schedule.

5.12.6.2(4) Fire rating requirements: all components of an Isolation system that are located below a floor assembly that is required to have a fire-resistance rating will have a fire-resistance rating of no less

than that required for the supported floor assembly. The fire-resistance rating of the components will also meet that required for load bearing walls, columns and other gravity-bearing elements adjacent to the Isolation System.

5.12.6.2(5) A seismic gap will be provided around the structure to accommodate the total design displacement in both orthogonal horizontal directions simultaneously.

5.12.6.3 Design and Analysis

5.12.6.3(1) Analysis, modeling and design of the seismically isolated structure will be in accordance with BCBC; refer to 4.1.8.19 and 4.1.8.20.

5.12.6.3(2) Elements of structures, non-structural components and equipment within Seismically Isolated Structures will be designed in accordance with the relevant paragraphs of the Commentary in Structural Commentaries of User's Guide - NBC (Part 4 of Division B).

5.12.6.4 Seismic Isolator Quality Control and Testing

5.12.6.4(1) Isolator testing: the force-deformation and damping characteristics of the Isolation System used in the analysis and design of the Seismically Isolated Structures will be validated by tests specified herein.

5.12.6.4(2) Qualification tests will be in accordance with Clause 17.8.1.1 of ASCE 7-16 and will be submitted to Design-Builder's Structural Engineer-of-Record (Registered Professional of Record) and the Authority for approval.

5.12.6.4(3) Prototype tests will be performed on two full-size specimens of each predominant type and size of Isolator Unit in accordance with Clause 17.8 of ASCE 7-16. In Clause 17.8.2.2 of ASCE 7-16, SM1 will be taken as S(1.0) and SMS will be taken as S(0.2). A detailed prototype testing scheme and the associated acceptance criteria will be prepared and submitted to Design-Builder's Structural Engineer-of-Record (Registered Processional of Record) and the Authority for approval prior to commencement of the tests. The prototype tests will satisfy the requirements in Clause 17.8.4 of ASCE 7-16. Prototype test results will be submitted to and approved by the Engineer of Record before the commencement of production.

5.12.6.4(4) Production tests will be performed on 100% of isolators in accordance with Clause 17.8 of ASCE 7-16. A detailed production testing scheme and the associated acceptance criteria will be prepared and submitted to Design-Builder's Structural

Engineer-of-Record (Registered Professional of Record) and the Authority for approval prior to commencement of the tests. The production test result for each bearing produced will be submitted to and approved by Design-Builder's Structural Engineer-of-Record (Registered Professional of Record) and the Authority before the commencement of installation On-Site.

5.12.6.4(5) Manufacturer qualification requirements: Design-Builder will select a manufacturer who meets all the minimum criteria as follows:

5.12.6.4(5)(a) Have a minimum of ten (10) years of experience with successful installed performance of Seismic Isolation device for hospitals or other critical infrastructure facilities;

5.12.6.4(5)(b) Have previously completed design, production, tests, and delivery of the Seismic Isolation devices having similar load and displacement capacities and properties;

5.12.6.4(5)(c) Have an ISO9001 or equivalent certified Quality Control System for the seismic isolation devices, materials, manufacturing procedure, and testing procedures;

5.12.6.4(5)(d) Demonstrate adequate reliability, longevity, and Design Life of seismic isolation devices and materials;

5.12.6.4(5)(e) Demonstrate adequate engineering capability and experience to support the project team during the Design and Construction phase of the Project;

5.12.6.4(5)(f) Have engineers that are experienced in the installation of seismic isolation devices for the supervision during the On-Site installation of these devices;

5.12.6.4(5)(g) Have a Professional Engineer that is expert in the testing of the Seismic Isolation device, sign and seal to certify that the prototype and production tests satisfy the specification for the Seismic Isolation device sold;

5.12.6.4(5)(h) Demonstrate the manufacturing and testing resources to complete the deliveries within the specified construction schedule; and

5.12.6.4(5)(i) Have no failures of installed and in-service Seismic Isolation bearings during a seismic event.

5.12.6.4(6) Quality Assurance, Quality Control Certificates and Product Warranty:

5.12.6.4(6)(a) Design-Builder is responsible for ensuring that the seismic isolation devices, the materials used, assembly, manufacture, testing, delivery to site, and performance complies with this Specification. Design-Builder will nominate a representative from the manufacturer, who will be responsible for ensuring the Seismic Isolation devices comply with this Specification.

5.12.6.4(6)(b) Design-Builder will provide evidence with their proposal that formal quality assurance procedures are in place regarding the manufacture and testing of the Seismic Isolation device.

5.12.6.4(6)(c) The nominated representative is required to check the work at each relevant stage of the manufacturing, and verify the necessary checklists, to ensure that the work complies with the Agreement.

5.12.6.4(6)(d) Design-Builder's Structural Engineer-of-Record (Registered Professional of Record) and the Authority may elect to audit the quality records, at which time the quality records, including checklists will be made available to them.

5.12.6.4(6)(e) Design-Builder will obtain from the manufacturer all certificates pertaining to the Seismic Isolation device and its components, detailed information about quality control program, and at least ten (10) years system and product warranty documents starting from the delivery of the last seismic isolator unit to the Site and will submit them all to Design-Builder's Structural Engineer-of-Record (Registered Professional of Record) and the Authority in the form of a report.

5.12.6.4(7) Isolation System inspection and replacement: the following items will be addressed as part of the long-term inspection and replacement program:

5.12.6.4(7)(a) Access for inspection and replacement of all components of the Isolation System will be provided;

5.12.6.4(7)(b) Design-Builder's Structural Engineer-of-Record (Registered Professional of Record) will complete a final series of observations of structure separation areas and components that cross the isolation interface before the issuance of the occupancy permit for the Seismically Isolated Structure. Such observations will verify that conditions allow free and unhindered displacement of the structure up to the total maximum displacement and that components that cross the isolation interface have been constructed to accommodate the total maximum displacement;

5.12.6.4(7)(c) Seismically Isolated Structures will have a monitoring, inspection, and maintenance plan for the Isolation System established by Design-Builder's Structural Engineer-of-Record (Registered Professional of Record); and

5.12.6.4(7)(d) Remodeling, repair, or retrofitting at the Isolation System interface, including that of components that cross the isolation interface, will be performed under the direction of a registered professional.

5.12.7 Design Loads

5.12.7.1 Performance requirements for the Facility:

5.12.7.1(1) Unless higher loads are required by the specific use and occupancy, and equipment loads, the following minimum floor Design live loads will apply:

5.12.7.1(1)(a) Level 1: 4.8 kPa;

5.12.7.1(1)(b) Corridors, lobbies, and aisles: 4.8 kPa;

5.12.7.1(1)(c) Upper floors (Patient rooms, exam rooms, offices, work stations, laboratories, procedure rooms, operating rooms except Operating Room – HDR, or similar spaces): 3.6 kPa;

5.12.7.1(1)(d) Upper Floors (storage rooms, diagnostic and functional imaging spaces, Operating Room – HDR, or similar spaces): 4.8kPa;

5.12.7.1(1)(e) Penthouse areas: 6.0 kPa;

5.12.7.1(1)(f) Mechanical / electrical / Communications Room areas: 6.0 kPa or as required for equipment. Refer to Section 7.8 Communications (Division 27) for applicable design requirements for Communications Room areas;

5.12.7.1(1)(g) Parking Areas: 2.4 kPa;

5.12.7.1(1)(h) All Equipment: Refer to Appendix 1H [Equipment and Furniture] and manufacturer's specialized requirements for design weights, radiation shielding system, floor deflection and hardness;

5.12.7.1(1)(i) CNC Equipment: See manufacturer's criteria for design support requirements; and

5.12.7.1(1)(j) Maintenance Walkways: 2.0 kPa.

5.12.7.1(2) Live Loads listed above will be in addition to all loads required to meet the radiation shielding requirements.

5.12.7.1(2)(a) Mobile Medical Unit:

5.12.7.1.2.(a).1 Each individual Tractor: 200kN;

5.12.7.1.2.(a).2 MMU vehicle minus tractor: 356kN;

5.12.7.1.2.(a).3 Supply vehicle minus tractor: 356kN; and

5.12.7.1.2.(a).4 Supply truck and MMU vehicle: each 556kN max. fully loaded.

5.12.7.1(3) Floors will be designed to accommodate concentrated loads from Equipment, fixtures, and machinery, whether floor, wall, or ceiling-mounted. Unless higher minimum concentrated loads are required by the specific use or from the equipment, fixtures and machinery, all floors will be designed for a minimum specified concentrated load of 9 kN.

5.12.7.1(4) Floors will be designed for a minimum superimposed dead load allowance of 1.5 kPa to allow for partitions, ceilings and suspended mechanical equipment.

5.12.7.1(5) Roofs will be designed by the Structural Engineer-of-Record for the required wind load and for the minimum snow and rain loads required by BCBC and the local building bylaws. Notwithstanding other requirements, the minimum live load for Design of roofs will be 2.2kPa. Roofs will be designed to accommodate concentrated loads from equipment, machinery and features, whether roof or ceiling-mounted.

5.12.7.1(6) Roofs will be designed for the superimposed dead load of roofing materials, ceilings, mechanical equipment, but not be less than 1.5 kPa to allow for future re-roofing alternatives.

5.12.7.1(7) Floors and roofs above mechanical and electrical service rooms and penthouses will be designed for a minimum superimposed suspended equipment dead load of 2.0 kPa in addition to the minimum dead load allowances specified above and the dead and live load from any mechanical or interstitial floor suspended from the floors and roofs.

5.12.7.1(8) Floors for rooms designated for medical records storage or compact high density mobile shelving will be designed for a minimum 14.0 kPa live load. For medical storage such as Sterile Storage and Distribution (MDR and ORs), it will be designed for a minimum 14 kPa (290 psf) live load. All these floors will be adequate to support the seismic or dynamic load imposed from the supported shelving and equipment. The specific areas for the medical records storage or compact high density mobile shelving include:

5.12.7.1(8)(a) U5.09 – CC Storage – Records/Files – CC;

5.12.7.1(8)(b) U5.03 – Storage – Records/Files;

5.12.7.1(8)(c) D2.20 – Storage – Implants;

5.12.7.1(8)(d) D2.28 – Storage – Clean Supply;

5.12.7.1(8)(e) D2.12 – Sterile Supply Core;

5.12.7.1(8)(f) D3.04 – Clean Supply Core;

5.12.7.1(8)(g) P3.02.02 – Case Cart Holding – Full/Stocked;

5.12.7.1(8)(h) P3.02.03 – Case Cart Holding – Empty; and

5.12.7.1(8)(i) P3.02.04 – Sterile Stores Supplies.

5.12.7.1(9) Design-Builder will provide a detailed shoring and re-shoring of formwork proposal to the Authority for review. Surveys of top of formwork prior to pour and top of slab immediately following finishing of the slab as well as immediately following the initial release of the shoring under the slab prior to re-shore will be provided by Design-Builder to the Authority as the Work progresses. A further survey using the same survey points will be provided 3 months following the removal of shoring for the slab.

5.12.7.1(10) Removal of formwork for suspended reinforced concrete floors and immediate re-shoring will commence only after 100 percent of the 28-day Design concrete strength has been achieved. This removal and reshoring will take place in small areas section by section no more than an area of 18 m x 18 m at one time. It is not acceptable to remove the formwork for an entire floor prior to re-

shoring. Re-shoring will be completed during the same day as the formwork was removed. Alternatively, subject to the submission of a signed and sealed comprehensive construction plan for review and acceptance by the Authority, removal of formwork for suspended reinforced concrete floors and immediate re-shoring may commence after 75 percent of the 28-day Design concrete strength has been achieved. The construction plan will include detailing the formwork design, construction and formwork stripping methodology and deflection control for the floor construction. In no case, the removal of formwork will commence in less than 5 days for slabs and 7 days for beams.

5.12.8 Flexibility for Future Change

5.12.8.1 Design the Facility floor structure excluding the underground parking, with a minimum of one 150mm diameter fire rated and fire-stopped knock-out opening on two sides of each column for future use to occur within framed voids or within wall framing complete with access panels. The knock-out openings will be in addition to any openings required for current services; additionally the floor structure will be capable of having a minimum of six additional core holes (100 mm diameter) per bay without additional reinforcing. The additional core holes can be located outside slab column strip zones. The knock-out openings may be provided by Hilti CP 680 P complete with screw cap or alternative as approved by the Authority. Provide a key plan of all penetrations indicating which are in use and which are capped for future use. All abandoned penetrations are to have the cans removed and be filled with non-shrink grout to permanently seal the penetration.

5.12.8.2 Selection of a structural system that will readily accommodate future changes for similar Design load parameters without the addition of structural members, welding, noise, dust, or demolition is a primary structural design criteria.

5.12.8.3 The structural column support grid for the Facility will be a minimum centre-to-centre dimension of 9 m x 9 m to accommodate flexibility in the layout of the Facility. Spans of less than 9 m are acceptable at perimeter edge conditions. The structural column support grid for the Energy Centre will be a minimum centre-to-centre dimension of 9 m x 6 m, with edge bays being minimum 6 m x 6 m, provided that the equipment layouts, service access space and equipment removal and replacement requirements of the Agreement are satisfied. The minimum centre-to-centre dimension of 9 m x 6 m will be increased as required to meet the requirements of the Agreement.

5.12.8.4 In-slab conduits and heating/cooling tubes are not allowed, except for the following:

5.12.8.4(1) As set out in Section 7.7.10.2(8); and

5.12.8.4(2) Exterior exposed vehicular ramps with slopes of 6 percent or greater.

5.12.8.5 In areas where the in-slab conduits and heating/cooling tubes are allowed and installed, ensure that the installation does not compromise or affect the structural integrity of the floor structure.

5.12.8.6 In anticipation of the Facility's future needs, all underside of new underground parking structural floor slabs will be level. Top of structural floor slab will slope to drain at a maximum of 2 percent. Localized areas of the parkade, except in the areas containing parking stalls accessible to Persons with Disabilities, sloped up to 3% for drainage is acceptable provided that the minimum specified thickness of the parkade slab is maintained at the localized areas, with its structural capacity adequate to support the parkade loading and its serviceability and minimum slope requirements in conformance with both CSA A23.1 and CSA S413.

5.12.8.7 For future equipment replacement in and out of the mechanical rooms and Energy Centre, provide sufficient number of adequately designed I beams, lifting rigs and lifting eye in the supporting structures along the routes as defined and prepared in Section 7.1.5 for the support of the equipment weight, including dynamic loading factors for the necessary shipping, rigging, handling and maneuvering of the equipment to be replaced and installed. The capacities of the I-beams, lifting rigs and lifting eyes will be adequate to support the weight of the equipment including its possible dynamic loading during the shipping and rigging of the equipment.

5.12.9 Deflection Limitations

5.12.9.1 Design the structure to meet the deflection limits of BCBC, and in accordance with the applicable materials Design standards listed in Section 2.4 Standards and Guidelines of this Schedule as a minimum and as required for the non-structural components of the Facility. Notwithstanding the above, the deflection limit will not exceed the levels specified in this Section.

5.12.9.2 Performance Requirements

5.12.9.2(1) For concrete floor or roof construction, the maximum deflection occurring after the installation of non-structural elements due to all sustained loads, including long-term creep deflection due to sustained loads, plus immediate deflection due to live load, will not exceed span/480 for the Facility. For the concrete Parkade floor level where it does not support or attach to non-structural elements likely to be damaged by large deflections, the maximum deflection limit of span/480 can be increased to span/360. Parkade floor slope for drainage will be designed to compensate for the increased deflection.

5.12.9.2(2) For steel roof construction, the maximum live load deflection will not exceed span/360 and the total load deflection will not exceed span/240.

5.12.9.2(3) For steel floor construction, the maximum live load deflection will not exceed span/480 and the total load deflection will not exceed span/360. The total load deflection will include effects of shrinkage of concrete topping slabs.

5.12.9.2(4) The floor and roof perimeter edge will be designed to limit combined short and long term deflection occurring after the installation of exterior wall components, including effects of creep, to a maximum of 25 mm.

5.12.9.2(5) The floors will be designed to meet the specialized equipment requirements as specified by the supplier's specifications; refer to Appendix 1H [Equipment and Furniture].

5.12.10 Vibration Limitations

5.12.10.1 Design the structural system to minimize the effects of vibration. Vibration is to be limited to acceptable levels for the use, occupancy, and equipment requirements of the spaces.

5.12.10.2 An Acoustic and Vibration Consultant will be retained by the Design-Builder to address and coordinate vibration controls and structural/foundation design with the structural Professional Engineer and mechanical Professional Engineer, as required to meet the minimum requirements listed in Appendix 1D [Acoustic, Vibration, and Noise Control Measures] of this Section.

5.12.11 Durability

5.12.11.1 Design the structure and structural components of the Facility with a predicted Design Life as set out in Section 3.8.2 Design Life Table 1, Structural and Architectural.

5.12.11.2 Design the structure in accordance with all applicable material standards.

5.12.11.3 Design the structure and structural components of the Facility to minimize the effects of corrosion and deterioration due to the environment and use in accordance with the following:

5.12.11.3(1) Adequate concrete crack control joints and expansion/contraction joints. Caulk exposed joints;

5.12.11.3(2) High strength concrete mixes proportioned to CSA A23-1/A23-2 durability requirements for exposure class;

5.12.11.3(3) Reinforce concrete for crack control and repair exposed cracks and all cracks with crack width exceeding 0.4 mm and surface defects to the satisfaction of the Authority;

5.12.11.3(4) Hot-dip galvanize on exterior exposed steel and all steel that may be exposed to weather / moisture infiltration. Provide galvanic

isolators and/or hot-dip galvanize fittings between fittings and the hot-dip galvanize steel to prevent dissimilar metal corrosion;

5.12.11.3(5) Provide chamfer to all exposed Architectural Concrete edges irrespective of its location and application; and

5.12.11.3(6) Add corrosion inhibitors to exterior reinforced concrete pavements subject to vehicle traffic.

5.12.12 Equipment Requirement

5.12.12.1 Provide support and anchorage of all Authority and Design-Builder supplied Equipment including vendor required seismic bracing. All Equipment will be supported, anchored, and braced to resist gravity, operational, and seismic loads as required for the functional and service requirements for the specific Equipment.

5.12.12.2 Provide all required structural supports, bracing and anchorages for such items as surgical lights and booms as set out in Appendix 1H [Equipment and Furniture]. The Design-Builder is responsible for all required structural supports based on the Authority's final Equipment selections, quantities and the configuration of such systems.

5.12.12.3 Provide floor depressions in concrete slabs to accommodate all Equipment such as cold storage rooms, walk-in refrigerators and freezers and ensure a level floor access both into and out of the units.

5.12.12.4 The Design for all equipment supports, anchorage, and bracing, including medical, will be carried out by a Professional Engineer.

5.12.12.5 Provide a minimum 150 mm thick reinforced concrete slab-on-grade complete with steel skid plates permanently anchored into the (flush with the top of slab) concrete or as otherwise required to suit the specific compactor assembly requirements; refer to Appendix 1H [Equipment and Furniture].

5.12.12.6 Depending on the Design of the loading dock, provide a catwalk or bridge with railings and canopy as required by the Authority on the hopper side of the compactor. Catwalk, canopy and bridge design will be in accordance with the requirements as set out in this Agreement including 6.5.1 Section 05 12 00 Structural Steel and 6.5.3 Section 05 50 00 – Metal Fabrications.

5.12.12.7 Performance Requirements

5.12.12.7(1) Design floor and roof assemblies to support the gravity and seismic loads for floor, wall, or ceiling-mounted clinical equipment included in Appendix 1H [Equipment and Furniture]. Ensure that steel content of structural members is compatible with Equipment which is sensitive to steel content of the surrounding structure.

5.12.12.7(2) Provide supplementary structural supports for the partial height ensuite washroom walls including for support of the door frames.

5.12.12.7(3) Design the structure for the vibration limitations specified by the manufacturer of the specified equipment or required by the planned use and occupancy of the floor space and carry out in-situ vibration testing when specified by the equipment manufacturer or as required in the Agreement. Where practical, the Design of and supports for ceiling-mounted equipment, such as radiology gantries, is to be universal for re-use with future equipment installations.

5.12.12.7(4) Drilled insert-type anchors for medical equipment supports and anchorage are to be rated by the insert manufacturer for seismic and cyclic loading applications and drop-in sleeve anchors will not be permitted.

5.12.12.7(5) For everything installed by the Design-Builder, it is the responsibility of the Design-Builder to ensure that the proposed solution will be endorsed by infection control. The solution will be aesthetically pleasing and determined in consultation with the Authority through the Review Procedure.

5.12.12.7(6) Provide sunken pits in the supporting floor structures for pit-mounted Equipment such as cart washers, walk-in fridges and freezers in accordance with the dimensions, finishing, drainage slope, tolerance and other requirements of the Equipment supplier. Structural design will adequately address the impact of the sunken pit to the supporting floor structures and adequately support the weight of the equipment, and for its seismic anchoring. Install necessary embedded metal angle anchored supports, anchor bolts according to the requirements of the equipment supplier.

5.12.12.7(7) At a minimum, maintenance walkways and interstitial floors will be 115 mm (38mm deck plus 77mm concrete topping); refer to Section 5.1.2.8. All mechanical or interstitial floors will be finished with epoxy coating or waterproof membrane as specified in Section 09 67 70 and include adequate drainage.

5.12.13 Member Design Criteria

5.12.13.1 Design all floor and roof structural framing members to have sufficient strength and stability so that the factored member resistance is equal to or greater than the effects of the factored loads.

5.12.13.2 Design all floor and roof structural framing members to have sufficient stiffness so as to remain serviceable under the specified gravity loads. The deflection criteria are presented in Section 5.12.9 Deflection Limitations.

5.12.13.3 Lateral Load Resisting System Design Criteria

5.12.13.3(1) Design all structural framing members to have sufficient strength and stability so that the factored member resistance is equal to or greater than the effects of the factored lateral wind pressures or seismic loads, including applicable importance factors, whichever produces the more unfavourable effect.

5.12.13.3(2) Design all structural framing members to have sufficient stiffness so as to remain serviceable under the specified wind pressures. The maximum inter-storey drift under the 1 in 50 year service wind pressure and gravity load, including applicable importance factors, will not exceed 1/500 of the storey height.

5.12.13.4 Cladding Support Design Criteria

5.12.13.4(1) Where the cladding system is to be supported by the structural members, Design the members to have sufficient strength and stability so that the factored member resistance is equal to or greater than the effects of the factored gravity, wind pressures and seismic forces, including applicable importance factors.

5.12.13.4(2) Where the cladding system is to be supported by the structural members, Design the members to have sufficient stiffness so as to remain serviceable under the 1 in 50 year service wind pressure and gravity loads, including applicable importance factors, and prevent undue stress to the cladding elements. The deflection serviceability limits are shown in Table 5.11.13.4(3) Deflection/Span Ratios.

5.12.13.4(3) Deflection / Span Ratios

Maximum Deflection/Span Ratios – Cladding Support Members		
Member Type	Specified Loading	Deflection Limits
Precast/reinforced concrete floor members supporting cladding panels.	Long-term superimposed dead load plus live load (Vertical)	1:500 or 15 mm max
Structural steel members of floors or roofs supporting cladding panels.	Live Load (Vertical)	1:500 or 15 mm max
All cladding support members.	1 in 50 year wind (Horizontal)	1:360 max

5.12.13.5 Structural Integrity

5.12.13.5(1) Various levels of structural integrity, ranging from the minimum level of structural integrity as set out in the BCBC to enhanced integrity, as determined by a rigorous progressive collapse Design approach will be provided in the structural Design. Design any structure and its structural members to have sufficient structural capacity and structural integrity to safely and effectively resist all loads and effects of loads and influences that may

reasonably be expected over the design service life of the structure including settlement.

5.12.13.6 Thermal Expansion

5.12.13.6(1) Design the primary and secondary structural elements to accommodate the effects of thermal movements of the Facility structure.

5.12.13.7 Seismic Isolation

5.12.13.7(1) Design the structure to be completely independent from any existing adjacent structures by a properly designed seismic isolation joint which takes into account the lateral drifts of both of the new structures in accordance with the provisions of BCBC.

5.12.14 Seismically Isolated Building Structure

5.12.14.1 The Seismically Isolated Building Structure will consist of a structural moat wall (perimeter retaining wall) around the perimeter of the Facility being isolated or protected from the amplified seismic responses associated with the top soft clay layer. It is an independent structural system with a seismic isolation gap (space) between the structural moat wall and the protected Facility.

5.12.14.2 The structural moat wall will isolate the ground motion amplification associated with the top soft clay layer of the Site from impacting onto the Facility, which is being isolated or protected, i.e., the core hospital building (except for certain areas as agreed by the Authority such as the radiation treatment vaults, Cyclotron/Radiopharmaceutical areas, Energy Centre, and canopies). With the isolation from the structural moat wall, the core hospital building, which will be founded directly on the dense till layer in accordance with the Geotechnical Report, will be isolated from the surrounding ground motion from the top surface layer of the Site and designed for the modified ground motion input from the supporting dense till layer as determined by the Geotechnical Consultant and Structural Engineer of Record.

5.12.14.3 The seismic isolation gap space between the interior face of the structural moat wall and the Facility means the boundary between the interface of the structural moat wall and the structure of the Facility, allowing independent seismic response of the moat wall from the protected Facility structure and preventing both structures from pounding and structural interaction during a seismic event. There will be adequate clearance to accommodate the total design displacement in both orthogonal horizontal directions simultaneously, equal to the summation of the maximum lateral displacement of the structural moat wall and that of the Facility, along the entire height of the structural moat wall, including the gap at grade around the perimeter of the Facility.

5.12.14.4 The structural moat wall will be constructed of a reinforced concrete diaphragm wall system embedded into the dense till layer with a tied back anchor system, to mitigate water ingress through the wall joints and to enhance the overall water

resistant integrity of the structural moat wall system. The diaphragm wall will be embedded into the dense till layer at a depth sufficient to serve as a ground water cut off wall which will minimize water seepage from the surrounding grade to below grade spaces.

5.12.14.5 Analysis, modelling and design of the structural moat wall will be in accordance with BCBC.

5.12.14.6 The structural moat wall will be designed to resist the seismic loads according to the BCBC and the design of the structural moat wall will take into account of the following conditions:

5.12.14.6(1) all load effects due to the retained soil layers in its normal static case, due to the ground response of the retained soil layers based on the seismic events specified in the BCBC and any hydrostatic pressure from the surrounding water table and all other applicable load effects;

5.12.14.6(2) a maximum drift at 1% under a seismic event at 2% in 50 years and all its structural components including the tied back anchors will remain elastic under the earthquake event at 5% in 50 years. The drift will allow for the elongation of the tied back anchors and potential ratcheting effect due to accumulated residual deformation from the retained soil layers under the seismic event;

5.12.14.6(3) the tied back anchors will be provided with adequate durability with protection against potential short and long-term corrosion expected to arise in the surrounding soil around the Site, for the Design Service Life as set out in Section 2.5.1.17 Design Service Life; and

5.12.14.6(4) all tied back anchors will be located aa minimum depth of 2.0 m (or as otherwise required by the AHJ and/or civil Engineer of Record) from the exterior grade to allow for Utility installation around the Site.

5.12.14.7 The analysis, modelling and Design of the Facility isolated from the structural moat wall founded on the dense till layer at level P3, the lowest parking level, will be based on either:

5.12.14.7(1) the spectral acceleration values determined from the Site Designation (as defined in the BCBC) using the average shear wave velocity, Vs30 measured at top 30m of the soil layers from the original grade of the building, according to the intent of the BCBC, or

5.12.14.7(2) the spectral acceleration values as agreed by the Authority and determined from the Site Designation using the Vs30 obtained from the Site-specific geotechnical evaluation and soil structural analysis of the potential isolation of the ground motion input from

the supporting grade at the dense tile layer taking into account the modified ground profile around the structural moat wall and potential interaction of the dense till layer under the Facility with the response of ground motions due to the proximity of the reaction responses from the structural moat wall embedment and its tied back anchors.

5.12.14.8 Provide a third-party peer review of the Seismically Isolated Building Structure by a qualified Geotechnical Consultant experienced in the development of seismic hazards, subject to approval by the Authority. The peer review will provide a report, the purpose of which will be to confirm the effectiveness of the isolation of the structural moat wall to cut off the amplification of ground motion induced from the top soft clay layer and appropriate Site Designation. The value of Vs30 will be used for the determination of the ground motion input for the Design of the Facility isolated by the structural moat wall, i.e., spectral acceleration values to be used for the Design of the Facility structure.

5.13 Commercial Opportunity and Retail

5.13.1 General Shelled Space Requirements

5.13.1.1 Provide the following Shelled Space for commercial and retail spaces within the Facility:

5.13.1.1(1) Retail – Food and Storage - Retail Food; and

5.13.1.1(2) Retail – Pharmacy and Storage - Retail Pharmacy.

5.13.1.2 Provide interior walls and finishes to route services, fire separations and any required fire resistance ratings to meet all applicable codes and standards.

5.13.1.3 Structural framing will be consistent with that in the Facility such that the work required to modify the framing for the future fit-out of these spaces will be minimized.

5.13.1.4 Provide GB on the interior side of exterior walls complete with minimal finishes as required to meet all applicable codes and standards;

5.13.1.5 Provide fire stopping at all service penetrations. Where necessary, provide canning sleeves for forming voids at all future service locations within concrete slabs.

5.13.1.6 Provide side folding grilles to meet the requirements as set out in Section 08 33 36 – Side Folding Grilles.

5.13.1.7 Provide interior glazing and doors as set out in Appendix 1B [Minimum Room Requirements].

5.13.2 Retail – Food and Storage - Retail Food Shelled Space Requirements

5.13.2.1 Mechanical Requirements;

5.13.2.1(1) All space heating and cooling will be the responsibility of the tenant (i.e. electrical power source for their heating/cooling terminal units). No Facility heating infrastructure will be provided for Shelled Space;

5.13.2.1(2) Provide louvers (minimum two (2) at 915 mm x 3.0 m) on exterior of the Facility located near the area to meet the make-up and exhaust air requirements;

5.13.2.1(3) Provide a 50 mm (2") cold water line metered thru BMS to the space;

5.13.2.1(4) There will be no connection required to the Facility's domestic hot water. The hot water will be generated by the tenant as required (i.e. electrical domestic hot water heater);

5.13.2.1(5) Provide three (3) 100 mm (4") diameter floor drains connected to the Facility sanitary drainage system;

5.13.2.1(6) Provide two (2) 100 mm (4") diameter sanitary stub-outs capped below the floor in an accessible space for future tenant connections;

5.13.2.1(7) Provide a 75 mm (3") vent connected to the Facility's sanitary ventilating system;

5.13.2.1(8) Provide a grease interceptor installed in an accessible location such as the underground parking; and

5.13.2.1(9) Provide a fully sprinklered space complete with upright sprinkler heads.

5.13.2.2 Electrical and Technology Requirements;

5.13.2.2(1) Provide two (2) 50 mm (2") conduits for power feeders 600V rated;

5.13.2.2(2) Provide tenant submetering on distribution feeders;

5.13.2.2(3) Provide 600V, 200A (conditional power);

5.13.2.2(4) Provide lighting on conditional and on emergency power (battery pack) for exiting and safety to meet all applicable codes and standards, the final lighting and lighting controls will be by Tenant;

5.13.2.2(5) Provide fire alarm loop, initiation and notification devices as required for exiting and safety to meet all applicable codes and standards;

5.13.2.2(6) Provide revenue grade CT/meter such that the Authority can meter the feeders;

5.13.2.2(7) Data Drops; and

5.13.2.2(8) Provide access controls, wired duress and security camera.

5.13.3 Retail – Pharmacy and Storage - Retail Pharmacy Shelled Space Requirements:

5.13.3.1 Mechanical Requirements;

5.13.3.1(1) All space heating and cooling will be the responsibility of the tenant (i.e. electrical power source for their heating/cooling terminal units). No Facility heating infrastructure will be provided for Shelled Space;

5.13.3.1(2) Provide louvers (minimum two at 915 mm x 1.8 m) on exterior of the Facility located near the area to meet the make-up and exhaust air requirements;

5.13.3.1(3) Provide a 19 mm (3/4") cold water line metered thru BMS to the space;

5.13.3.1(4) There will be no connection required to the Facility's domestic hot water. The hot water will be generated by the tenant as required (i.e. electrical domestic hot water heater);

5.13.3.1(5) Provide one (1) 100 mm (4") diameter floor drain connected to the Facility sanitary drainage system;

5.13.3.1(6) Provide two (2) 100 mm (4") diameter sanitary stub-outs capped below the floor in an accessible space for future tenant connections;

5.13.3.1(7) Provide a 75 mm (3") vent connected to the Facility's sanitary ventilating system; and

5.13.3.1(8) Provide a fully sprinklered space complete with upright sprinkler heads.

5.13.3.2 Electrical and Technology Requirements;

5.13.3.2(1) Provide two (2) 50 mm (2") conduits for power feeders 600V rated;

5.13.3.2(2) Provide tenant submetering on distribution feeders;

5.13.3.2(3) Provide 600V, 200A (conditional power);

5.13.3.2(4) Provide lighting on conditional and on emergency power (battery pack) sufficient for exiting and safety to meet all applicable codes

and standards, the final lighting and lighting controls will be by Tenant;

5.13.3.2(5) Provide fire alarm loop, initiation and notification devices as required for exiting and safety to meet all applicable codes and standards;

5.13.3.2(6) Provide revenue grade CT/meter such that the Authority can meter the feeders;

5.13.3.2(7) Data Drops; and

5.13.3.2(8) Provide access controls, wired duress and security camera.

5.13.4 Vending Machines

5.13.4.1 Provide infrastructure and alcove space for vending machines at all locations as set out in Appendix 1A [Clinical Specifications and Functional Space Requirements]. Vending machines will be approximately 1.5 m wide x 914 mm deep x 2.1 m high.

5.14 Infection Prevention and Control

5.14.1 General

5.14.1.1 The Design-Builder will comply with CSA Z8000 Canadian Healthcare Facilities and CSA Z317.13 Infection Control during Construction, Renovation or Maintenance of Healthcare Facilities.

5.14.1.2 Provide Airborne Isolation Rooms and AIR Anterooms which minimize air leakage into the space. Walls, windows, ceilings, and penetrations into the space will be fully sealed. Walls will extend to the underside of the slab and be fully sealed.

5.14.1.3 Design the Facility to mitigate and prevent, where possible, the spread of infection including via contaminated surfaces and airborne pathogens, consistent with all infection control standards.

5.14.1.4 Select materials that meet CSA Z8000 requirements, using simple detailing with quality workmanship and finishes and providing ease of accessibility to withstand repeated routine cleaning with hospital-grade disinfectants, allow for maintenance and minimize the physical spread of bacteria. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs.

5.14.1.5 Storage and handling of construction materials will meet the requirements of CSA Z317.13.

5.14.1.6 The Design-Builder is responsible for ensuring that the materials used in the Facility will be endorsed by the Infection Control Practitioner.

5.14.1.7 Design the Facility to segregate sterile, clean, and soiled items, including segregation of circulation traffic patterns of clean and soiled materials being transported within the Facility.

5.14.1.8 Design the Facility to mitigate the spread of airborne infections during an outbreak by creating Outbreak Control Zones, as follows:

5.14.1.8(1) 12-Bed Unit, Medical-Oncology

5.14.1.8(1)(a) Provide one (1) Outbreak Control Zone consisting of a 12-bed pod and all associated 12-bed pod support spaces as described in Appendix 1A [Clinical Specifications and Functional Space Requirements].

5.14.1.8(2) 12-Bed High Acuity Unit

5.14.1.8(2)(a) Provide one (1) Outbreak Control Zone consisting of a 12-bed pod and all associated 12-bed pod support spaces as described in Appendix 1A [Clinical Specifications and Functional Space Requirements].

5.14.1.8(3) 24-Bed Unit (3)

5.14.1.8(3)(a) Provide three (3) Outbreak Control Zones each consisting of two (2) 12-bed pods and all associated 12-bed pod support spaces as described in Appendix 1A [Clinical Specifications and Functional Space Requirements].

5.14.1.8(4) 12-Bed Unit (6)

5.14.1.8(4)(a) Provide six (6) Outbreak Control Zones each consisting of a 12-bed pod and all associated 12-bed pod support spaces as described in Appendix 1A [Clinical Specifications and Functional Space Requirements].

5.14.1.8(5) Outbreak Control Zones will:

5.14.1.8(5)(a) be bounded by construction that secures the zone and allows the mechanical ventilation systems to create negative air pressure within the zone relative to adjacent floor areas;

5.14.1.8(5)(b) contain vestibule space that can be converted into an anteroom at each entrance to the OCZ with a hand hygiene sink. The anteroom will be of sufficient proportions to facilitate the efficient

movement of a Patient in a bed being transported by Staff through the anteroom such that the doors are sequenced as set out in Section 6.8.21.3(2)(e).

5.14.1.8(5)(c) be distinct and separate zones (24-Bed Unit OCZ and 12-Bed Unit OCZ will not overlap) and designed to operate both independently and simultaneously;

5.14.1.8(5)(d) wherever possible, align OCZ boundaries (i.e. walls and cross-corridor doors) with BCBC required fire separations; and

5.14.1.8(5)(e) be designed in coordination with all parts of this Agreement.

5.14.2 Hand Hygiene Sinks

5.14.2.1 Prepare a workflow pattern and risk assessment in consultation with the Authority to confirm that the final quantity and placement of hand hygiene sinks in the Facility is in accordance with CSA Z8000 and Fraser Health Hand Hygiene Sink and Faucet Requirements.

5.14.2.2 Provide hand hygiene sinks at the following locations, at a minimum:

5.14.2.2(1) As described in Appendix 1B [Minimum Room Requirements];

5.14.2.2(2) As described in Appendix 1A [Clinical Specifications and Functional Space Requirements];

5.14.2.2(3) At AIR Anterooms leading to OCZ's as described in Section 5.14.1.8(5)(b); and

5.14.2.2(4) At all points of entry to the Perioperative Component restricted access corridors, including stairwells.

5.14.2.3 Unless noted otherwise, provide the following at each HHS:

5.14.2.3(1) Handsfree paper towel dispenser;

5.14.2.3(2) Soap dispenser; and

5.14.2.3(3) Waste receptacle.

5.14.3 Scrub Sinks

5.14.3.1 At minimum, provide specialized, stainless steel scrub sinks in the following locations:

5.14.3.1(1) As indicated in CSA Z8000 7.5.12; and

5.14.3.1(2) As indicated in Appendix 1B [Minimum Room Requirements].

5.14.3.2 Provide scrub sinks in accordance with Fraser Health Hand Hygiene Sink and Faucet Requirements.

5.14.3.3 For scrub sink controls and operation refer to Section 7.4.2.7.24.(d).1.

5.14.3.4 Design will include appropriate placement of scrub solutions, eyewash station, linens, mirror and surgical supplies such as masks, gloves, fingernail cleaners, brushes and other items required by the Authority.

5.14.4 Alcohol-Based Hand Rub Dispensers and Respiratory Etiquette Stations

5.14.4.1 The Design-Builder will provide all ABHR dispensers for the Facility.

5.14.4.2 The Design-Builder will prepare a workflow pattern and risk assessment in consultation with the Authority to address the quantity and placement of ABHR dispensers, in accordance with BC Ministry of Health Best Practices for Hand Hygiene in All Healthcare Settings and Programs.

5.14.4.3 Provide ABHR dispenser stations at locations as set out in CSA Z8000 so that visitors stop, take notice, and access them. Dispenser stations will have at least four (4) antiseptic hand rub dispensers mounted for Convenient Access for visitors.

5.14.4.4 Provide Respiratory Etiquette stations at all Facility entrances and other key locations, including selected sub-Component entrances, as reviewed with the Authority. These stations will include signage, ABHR dispenser procedure, masks and tissues.

5.14.5 Personal Protective Equipment

5.14.5.1 Prepare a workflow pattern and risk assessment in consultation with the Authority to confirm the final quantity and placement of PPE dispensers in the Facility.

5.14.5.2 The location and quantity of PPE dispensers throughout the Facility will be as approved by the Authority to meet functional and operational requirements.

5.14.5.3 At a minimum, the Design-Builder will provide large, small and wall-mounted PPE dispensers to meet the following requirements:

5.14.5.3(1) Dispensing capacity and placement will be reviewed with the Authority to ensure that the capacity and placement meet the day-to-day requirements of the Component or space.

5.14.5.3(2) Large PPE dispensers will be specialty casework and generally consist of the following:

5.14.5.3(2)(a) recessed storage cabinets for the types of PPE required to protect Staff from infections when in contact with blood or other bodily fluids, including gloves, disposable and reusable gowns, aprons,

masks and hair/head covers, respirators, goggles, and face shields;

5.14.5.3(2)(b) factory produced components that are lockable, replaceable, reconfigurable and interchangeable in the future by the Authority with the ability to be easily rearranged to change configuration or to include additional modules; and

5.14.5.3(2)(c) having a minimum width of 1.2 m with a base at 150 mm AFF and an overall height of 2.1 m AFF.

5.14.5.3(3) Small PPE dispensers will be specialty casework and generally consist of the following:

5.14.5.3(3)(a) recessed storage cabinets for the types of PPE required to protect Staff from infections when in contact with blood or other bodily fluids including gloves, gowns, aprons, masks, respirators, goggles, and face shields;

5.14.5.3(3)(b) factory produced components that are lockable, replaceable, reconfigurable and interchangeable in the future by the Authority with the ability to be easily rearranged to change configuration or to include additional modules; and

5.14.5.3(3)(c) having a minimum width of 300 mm with a base at 150 mm AFF an overall height of 2.1 m AFF.

5.14.5.3(4) Wall-mounted PPE dispensers will be prefabricated and generally consist of the following:

5.14.5.3(4)(a) Coated wire holders that are easily cleanable, demountable for mechanical disinfection and adaptable to the sizes and the types of PPE required to protect Staff from infections when in contact with blood or other bodily fluids including gloves, gowns, aprons, masks, respirators, goggles, and face shields;

5.14.5.3(4)(b) Factory produced components that are lockable, replaceable, reconfigurable and interchangeable in the future by the Authority with the ability to be easily rearranged to change configuration or to include additional modules; and

5.14.5.3(4)(c) Have a minimum width of 300 mm with a base at 150 mm AFF an overall height of 2.1 m AFF.

5.14.5.4 The Design-Builder will provide large PPE dispensers in the following locations, at minimum;

5.14.5.4(1) Vestibule - Walk-In Entry;

5.14.5.4(2) Vestibule - Ambulance Entry;

5.14.5.4(3) Food Preparation/Production area; and

5.14.5.4(4) All Anterooms and Vestibules within the Emergency, MDR, Oncology Pharmacy and Pharmacy Components.

5.14.5.5 The Design-Builder will provide small PPE dispensers in the following locations at minimum:

5.14.5.5(1) Waiting areas; and

5.14.5.5(2) Patient/Service Elevator lobbies.

5.14.5.6 The Design-Builder will provide wall-mounted PPE dispensers in the following locations at minimum:

5.14.5.6(1) All Anterooms throughout the Facility, unless noted otherwise.

5.14.5.7 Provide small or large PPE dispensers in corridors throughout the Facility, such that PPE is immediately accessible in all areas where Patients are receiving care or treatment, including the following at minimum:

5.14.5.7(1) In the Inpatient Unit Component, provide one (1) small PPE dispenser in the corridors located between every two (2) Patient Rooms;

5.14.5.7(2) In the Emergency Component, provide one (1) small PPE dispenser in the corridors located between every two (2) rooms where care or treatment is being administered such as Exam/Treatment Rooms; and

5.14.5.7(3) In Ambulatory Care, Oncology Ambulatory Care Unit, Systemic Therapy Radiation and Therapy Delivery Components, provide one (1) small PPE dispenser in the corridors located between every four (4) to six (6) rooms where care or treatment is being administered such as Exam/Treatment Rooms and Chair Bays.

5.14.6 Equipment and Storage

5.14.6.1 Provide storage shelves that:

5.14.6.1(1) Are cleanable with the Authority-approved detergents and disinfectants;

5.14.6.1(2) Are not located under sinks;

5.14.6.1(3) Are in accordance with Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving and Racks and

5.14.6.1(4) Have the bottom shelf positioned a minimum 200 mm AFF to permit routine cleaning.

5.14.6.2 Provide dedicated storage space with power outlets for charging as required for large, wheeled Equipment such as mobile Patient lifts.

5.14.6.3 If open shelving is provided for storage, the top and bottom shelf of such shelving will be a solid surface to prevent contamination from the floor.

5.14.6.4 Storage space for sharps disposal and Patient waste disposal will be secure to prevent tampering or inappropriate access. Exact locations for sharps disposal and Patient waste disposal systems will be as required by the Authority, such that these items are available in all areas where Staff are treating Patients and additional areas as determined in consultation with the Authority.

5.15 Interior Environment

5.15.1 Interior Design

5.15.1.1 General Requirements

5.15.1.1(1) Employ, as part of the Project team, an interior designer who is licenced and registered with IDIBC, or equivalent as approved by the Authority.

5.15.1.1(2) The interior design will incorporate the following:

5.15.1.1(2)(a) Select materials and finishes with regard to reducing noise, promoting safety and durability while reducing maintenance;

5.15.1.1(2)(b) Positive distractions such as artwork, digitally printed wallcoverings and murals;

5.15.1.1(2)(c) Provide positive distractions in areas where occupants would reasonably benefit from such a feature including high-traffic corridors, waiting areas, lobbies, lounges and clinical areas such as radiation vaults which are intimidating for Patients;

5.15.1.1(2)(d) Incorporate floor patterns, wall finishes and ceiling designs that help reduce the psychological perception of long corridors;

5.15.1.1(2)(e) Incorporate rest stop seating within long corridors and along commonly travelled paths, wherever possible;

5.15.1.1(2)(f)	Provide a variety of furniture configurations in areas such as waiting rooms to provide Patients with socialization options to suit their preference;
5.15.1.1(2)(g)	Consideration that seating clusters invite interactions, while linear layouts prevent feelings of awkwardness related to direct eye contact with other Patients;
5.15.1.1(2)(h)	Seating areas that offer options for solace and solitude;
5.15.1.1(2)(i)	Provide internal courtyard gardens where possible, to provide natural lighting, views to the outside and other design elements to contribute to the recovery and healing process of the Patients;
5.15.1.1(2)(j)	Maximize the Patients' exposure to natural light and outside views though placement of items such as chair bays in proximity to exterior windows;
5.15.1.1(2)(k)	Provide warm colours and finishes such as featuring a 'wood-grain' look in waiting areas;
5.15.1.1(2)(l)	Provide warm colours and soft lighting to create an inviting atmosphere in rooms used for consultation, waiting, examinations and Patient Rooms;
5.15.1.1(2)(m)	Use cooler colours to give the perception of a more open space in areas with limited access to natural light or in small spaces;
5.15.1.1(2)(n)	Use finishes such as wallcoverings that reduce the cold touch of hard surfaces;
5.15.1.1(2)(o)	Provide lighting temperature which complements the colour scheme;
5.15.1.1(2)(p)	Provide light levels in accordance with Appendix 1N [Electrical and Communications Matrix] which will be higher in work areas and lower in relaxing rooms such as lounges and waiting areas;
5.15.1.1(2)(q)	Provide non-direct light sources with adjustable levels considering that cancer Patients are sensitive to light; and
5.15.1.1(2)(r)	Coordinate with the progressive disclosure Wayfinding concepts, as described in Appendix 1R [Wayfinding Standards and Requirements].

5.15.2 Colour

5.15.2.1 The Design-Builder will:

5.15.2.1(1) Provide natural colour palettes that contribute to the creation of a healing environment;

5.15.2.1(2) Apply colours and textures to enhance pedestrian and elder safety and assist in Wayfinding. Excessive patterning or textures will not be used, as this can be misconstrued by Patients;

5.15.2.1(3) Use contrasting colours to highlight distinct features of the environment to enhance visibility;

5.15.2.1(4) Do not use pastel colours, which may be difficult for older adults to differentiate;

5.15.2.1(5) Use the matching colours to camouflage features to reduce unwanted use, such as exits or restricted areas;

5.15.2.1(6) Use colour cueing in conjunction with signage to improve navigation through and use of the physical environment;

5.15.2.1(7) Provide Component colour palettes appropriate for the emotional and psychological needs of the Patients; and

5.15.2.1(8) Do not use glare-creating finishes such as high-gloss.

5.15.3 Ergonomic Design

5.15.3.1 The Design-Builder will:

5.15.3.1(1) reduce ergonomic risk factors through the design of Millwork, Healthcare Casework, ceiling, lighting, lift devices and Patient assist or Equipment manoeuvring space in accordance with the following standards:

5.15.3.1(1)(a) Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving and Racks;

5.15.3.1(1)(b) Fraser Health Patient Handling Equipment for Facility Design and Procurement; and

5.15.3.1(1)(c) Fraser Health Ergonomic Standard for Workstations.

5.15.3.1(2) Include ergonomic measures to address awkward posture and repetitive motion (lighting, work heights, adjustability) at all task-intensive workstations and benches; and

5.15.3.1(3) Incorporate motorized height adjustable and standing height workstations and benches as set out in Appendix 1B [Minimum Room Requirements] and other areas as determined in consultation with the Authority.

5.15.4 Elder-Friendly Design

5.15.4.1 The Design-Builder will comply with Code Plus, Physical Design Components for an Elder-Friendly Hospital, latest edition, or the edition in effect on the Effective Date, that sets forth elder-friendly and dementia-friendly design recommendations that go beyond industrial building codes and standards, to preserve the safety and promote the functional ability of older adults in health care facilities.

5.15.4.2 The Design-Builder will provide Convenient Access to wheelchairs/stretchers and nestable transport chairs (Staxi); refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] for location and quantities.

5.15.4.3 Provide Universal Design and Convenient Access for persons who require the use of wheelchairs in Patient and Public Circulation routes, including flush and level entrances.

5.15.5 Smudging

5.15.5.1 Smudging is a cultural and ceremonial activity involving the burning of one or more medicines gathered from the earth. The Authority has designated specific rooms in the Facility for smudging, refer to Section 7.5.11.1(37). The Design-Builder will be responsible for providing all Building Systems to permit smudging such as:

5.15.5.1(1) Rooms which are 100% exhausted and negatively pressurized;

5.15.5.1(2) Partition walls which extend from floor to underside of structural slab above;

5.15.5.1(3) Partition walls which are constructed as 0-HR fire rated smoke separations unless otherwise required;

5.15.5.1(4) Doors which have full perimeter seals;

5.15.5.1(5) Doors which have automatic door bottom drop seals; and

5.15.5.1(6) Smoke detectors with bypass capability as set out in Section 7.9.3.2(3).

5.15.6 Pediatric Design

5.15.6.1 Design the Facility with pediatric-friendly spaces, using the following criteria:

5.15.6.1(1) Design the Facility to appeal to children of the various ages that will use each part of the Facility, including waiting areas, lounges

and clinical areas as determined in consultation with the Authority;

5.15.6.1(2) Design the Facility to be scaled for children where applicable;

5.15.6.1(3) Provide ergonomically correct features to suit children where applicable;

5.15.6.1(4) Use space design, daylight, colour, pattern and texture to achieve pediatric-friendly spaces; and

5.15.6.1(5) Encourage playfulness and interaction with the environment where applicable.

5.15.7 Window and Glazing Coverings

5.15.7.1 The Design-Builder will provide roller shade window and glazing coverings:

5.15.7.1(1) On all exterior glazing unless noted otherwise, for privacy, sun and heat control, that are easy to clean and do not support or provide a surface that encourages spread of infectious disease (e.g. do not become electrostatically charged);

5.15.7.1(2) On all interior glazing where privacy is a concern as determined with the Authority; and

5.15.7.1(3) In Multimedia Rooms and all other rooms where video conferencing is required, refer to Section 5.15.7.8.

5.15.7.2 Coverings are not required where exterior electrochromic glass is provided; refer to Section 5.7.2.4.

5.15.7.3 Provide a factory assembled, roller shade window and glazing covering units consisting of fabric, shade roller tube, hem bar, removable extruded aluminum fascia, mounting brackets, end caps, and drive assembly and miscellaneous hardware.

5.15.7.4 Use roller shade coverings manufactured from materials and mechanisms that minimize cleaning and maintenance operations and maximize infection prevention and control, refer to Section 5.14 Infection Control for additional requirements.

5.15.7.5 Roller shade covering controls will be Ligature Resistant type with no loops or chains except for within Staff only administrative areas.

5.15.7.6 Provide motor operated roller shade units as set out in this Schedule and other locations where window treatments controls are deemed as difficult to reach by the Authority such as those located above 1.22.1 m AFF or where serving double-height (or approximately 4.8 m) spaces.

5.15.7.7 Where roller shade coverings are provided in Patient Rooms, they will be appropriate for darkening the room as required for Patient's to sleep during daylight hours.

5.15.7.8 Provide blackout blinds in exterior windows and glazing (and doors with glazing where applicable) in the following locations:

5.15.7.8(1)(a) On-Call Rooms; refer to Appendix 1T [UBC FoM Design Guidelines and Functional Requirements];

5.15.7.8(1)(b) Multimedia Rooms as set out in Section 7.8.15.3(17); and

5.15.7.8(1)(c) Reading Rooms.

5.16 Building Security and Safety

5.16.1 Basic Requirements

5.16.1.1 Provide an Anti-Barricade strategy for those rooms as described in Appendix 1B [Minimum Room Requirements]. The Authority considers the following as appropriate Anti-Barricade strategies unless noted otherwise:

5.16.1.1(1) Double action dual swing doors;

5.16.1.1(2) Doors which normally swing outward from the occupied space such as Patient ensuite washrooms which will swing outward into the Patient room; and

5.16.1.1(3) Rooms provided with more than one (1) door and have two (2) points of egress, i.e. dual egress whereby the second egress door will swing out in the direction of escape.

5.16.1.2 Design-Builder will provide an Anti-Barricade strategy that meets the Authority's functional and safety requirements.

5.16.1.3 Where two (2) means of egress are required i.e. dual egress, it is desirable to have the second means of egress discharge into a corridor. The Authority may accept the second means of egress discharging into an adjacent room, if unable to provide exit into a corridor on a case-by-case basis provided the second means of egress does not exit into another Patient occupied space.

5.16.1.4 All fasteners and fittings on the Facility's exterior will be concealed type.

5.16.1.5 Ensure fasteners are installed on the non-Patient or non-public side of secure doors and windows (e.g. inside the Facility for exterior doors / windows, and on the corridor side for items such as interior windows, where occurs.

5.16.1.6 All fasteners and fittings will be either concealed type or Tamper Resistant in public and Patient accessible areas. Tamper Resistant fasteners and fittings will be:

5.16.1.6(1) Removable only by Staff with a special driver or tools; and

5.16.1.6(2) Resist vandalism or disassembly by public or Patients.

5.16.2 Security and Safety Risk Mitigation

5.16.2.1 The Design-Builder will include the following risk mitigation requirements at minimum:

5.16.2.1(1) Ingestion: The Facility will minimize the opportunity for Patients to break apart or disassemble and ingest elements in the space or use them for any means of self-harm. For building elements that are breakable, they will be designed in such a way that the components are held in place upon breaking. Provide pick-proof joint sealant at all exposed joints in Patient occupied high risk areas such as the Emergency Department, all washrooms except for Staff only use, and Inpatient Units.

5.16.2.1(2) Weapons: The Patient environment will not have fissures or openings where weapons and contraband can be hidden. In addition, the Patient environment will minimize opportunities where the environment itself can be used as a weapon.

5.16.2.1(3) Interior Glazed Screens and Doors: Interior glazing in Patient areas will be safe, secure and meet the applicable fire rating required by BCBC without restricting the view. Wired glass is not permitted in the Facility.

5.16.2.1(4) Wandering: Provide passive cues that enable Patients with cognitive deficits to navigate to those areas that are meaningful to them without inadvertently intruding on other Patients' spaces.

5.16.2.1(5) Fixtures: Mechanical and electrical fixtures will be non-weaponizable and will be easy to replace, without impacting the surrounding environment/ assembly if damaged, in order to maintain a safe, clean and comfortable environment for Patients and Staff. Fasteners will be Tamper Resistant and all supporting elements will have concealed fasteners. There will be no access panels in ensuite washrooms or in any Patient Care Areas.

5.16.3 CPTED Principles

5.16.3.1 The Design-Builder will incorporate the following CPTED principles into the architectural, environmental and systems designs to enhance safety and security throughout the Facility:

5.16.3.1(1) Ownership – A space that becomes personalised is one that incurs value in the individuals that identify with it. A design that encourages ownership also creates pride and responsibility;

5.16.3.1(2) Territoriality – Physical or representational boundaries that indicate ownership of a space;

5.16.3.1(3) Clustering – Co-location of groups of Staff/Patients to encourage familiarity, thereby making the presence of strangers more apparent;

5.16.3.1(4) Utilization – Planning that ensures that there are not under-utilized or over-utilized spaces;

5.16.3.1(5) Lighting – The backbone of any deterrence strategy, thoughtful application of lighting, both interior and exterior, is a significant component of a successful security plan;

5.16.3.1(6) Surveillance, Passive – A strategy of planning supported by transparent architectural elements and lighting to facilitate surveillance without reliance on technology;

5.16.3.1(7) Surveillance, Active – The uniform application of fixed monitoring devices/technology to indicate that the campus is a secure and safe environment for Patients, Staff and the community;

5.16.3.1(8) Control Points, Access – Access controls measures will be implemented uniformly with a real time and scalable level of screening, reporting and authorization;

5.16.3.1(9) Control Points, Perimeter Control – Fixed elements such as fences, guards and walls that secure and control access to the Facility;

5.16.3.1(10) The security camera system is to be legible, which means that where it is visible, it will be recognizable and standardized throughout the Facility. Cameras will be recognizable as a camera and the same type of camera will be used throughout the Component. Wayfinding signage will notify Patients and families of the presence of cameras; and

5.16.3.1(11) Refer to 8.2.1 Basic Requirements for specific landscape requirements related to security.

5.17 Interior Signage and Wayfinding Requirements

5.17.1 Design-Builder will:

5.17.1.1 Provide a simple configuration of the Facility Public Circulation systems and functions so that Wayfinding is inherently easy for Patients and visitors who are not familiar with the Facility;

5.17.1.2 Provide violence prevention signage at all entrances and other areas as determined by the Authority in consultation with JOHSC and Ministry of Health;

5.17.1.3 Locate major destinations, such as Component or department entrances, directly off entry spaces and/or along primary Public Circulation paths, make waiting areas as open as possible to circulation routes without forming part of the circulation corridors;

5.17.1.4 Provide significant recognizable, easily named and identified elements in key locations that can become ‘meeting points’ for Patients and visitors such as in the Main Entrance Lobby; and

5.17.1.5 Design public passenger elevator and stair lobbies and Public Circulation routes to be distinct from service routes and other non-public routes.

5.17.2 Signage will be resistant to graffiti and physical damage and be of a material able to withstand repeated routine cleaning.

5.18 Donor Recognition

5.18.1 Design-Builder will incorporate into the Design, the following donor recognition requirements:

5.18.1.1 Space for a donor wall measuring twelve (12) metres in length by three (3) metres in height with wall space for digital signage measuring six (6) meters;

5.18.1.2 Provide power and data for the donor wall and, as determined in consultation with the Authority through the Review Procedure, will be provided with backing along the full length and width of the element and lighting designed to be complementary to the display;

5.18.1.3 The donor wall will be comprised of traditional static plaques along with a digital interactive signage and will use of a variety of physical shapes and forms, as well as employ the use of colour and light to engage visitors. The combination of technology used will allow visitors to be passive viewers, or to interact at their own pace using the interactive screens. Mood is achieved through enhanced, emotion-driven storytelling and donor listings that both the CH and CC Foundations can update and edit; and

5.18.1.4 The donor wall will have a place of prominence in the Main Entrance Area to not only acknowledge donors but also serve as a showcase of innovation for the Facility.

5.19 UBC Faculty of Medicine

5.19.1 The Design-Builder will design the following spaces in accordance with the requirements set out in Appendix 1T [UBC FoM Design Guidelines and Functional Requirements]:

5.19.1.1 Y3.01 Lounge – Study Stations and Book Collection – UBC;

5.19.1.2 Y3.02 Alcove – Lockers – UBC;

5.19.1.3 Y3.03 On-Call Room;

5.19.1.4 Y3.06 On-Call Room – Large; and

5.19.1.5 V1.13 Videoconference/Seminar Room – UBC.

5.20 Hazardous Substances and Gas Storage

5.20.1 Design rooms and spaces intended for the storage of hazardous substances such as formalin and gas cylinders such as liquid nitrogen tanks in accordance with the following requirements:

5.20.1.1 WorkSafe BC;

5.20.1.2 Fraser Health Chemical Storage Design Requirements; and

5.20.1.3 BC Fire Code.

5.20.2 Design rooms and spaces complete with reinforced concrete or grout-filled CMU and blast-proof doors as required to withstand explosions in accordance with applicable standards.

5.20.3 At a minimum, the Design-Builder will design the Storage – Hazardous Chemical, Storage - Gas Cylinders – Centralized and Storage - Gas Cylinders to meet the requirements of Section 5.20.

5.21 Care Team Station Millwork and Healthcare Casework

5.21.1 Care Team Stations, regardless of the NSM listed in Appendix 1A [Clinical Specifications and Functional Space Requirements] will be provided with Millwork and healthcare casework in quantities set out in Category 3 of the Millwork and Specialty Casework Area Methodology Diagram, Attachment 1 to the Appendix 1B [Minimum Room Requirements].

5.21.2 Millwork and healthcare casework at Care Team Stations will:

5.21.2.1 Be designed to meet the functional and operational requirements of Component which they serve, refer to Appendix 1A [Clinical Specifications and Functional Space Requirements];

5.21.2.2 Include standing height surfaces along the corridor side of the Care Team Station that provide space for storage of carts and other equipment beneath the counter such that they can be recessed and kept out of the clear corridor width;

5.21.2.3 Include motorized adjustable height surfaces for Staff documentation;

5.21.2.4 Include a combination of upper and lower casework designed to meet the specific storage and workflow requirements of the Staff within the Component;

5.21.2.5 Include space, counters, storage and clearances for all Authority and Design-Builder provided items and devices such as:

5.21.2.5(1) PC’s, workstations, label printers, Patient status boards,

5.21.2.5(2) charging stations for WOW batteries, panic duress and nurse call devices;

5.21.2.5(3) central physiological (or vital signs) monitors, as applicable;

5.21.2.5(4) nurse call stations, terminals and intercom;

5.21.2.5(5) magnetic whiteboards, hand hygiene sinks, and lockers; and

5.21.2.5(6) those as set in this Schedule including Appendix 1H [Equipment and Furniture] and Appendix 1J [Equipment List IM/IT].

5.21.2.6 Provide modular storage for supplies. Product chosen to be adjustable by Staff to allow for changes over time.

5.21.2.7 Be designed in accordance with the requirements set out in Section 5.15.3 Ergonomic Design and Section 6.6.2 Section 06 40 00 – Architectural Woodwork;

5.21.2.8 Included a Ceiling Height as set out in Section 5.7.10 Ceiling Height Requirements; and

5.21.2.9 Include specialty lighting coordinated with the interior design, refer to Section 7.7.13.2(25).

5.22 Artwork

5.22.1 Artwork means artwork, artifacts and archives to be included in the Design of the Facility. Artwork includes the Authority's procured artwork and/or public artwork, which can be of various sizes and consist of multiple components to be displayed together.

5.22.2 Artwork will form an integral part of the Design of the Facility.

5.22.3 The Design-Builder will coordinate the installation of all artwork, and provide the Building Systems required by the Authority to display and support all artwork, in order to advance the Authority's goal of:

5.22.3.1 Improving the quality of the environment by reinforcing the impression of a caring environment and by creating a sense of space through strong ties to the local community; and

5.22.3.2 Forming a positive distraction for Patients and promoting social interaction and social support as well as a sense of ownership among Patients and Staff.

5.22.4 The Design-Builder will:

5.22.4.1 Coordinate with the Authority, and the specific placement of artwork such that artwork is integrated with the Wayfinding strategy for the Facility;

5.22.4.2 Design the Facility to support the Authority's art program. Coordinate with the Authority to ensure the appropriate placement within the general locations that the Authority has designated for artwork including major, minor and digital installations throughout the Facility as set out in the Authority's NSHBCCC Artwork List;

5.22.4.3 Major artwork includes large-scale artwork installations. These are purposefully placed three dimensional-objects which are more permanent in nature such as sculptures requiring a constructed environment that is specific to the artwork. Major artwork may include items which are mounted to the floor and/or wall(s) or may be suspended from the structure above;

5.22.4.4 Minor artwork includes installations placed indoors such as paintings, photography and are more temporary in nature (being rotated or replaced periodically). Minor artwork will generally be wall mounted.

5.22.4.5 Provide lighting specifically designed to enhance the display of all artworks;

5.22.4.6 Provide all necessary structural support and seismic restraint in accordance with the BCBC. Provide Vandal Resistant mounting and other protective measures for artworks as required. Provide all necessary power and data required for digital artwork installations. Power will be provided from the receptacle bank as set out in Section 7.7.10.1(16);

5.22.4.7 Consider the development of major interior and exterior public pathways as galleries with hanging and display systems that can accommodate complete size and spacing flexibility in mounting; and

5.22.4.8 Work in concert with the Authority to coordinate and manage artwork that is owned by the Authority or to be procured by the Authority.

PART 6. FACILITIES CONSTRUCTION SUBGROUP SPECIFICATIONS

6.1 General Requirements (Division 1)

6.1.1 Section 01 40 00 – Quality Requirements

6.1.1.1 Exterior Cladding

6.1.1.1(1) Four (4) weeks prior to scheduled commencement of cladding installation and associated work, convene pre-installation meeting and mock-up at Project site or off-premise to be determined in consultation with the Authority as may be required by and at no expense to the Authority. Cladding mock-up to be attended by cladding installer, representative of the cladding manufacturer, window manufacturer, window installer, the Design-Builder's Contractor, Architect, Authority, Building Envelope Consultant, and other representatives directly concerned with the performance of the work. Record discussions of conference and decisions and agreements or disagreements reached and furnish copy of record to each party attending. Submit to the Authority all building envelope test results, witnessed by the Building Envelope Consultant.

6.1.1.2 Roofing

6.1.1.2(1) Two (2) weeks prior to scheduled commencement of roofing installation and associated work, convene pre-installation meeting at Site with installer, installer of each component of associated work, installers of deck or substrate construction to receiving roofing work, installers of rooftop units and other work in and around roofing that will precede or follow roofing work (including mechanical work), representative of approved primary materials manufacturer, Design-Builder, Architect, Authority, Building Envelope Consultant, and other representatives directly concerned with performance of the work. Record discussions of conference and decisions and agreements or disagreements reached and furnish copy of record to each party attending.

6.1.1.3 Window and Curtainwall

6.1.1.3(1) Four (4) weeks prior to scheduled commencement of curtainwall or window installation and associated work, convene pre-installation meeting and mock-up at Project site or at an off-premise building as may be required by and at no expense to the Authority. Window mock-up to be attended by window installer, representative of the window manufacturer, Design-Builder's Contractor, Architect, Authority, Building Envelope Consultant, and other representatives directly concerned with the performance of the work. Record discussions of conference and

decisions and agreements or disagreements reached and furnish copy of record to each party attending.

6.1.1.3(2) Window mock-up to also include leak testing of mock-up window in accordance with ASTM E1105 – 15 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

6.1.1.4 Interior and Exterior Architectural Concrete Finishes

6.1.1.4(1) Provide 400 mm x 400 mm x 50 mm sample concrete panels with proposed surface finishes for review by the Authority.

6.1.1.5 Below Grade Waterproofing

6.1.1.5(1) Arrange for demonstrations of installations of waterproofing systems at sections of foundation wall, to be attended by manufacturer of material components, Architect, Authority and other representatives directly concerned with the performance of the work.

6.1.1.6 Building Envelope Requirements

6.1.1.6(1) The Design-Builder will retain a Building Envelope Consultant as part of the Project team throughout the Design and Construction process. The Building Envelope Consultant will review the building envelope design at all Submittal stages and provide assistance with review of the installation of building envelope systems. The Building Envelope Consultant will provide assistance with testing of the performance of building envelope components.

6.1.1.6(2) Retain a third-party inspection and testing company certified by the Standards Council of Canada (SCC) or Canadian Council of Independent Laboratories (CCIL) to conduct testing using an infrared thermographic camera to identify any areas in the building envelope that do not meet the required air and vapour requirements established for this Facility.

6.1.1.6(3) The Building Envelope Consultant will provide a signed building envelope construction review report prior to Substantial Completion confirming the as-built Construction of the building envelope is in general conformity with the Design and is expected to perform as required.

6.1.1.6(4) Submit building envelope test results, witnessed by the Building Envelope Consultant, to the Authority verifying that the building envelope meets all requirements.

6.1.1.6(5) The Facility will be tested per ASTM E779, and the maximum system air leakage rate to be 0.10 L/(s·m²) at 75 Pa.

6.1.1.6(6) Wall and soffit panel assemblies are to conform to AAMA 508 and meet requirements as follows:

6.1.1.6(6)(a) Pressure Equalization – ASTM E1233/E1233M: At 100 cycles of pressure from 0.24 kPa (5 lbs/ft2) to 1.20 kPa (25 lbs/ft2), pressure equalization will occur within 0.08 seconds with a maximum cavity pressure of 12.5 lbs/ft2. No water in a continuous stream, or mist/droplets in excess of 5% of the air/water barrier surface.

6.1.1.6(6)(b) Dynamic Water Penetration – AAMA 501.1: No uncontrollable water infiltration under dynamic pressure differential of minimum 0.57 kPa (12 lbs/ft2).

6.1.1.6(6)(c) Static Water Penetration – ASTM E331: No uncontrolled water infiltration at minimum of 0.57 kPa (12 lbs/ft^2). Wall design will feature provision to drain to the exterior face of the wall any leakage of water at joints and any condensation that may occur within the construction.

6.1.1.6(6)(d) Air Leakage – ASTM E283/E283M: Maximum air leakage will be 6.09x10-4 cms/m2 (0.12 cfm/ ft^2) at 7.51x10-2 kPa (1.57 lbs/ft^2) wind load. Note: AAMA 508 uses higher air/water barrier leakage to simulate possible defects in as-built conditions.

6.1.1.6(7) A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates will be submitted to the Authority and City. The following modifications will be made to ASTM E779:

6.1.1.6(7)(a) Tests will be accomplished using either (1) both pressurization and depressurization or (2) pressurization alone, but not depressurization alone. If both pressurization and depressurization are not tested, the air leakage will be plotted against the corrected P for pressurization in accordance with Section 9.4 of ASTM E779;

6.1.1.6(7)(b) The test pressure range will be from 25 Pa to 80 Pa per Section 8.10 of ASTM E779, but the upper limit will not be less than 50 Pa and the difference

between the upper and lower limit will not be less than 25Pa;

6.1.1.6(7)(c) If the pressure exponent ‘n’ is less than 0.45 or greater than 0.85 per Section 9.6.4 of ASTM E779, the test will be re-run with additional readings over a longer time interval; and

6.1.1.6(7)(d) If the tested rate exceeds the rate assumed as part of the energy modeling and associated energy target, a visual inspection of the air barrier will be conducted, and any leaks noted will be sealed. An additional report identifying the corrective actions taken to seal air leaks will be submitted to the AHJ and any further requirement to meet the leakage air rate will be waived, aside from the impact on the energy target.

6.1.1.7 Floor Testing Requirements

6.1.1.7(1) Retain a third-party inspection and testing company certified by the Standards Council of Canada (SCC) or Canadian Council of Independent Laboratories (CCIL) to conduct testing of concrete subfloor substrate prior to commencing flooring installation.

6.1.1.7(2) Inspect concrete slab for proper tolerance and dryness, as indicated in individual PSOS Sections and as specified herein, and report any discrepancies in writing to the Authority.

6.1.1.7(3) Ensure concrete is cured a minimum 28 days before commencing with flooring installation. Test concrete slabs for excessive moisture by methods as recommended by flooring manufacturer.

6.1.1.7(4) Concrete subfloors receiving flooring materials are to conform to the following standards:

6.1.1.7(4)(a) ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

6.1.1.7(4)(b) ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

6.1.1.7(4)(c) ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes.

6.1.1.7(5) Apply sub-floor filler, patching compound or underlayment as required to fill low spots and cracks to achieve floor flatness to a

tolerance as recommended in the NFCA Floor Covering Reference Manual section A10.

6.1.1.7(6) Prepare intended surfaces to receive flooring work in accordance with the flooring manufacturer's recommendations.

6.1.1.7(7) Do not install flooring finish materials during Construction activities that will affect the cleanliness of the intended subfloor surface receiving the flooring finish material.

6.1.1.7(8) All work required to remediate concrete slabs to acceptable conditions will be the responsibility of the Design-Builder.

6.1.1.7(9) Site-test and mock-ups of transitions of dissimilar flooring materials:

6.1.1.7(9)(a) Dissimilar flooring material junctures will occur on the Project, whereby vinyl flooring will abut with rubber flooring in certain instances.

6.1.1.7(9)(b) Provide On-Site testing and mock-ups to evaluate both cold and hot welding systems and to establish the most suitable application procedures for sealing such transition conditions.

6.1.1.7(9)(c) Welding to be conducted in accordance with manufacturer’s recommendations and must meet the approval of the Authority.

6.1.1.8 Fume Hood and BSC Testing

6.1.1.8(1) The Design-Builder will retain a specialist testing agency for verification of fume hood and BSC Class I and II testing. Engage the agency starting during the design phase and incorporate design considerations such as required clearances to adjacent work surfaces, doorways, walls, etc.

6.1.1.8(2) For fume hoods perform the following tests in accordance with OHS Regulation, ASHRAE 110 Methods of Testing Performance of Laboratory Fume Hoods, and CNSC GD-52 for the Oncology Pharmacy:

6.1.1.8(2)(a) Face velocity verification;

6.1.1.8(2)(b) Face velocity monitor alarm verification and calibration;

6.1.1.8(2)(c) Smoke visualization tests; and

6.1.1.8(2)(d) Tracer gas containment tests.

6.1.1.8(3) For the BSC Class I and II testing include:

6.1.1.8(3)(a) Inflow velocity measurements;

6.1.1.8(3)(b) Downflow velocity measurements;

6.1.1.8(3)(c) HEPA filter integrity testing;

6.1.1.8(3)(d) Smoke pattern testing;

6.1.1.8(3)(e) Alarm calibration; and

6.1.1.8(3)(f) Other testing as per manufacturer's requirements.

6.1.1.9 Mechanical Insulation and Firestopping Quality Assurance

6.1.1.9(1) The Design-Builder will retain the BCICA for inspection of all mechanical insulation and firestopping installations per its Quality Assurance Program and obtain a Quality Assurance Certificate. Comply with or exceed the BCICA installation requirements. Insulating and firestopping work will be performed by certified tradesmen with Red Seal endorsement from Canadian Council of Directors of Apprenticeship (CCDA) for Insulator (Heat and Frost).

6.1.1.9(2) The Authority reserves the right to have completed:

6.1.1.9(2)(a) Periodic spot checks during installation of mechanical insulation and firestopping systems and a detailed audit of the work after completion; and

6.1.1.9(2)(b) Removal of the protective finish coverings on up to 5% of all fittings, flanges, couplings, valves, and pipeline accessories to review the sealing of the insulation, at no additional cost to the Authority. If insulation sealing is found to be incorrect at any one location, the Design-Builder will remove the protective finish on all fittings, flanges, couplings, valves, and pipeline accessories for review. The Design-Builder will repair defective sealing and replace protective coverings at no additional cost to the Authority.

6.1.1.9(3) The Design-Builder will coordinate with the Authority's firestopping Professional Engineer with regards to the following scope of work:

6.1.1.9(3)(a) Review of all proposed firestopping and the applicability from factory-tested fire rated assembly building services penetration prospective;

6.1.1.9(3)(b) Review of all firestopping submittals; and

6.1.1.9(3)(c) Review that all firestopping installations are in accordance with the standards and firestopping manufacturer installation guidelines.

6.1.1.9(4) The Design-Builder will not conceal or otherwise obscure firestopping installations until the Authority's Professional Engineer has reviewed them.

6.1.1.9(5) The fire stopping Professional Engineer will report deficiencies to the Authority and Design-Builder. The Design-Builder will be responsible for all corrective actions and any follow-up required by the Authority to demonstrate and achieve compliance with the standards and firestopping manufacturer installation guidelines.

6.1.1.10 Fire and Egress Door Assemblies

6.1.1.10(1) The Design-Builder will engage a Fire and Egress Door Assembly Inspector certified FDAI or CFDAI with DHI to certify all fire and egress doors prior to Substantial Completion.

6.1.2 Section 01 78 00 – Closeout Submittals

6.1.2.1 Warranties

6.1.2.1(1) The Design-Builder will provide extended warranties as set out in Appendix 1X [Warranty Requirements].

6.1.2.2 Spare Parts and Extra Stock Materials

6.1.2.2(1) The Design-Builder will provide spare parts and extra stock materials as set out in Appendix 1Y [Spare Parts and Extra Stock Materials].

6.2 Existing Conditions (Division 2)

6.2.1 Section 02 00 00 – Existing Conditions

6.2.1.1 The Design-Builder acknowledges visiting the Site, at its option and prior to the execution of the Agreement, and performing further sub-surface investigation, drilling and sampling, material testing, exploratory excavations, and pre-construction monitoring, at its own expense and after receiving written permission from the Authority.

6.3 Concrete (Division 3)

6.3.1 Section 03 30 00 – Cast-in-Place Concrete

6.3.1.1 Summary

6.3.1.1(1) This section outlines architectural and building envelope requirements for cast-in place concrete, supplementary to structural requirements.

6.3.1.2 Requirements

6.3.1.2(1) If required by the Radiation Protection Adviser, provide high density concrete in conjunction with the lead shielding to meet the room radiation safety requirements.

6.3.1.2(2) Provide a structure with a predicted Design Life as set out in Section 3.8.

6.3.1.2(3) Finish concrete floors with a smooth, dense, trowel finish with a Class A Flatness Classification in accordance with CSA A23.1 or more restrictive tolerance required by the manufacturers of the equipment set out in Appendix 1H [Equipment and Furniture] such as linear accelerators, PET/CT scanners, MRI's and CNC equipment, etc. Overlay toppings to level floors will not be used. Isolated micro leveling is not allowed where exposed concrete floor finishes are described in Appendix 1B [Minimum Room Requirements], but may be permitted provided the following conditions are met:

6.3.1.2(3)(a) Isolated micro levelling material will be bonded properly to the concrete slab and perform adequately similar to the concrete slab in accordance with CSA Clause 7.8 Bonded Toppings of CSA A23.1; and

6.3.1.2(3)(b) Repaired floor area will be inspected and retested by the Design-Builder through a CSA certified testing laboratory for conformance to the specified tolerance.

6.3.1.2(4) Repair cracks in concrete floors and walls to suit the floor finish and long-term serviceability requirements of the floor.

6.3.1.2(5) Waterproof foundation walls surrounding occupied spaces to prevent groundwater ingress. Construction joints will have purpose-made water stops. A perimeter footing drainage system will be installed around the exterior of the below grade spaces. Use a waterproofing chemical admixture to the concrete mix at the batching or mixing stage to create a permanent self-sealing, corrosion free concrete waterproofing system.

6.3.1.2(6) Provide reinforced concrete housekeeping pad dowelled into structural (concrete to be roughened) slab for equipment in conjunction with mechanical, electrical, and other Building System requirements. All gaps will be sealed to prevent water

intrusion. In addition to being dowelled, the Design-Builder will prepare the surface of the structural slab to receive the housekeeping pad including surface texturing and scoring. All housekeeping pads are to be finished with a beveled edge. Housekeeping pads will only be placed / poured against solid concrete walls. Pouring against gypsum boards walls is not permitted. All housekeeping pads to be finished with epoxy coating or waterproof membrane as specified in Section 09 67 70.

6.3.1.3 Quality Assurance

6.3.1.3(1) Concrete construction will follow “Best Practice Guidelines for Concrete Placement Planning, Field Testing, and Sample Collection” jointly prepared by the BC Ready-Mixed Concrete Association and the Canadian Council of Independent Laboratories.

6.3.2 Section 03 33 00 – Architectural Concrete

6.3.2.1 Part 1 General

6.3.2.1(1) References

6.3.2.1(1)(a) ACI 303R, Guide to Cast-in-Place Architectural Concrete Practice, American Concrete Institute.

6.3.2.1(1)(b) ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.

6.3.2.1(1)(c) British Columbia Ready-Mix Concrete Association (BCRMCA).

6.3.2.1(1)(d) Canadian Council of Independent Laboratories (CCIL).

6.3.2.1(1)(e) CAN/CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

6.3.2.1(2) Performance Requirements

6.3.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.3.2.1(2)(b) Where exposed Architectural Concrete with no finish materials is used, provide sodium or potassium silicate products that react chemically with calcium in the concrete to densify, seal and dustproof the concrete.

6.3.2.1(2)(c) Perform Architectural Concrete work to requirements of CAN/CSA A23.1/A23.2, ACI 303R and publication ‘Best Practice Guidelines for Concrete Placement Planning, Field Testing, and Sample Collection’ by BCRMCA and CCIL.

6.3.2.1(2)(d) Design and Construction of cast-in-place concrete of properties required for the intended use in accordance with the requirements of all applicable codes and specifications for the applicable concrete exposure class and to maximize the fly ash content of the mix. All cast in place concrete will be placed, consolidated, and finished by a competent tradesman holding a Certificate of Qualification awarded by BC Industry Training Authority or alternative as approved by the Authority.

6.3.2.1(2)(e) Honeycombing, bug holes and all surface defects/blemishes will be repaired immediately or removed under the direction of the Structural Engineer-of-Record.

6.3.2.1(2)(f) Architectural Concrete finishing to allow for finishes identified in ACI 303R and meet criteria as follows:

6.3.2.1.2.(f).1 Architectural Concrete will have selected treated surfaces and finishing per ACI 303R.

6.3.2.1.2.(f).2 Repairs to be under the direction of the Structural Engineer-of-Record.

6.3.2.1(3) Quality Assurance

6.3.2.1(3)(a) Contractor Qualifications: Company specializing in cast-in-place Architectural Concrete work with minimum three years documented experience.

6.3.2.1(3)(b) Cause cast-in-place concrete and concrete materials to be inspected and tested by a CSA certified testing laboratory.

6.3.2.2 Part 2 Products

6.3.2.2(1) Materials

6.3.2.2(1)(a) Cement, aggregates, general:

6.3.2.2.1.(a).1 Cement, aggregates, admixtures and mix designs to be in accordance with CSA A23.1.

6.3.2.2.1.(a).2 Cement used for Architectural Concrete to be supplied in single kiln run.

6.3.2.2.1.(a).3 Aggregate will be supplied in one batch to avoid colour variations.

6.3.2.2(1)(b) Pigments: Non-staining, non-bleeding, non-fading, metallic oxide of type acceptable to Authority to produce general colour range of final finish.

6.3.2.2(1)(c) Superplasticizer: ASTM C494/C494M, Type F or G.

6.3.2.2(1)(d) Forms: Use wood formwork or Sonotube type form for all cast in place concrete or alternative as approved by the Authority.

6.3.2.3 Part 3 Execution

6.3.2.3(1) Not applicable.

6.3.3 Section 03 35 46 – Concrete Topical Treatments

6.3.3.1 Part 1 General

6.3.3.1(1) Summary

6.3.3.1(1)(a) Chemical products applied to concrete surfaces to enhance durability.

6.3.3.1(2) Performance Requirements

6.3.3.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.3.3.1(3) Quality Assurance

6.3.3.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with a quality management system and minimum three years documented experience.

6.3.3.1(3)(b) Applicator Qualifications: Company with certified concrete finishers trained in the application of the products specified in this section, with satisfactory documented experience.

6.3.3.1(3)(c) Conduct pre-installation conference at project Site and include workplace tour.

6.3.3.2 Part 2 Products

6.3.3.2(1) Concrete Floor Sealer (CFS) for slab on grade in the below grade parking areas.

6.3.3.2(1)(a) Penetrating, clear, sealer to provide barrier against ingress of water and waterborne salts.

6.3.3.2(1)(b) Acceptable Products:

6.3.3.2.1.(b).1 Sikafloor SN-100 by Sika, water-repelling sealer.

6.3.3.2.1.(b).2 Super Aqua-Cure Vox by Euclid Chemical, water-based high solids, cure and seal for concrete.

6.3.3.2.1.(b).3 Or alternative as approved by the Authority.

6.3.3.2(2) Concrete Densifier and Sealer for interior concrete floor surfaces to remain exposed.

6.3.3.2(2)(a) Lithium based solution to densify, harden, seal and dustproof hard troweled concrete surfaces.

6.3.3.2(2)(b) Acceptable Products:

6.3.3.2.2.(b).1 Mapecrete Hard LI by MAPEI, lithium silicate densifier and sealer;

6.3.3.2.2.(b).2 ULTRAGUARD by Euclid Chemical, lithium silicate densifier and sealer;

6.3.3.2.2.(b).3 SCOFIELD Formula One Lithium Densifier MP by Sika, chemically reactive, surface densifier and sealer for concrete;

6.3.3.2.2.(b).4 Or alternative as approved by the Authority.

6.3.3.2(3) Anti-graffiti coating, for concrete walls and columns to remain exposed.

6.3.3.2(3)(a) Sealer to provide resistance to defacement by aerosol paints and markers.

6.3.3.2(3)(b) Acceptable products:

6.3.3.2.3.(b).1 Sikagard AG by Sika, water-borne, fluoro polyurethane based, semi sacrificial anti-graffiti sealer.

6.3.3.2.3.(b).2 TAMMS AG 400 by Euclid Chemical, anti-graffiti coating system.

6.3.3.2.3.(b).3 Or alternative as approved by the Authority.

6.3.3.3 Part 3 Execution

6.3.3.3(1) Not applicable.

6.3.4 Section 03 45 00 – Architectural Precast Concrete

6.3.4.1 Part 1 General

6.3.4.1(1) References

6.3.4.1(1)(a) ACI 318, Building Code Requirements and Commentary.

6.3.4.1(1)(b)	ASTM A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
6.3.4.1(1)(c)	ASTM A492, Standard Specification for Stainless Steel Rope Wire.
6.3.4.1(1)(d)	ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
6.3.4.1(1)(e)	ASTM C33/C33M, Standard Specification for Concrete Aggregates.
6.3.4.1(1)(f)	ASTM C150/C150M, Standard Specification for Portland Cement.
6.3.4.1(1)(g)	ASTM C260/C260M, Standard Specification for Air-Entraining Admixtures for Concrete.
6.3.4.1(1)(h)	ASTM C920, Standard Specification for Elastomeric Joint Sealants.
6.3.4.1(1)(i)	ASTM C979/C979M, Standard Specification for Pigments for Integrally Colored Concrete.
6.3.4.1(1)(j)	Canadian Prestressed Concrete Institute (CPCI) - Architectural Precast Concrete Technical Guide.
6.3.4.1(1)(k)	Canadian Precast Concrete Quality Assurance (CPCQA).
6.3.4.1(1)(l)	CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
6.3.4.1(1)(m)	CSA A23.3, Design of Concrete Structures.
6.3.4.1(1)(n)	CSA A23.4, Precast Concrete - Materials and Construction.
6.3.4.1(1)(o)	CSA A3000, Cementitious Materials Compendium.
6.3.4.1(1)(p)	CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.
6.3.4.1(1)(q)	CAN/ULC S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

6.3.4.1(1)(r) Federal Standard RR-W-410D, Wire Rope and Strand.

6.3.4.1(1)(s) PCI MNL 117, Prestressed Concrete Institute Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

6.3.4.1(2) Performance Requirements

6.3.4.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.3.4.1(2)(b) System Descriptions: Work of this Section is to include the following architectural precast concrete options:

6.3.4.1.2.(b).1 Insulated architectural precast (mass wall), modified Rain Screen.

(b).1.1 Wall assembly will include interior non-structural metal studs and gypsum board finish.

6.3.4.1.2.(b).2 Uninsulated architectural precast, modified Rain Screen.

(b).2.1 Wall assembly will include foil faced mineral fibre insulation, interior non-structural metal studs and gypsum board finish.

6.3.4.1.2.(b).3 Thin veneer precast Architectural Concrete cladding panels, reinforced with stainless steel prestressed tendons, cavity wall Rain Screen.

(b).3.1 Wall assembly will include mineral fibre cavity insulation, membrane air/vapour barrier applied on sheathing board, structural metal stud framing with gypsum board finish or applied on structural concrete wall.

6.3.4.1(2)(c) Design precast concrete elements, including anchors, connections and inserts to meet requirements of CSA A23.3, CSA A23.4 and the BCBC, except where more stringent requirements are indicated herein.

6.3.4.1(2)(d) Design and Construction of precast concrete of properties required for the intended use in accordance with the requirements of all applicable codes and specifications for the applicable concrete

exposure class and to maximize the fly ash content of the mix.

6.3.4.1(2)(e) Honeycombing, bug holes and all surface defects/blemishes will be repaired immediately or removed under the direction of the Structural Engineer-of-Record.

6.3.4.1(2)(f) The precast concrete will conform to the following design criteria in conformance with CSA A23.1/A23.2:

- 6.3.4.1.2.(f).1 Cement: Type GU Portland cement.
- 6.3.4.1.2.(f).2 Minimum compressive strength: 35 MPa at 28 days.
- 6.3.4.1.2.(f).3 Minimum cement content: 365 kg/m3 of concrete.
- 6.3.4.1.2.(f).4 Class of exposure: F-2.
- 6.3.4.1.2.(f).5 Entrained air: 5-8% as per ACI 318 and CSA A23.1/A23.2.
- 6.3.4.1.2.(f).6 Water cement ratio: 0.40 max.

6.3.4.1(2)(g) Design for durability of building envelope materials in accordance with Section 3.8 and requirements of CSA S478. Select materials with proven record of durability and provide proof of durability from suppliers.

6.3.4.1(2)(h) Seismic Performance: Design materials specified in this Section to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.

6.3.4.1(2)(i) Ensure recesses or pockets are filled to maintain uniform perm rating of insulated precast concrete walls (mass walls) acting as a vapour retarder.

6.3.4.1(2)(j) Double drained system:

- 6.3.4.1.2.(j).1 Joints between wall panels and adjoining construction will be modified Rain Screen principal, airtight at interior face, vented at exterior face. Provide bellows joint for corner joints with use of airtight neoprene inside, vented sealed joints outside.
- 6.3.4.1.2.(j).2 Exterior bead will be a Rain Screen while interior bead will be an air seal. Intervening space is vented to exterior.
- 6.3.4.1.2.(j).3 Two stage joints at horizontal precast joints to be end-dammed where they meet single stage joints at curtain wall.

6.3.4.1(2)(k) Thin veneer precast Architectural Concrete cladding:

6.3.4.1.2.(k).1 Design exterior envelope cavity walls based on Rain Screen Principle advocated by NRCC and provide for drainage of water entering envelope cavity wall system. Provide for compartments in long cavity wall and at corners to achieve appropriate pressure equalization in exterior envelope cavity wall design.

6.3.4.1.2.(k).2 Design exterior walls to provide continuous, complementary and compatible air / vapour / thermal barriers throughout building envelope. Provide continuity of air seal materials and assemblies.

6.3.4.1.2.(k).3 Design wall to provide for thermal movement of component materials caused by ambient temperature range from -30 to 80 degrees C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

6.3.4.1.2.(k).4 Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with BCBC.

6.3.4.1.2.(k).5 Design exterior walls to provide continuous, complementary and compatible air / vapour / thermal barriers throughout building envelope. Provide continuity of air seal materials and assemblies.

6.3.4.1.2.(k).6 Design exterior walls to minimize thermal bridging using proven installation methods and details consisting of a combination of low conductivity materials, thermal breaks, and insulation to minimize heat loss and enhance assemblies’ effective R-values.

6.3.4.1.2.(k).7 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

6.3.4.1.2.(k).8 Exterior thin veneer precast Architectural Concrete cladding system will be a Rain Screen or cavity wall system.

6.3.4.1.2.(k).9 Exterior thin veneer precast concrete cladding support will be designed as a complete

system to include all loading and attachments to all structural components including adjacent concrete, miscellaneous steel, load bearing steel stud framing, anchors and ties.

6.3.4.1(3) Quality Assurance

6.3.4.1(3)(a) All precast concrete systems and elements will be supplied from a precast concrete plant certified to Canadian Precast Concrete Quality Assurance (CPCQA) Certification Program.

6.3.4.1(3)(b) Retain a Professional Engineer, registered in the Province of British Columbia, to design each type of architectural precast concrete wall system, and verify that the following will comply with the requirements of the BCBC:

6.3.4.1.3.(b).1 Precast concrete wall panels will be factory manufactured in a climate-controlled environment, transported to the Project Site for final assembly by qualified installers;

6.3.4.1.3.(b).2 Precast concrete wall panels to be fabricated and installed by members of the Precast/Prestressed Concrete Institute (PCI) or Canadian Prestressed Concrete Institute (CPCI) and a company specializing in the Products specified in this section with minimum three years documented experience; and

6.3.4.1.3.(b).3 Cause precast concrete materials and workmanship to be inspected and tested by the precast concrete contractor as part of its quality control program in accordance with all applicable standards.

6.3.4.2 Part 2 Products

6.3.4.2(1) Manufacturers

6.3.4.2(1)(a) Acceptable Products: Subject to conformance with requirements of this Section, provide precast Architectural Concrete work by APS Precast or alternative as approved by the Authority.

6.3.4.2(2) Materials

6.3.4.2(2)(a) Formwork: CSA A23.4.

6.3.4.2(2)(b) Reinforcement: Type 316 stainless steel prestressing tendons ASTM A492, ASTM A240/A240M and Federal Standard RR-W-410D.

6.3.4.2(2)(c) Inserts, hardware and connections: Type 316 stainless steel ASTM A240/A240M.

6.3.4.2(2)(d) Rain Screen attachment:

- 6.3.4.2.2.(d).1 Furring, Clips, Brackets: G90 Galvanized Sheet per ASTM A653/A653M;
- 6.3.4.2.2.(d).2 Fasteners: 300 series stainless steel; and
- 6.3.4.2.2.(d).3 Ventilated cavity depth: 20 mm.

6.3.4.2(2)(e) Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics to conform to CSA A23.4, CSA A23.1/A23.2 and as follows:

- 6.3.4.2.2.(e).1 Aggregates: ASTM C33/C33M;
- 6.3.4.2.2.(e).2 Cement: ASTM C150/C150M and CSA A3000;
- 6.3.4.2.2.(e).3 Air entraining admixtures: ASTM C260/C260M; and
- 6.3.4.2.2.(e).4 Colour pigments: ASTM C979/C979M, inorganic natural iron oxide pigments.

6.3.4.2(2)(f) Precast airseal and joint sealant:

- 6.3.4.2.2.(f).1 Silicone sealant: ASTM C920, Type S, Grade NS, Class 100/50; One-part, low-modulus, moisture-curing, silicone, non-bleeding and non-sag; or
- 6.3.4.2.2.(f).2 Hybrid polyurethane: ASTM C920, Type S, Grade NS, Class 35; One-part, hybrid-polyurethane with silane end-capped polymer technology, non-bleeding and non-sag type.

6.3.4.2(2)(g) Precast panel insulation (insulated precast concrete walls, mass walls):

- 6.3.4.2.2.(g).1 CAN/ULC S701, Type III; extruded polystyrene.
- 6.3.4.2.2.(g).2 Acceptable Products: Panelmate Ultra by Dupont de Nemours Inc., OC 300 by Owens Corning Canada Inc. or alternative as approved by the Authority.

6.3.4.3 Part 3 Execution

6.3.4.3(1) Not applicable.

6.4 Masonry (Division 4)

6.4.1 Section 04 22 00 – Concrete Unit Masonry

6.4.1.1 Part 1 General

6.4.1.1(1) References

6.4.1.1(1)(a) ASTM A82, Specification for Steel Wire, Plain, for Concrete Reinforcement.

6.4.1.1(1)(b) ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.4.1.1(1)(c) ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.

6.4.1.1(1)(d) ASTM E514/E514M, Standard Test Method for Water Penetration and Leakage Through Masonry.

6.4.1.1(1)(e) CCMPA, Canadian Concrete Masonry Producers Association, Metric Technical Manual.

6.4.1.1(1)(f) CMCA, Canadian Masonry Contractors Association, Masonry Practices Manual

6.4.1.1(1)(g) CSA A165 Series, CSA Standards on Concrete Masonry Units.

6.4.1.1(1)(h) CAN/CSA A179, Mortar and Grout for Unit Masonry.

6.4.1.1(1)(i) CSA A370, Connectors for Masonry.

6.4.1.1(1)(j) CSA A371, Masonry Construction for Buildings.

6.4.1.1(1)(k) CAN/CSA A3000, Cementitious Materials Compendium.

6.4.1.1(1)(l) CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

6.4.1.1(1)(m) CSA S304, Design of Masonry Structures.

6.4.1.1(1)(n) CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

6.4.1.1(2) Performance Requirements

6.4.1.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.4.1.1(2)(b) Design masonry walls to requirements of CAN/CSA S304, CAN/CSA A370, CAN/CSA A371, CCMPA and BCBC requirements, except where more stringent requirements are indicated herein.

6.4.1.1(2)(c) Seismic Performance: Design materials specified in this Section to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.

6.4.1.1(2)(d) Unless noted otherwise, provide only stainless steel reinforcement for exterior envelope walls.

6.4.1.1(2)(e) Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

6.4.1.1(2)(f) Concrete unit masonry will be considered for both independent exterior walls and in exterior wall systems as a structural backing to other finish materials or systems.

6.4.1.1(2)(g) Concrete masonry walls will be laterally restrained at their tops and bases.

6.4.1.1(2)(h) Masonry Design and Construction will comply with Canadian Masonry Contractors Association (CMCA) Masonry Practices Manual.

6.4.1.1(2)(i) Concrete Block for Fire and Smoke Separations

6.4.1.1.2.(i).1 Masonry fire protection and fire separations will be validated by ULC or NRC fire tests in complete accordance with test design specification. Alternatively, if no ULC or NRC fire tests are indicated, construct masonry fire protection and fire separation of thickness for required fire resistance ratings, and conforming to the Fire Performance Ratings, Appendix D to the National Building Code of Canada.

6.4.1.1.2.(i).2 Ensure fire and smoke masonry separations conform to BCBC requirements with respect to materials, classification, equivalent thicknesses, fire resistance ratings, type of concrete and other requirements of AHJ. Conform to BCBC and applicable

Supplementary Standards for Fire performance rating.

6.4.1.1.2.(i).3 Conform to requirements of the Canadian Concrete Masonry Products Association (CCMPA) Metric Technical Manual and provide hollow or solid block assemblies to achieve required fire ratings.

6.4.1.1(3) Quality Assurance

6.4.1.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.4.1.1(3)(b) Contractor Qualifications: Masonry contractor will be a member in good standing of the Masonry Institute of British Columbia and be qualified under the Technical Masonry Certification (TMC) program.

6.4.1.1(3)(c) Requirements of Regulatory Agencies: Installation to comply with governing regulations and to approval of the AHJ.

6.4.1.1(3)(d) Temporary wind bracing for masonry during construction will conform to CSA A371. Provide temporary bracing for masonry work during erection to prevent damage due to winds or other lateral loads until permanent structure provides adequate bracing.

6.4.1.1(3)(e) Low-lift and high-lift grouting of reinforced concrete block walls will conform to CSA A371.

6.4.1.1(3)(f) Conform to requirements of Canadian Masonry Contractors Association (CMCA), Masonry Practices Manual, CSA S304 for determination of loads acting on connectors and design requirements and to CSA A370 and CSA A371 for construction requirements, except where more stringent requirements are noted.

6.4.1.1(3)(g) Concrete masonry practices and work standards to conform where applicable to the "Concrete Masonry Handbook" published by the Portland Cement Association and CSA A371.

6.4.1.2 Part 2 Products

6.4.1.2(1) Concrete Block Masonry

6.4.1.2(1)(a) Lightweight Concrete Block Masonry Units: Lightweight units, CSA A165 Series, Classification H/15/D/M, S/15/D/M or Sc/15/D/M as required by application.

6.4.1.2(1)(b) Normal weight Concrete Block Masonry Units: Lightweight units, CSA A165 Series, Classification H/15/A/M, S/15/A/M or Sc/15/A/M as required by application.

6.4.1.2(1)(c) Fire Resistant Concrete Block Masonry Units: CSA A165 Series, Classification H/15/B/M. Aggregate used in fire resistant units and equivalent thickness of units to the National Building Code of Canada, for fire-resistance ratings.

6.4.1.2(1)(d) Concrete unit masonry for interior applications to be considered as an integrally finished material, as a base for applied finish and as a structural backing to other finish systems

6.4.1.2(1)(e) Painted or unpainted concrete unit masonry will not be used as an exposed finish in clinical or public areas.

6.4.1.2(1)(f) Where concrete unit masonry is used as the exposed finish including door and window wall openings, all exposed corners will be radiused.

6.4.1.2(2) Reinforcing

6.4.1.2(2)(a) Joint Reinforcement: CSA A370, CSA A371, ASTM A82 and ASTM A480/A480M; hot dip galvanized for interior, typical; all components at exterior walls to be stainless steel, Type 304, complete with separator or isolator to prevent galvanic reaction where required.

6.4.1.2(2)(b) Connectors: CSA A370 and CSA S304.

6.4.1.2(2)(c) Reinforcing steel: CSA G30.18, Grade 400.

6.4.1.2(3) Mortar Materials

6.4.1.2(3)(a) Loadbearing masonry: CSA A179, Type S, proportion method.

6.4.1.2(3)(b) Interior non-loadbearing masonry: CSA A179, Type N, proportion method.

6.4.1.2(3)(c) Cement: to CANCSA A3000, normal portland cement, Type GU, grey. Provide white cement where required for white or light coloured mortars.

6.4.1.2(3)(d) Mortar Aggregate: to CAN/CSA A179, washed, clean, sharp and free from organic materials.

6.4.1.2(3)(e) Hydrated lime: ASTM C207, Type S.

6.4.1.2(3)(f) Mortar pigment: In colour to suit masonry.

6.4.1.2(3)(g) No anti-freeze liquid, salts or other substances to be used in the mortar to lower the freezing point.

6.4.1.2(3)(h) Water: Clean and free of injurious amounts of salts, oil, acid, alkali, organic matter and other deleterious substances.

6.4.1.2(3)(i) Integral Water Repellent: Provide integral water repellent liquid polymeric admixture to all exterior masonry units and mortar to yield resistance to water penetration. Material to achieve Class E rating in accordance with ASTM E514/E514M.

6.4.1.2(3)(j) Sealer: Clear water repellant penetrating coating composed of silane/siloxane. Acceptable Products: Fabrikem Fabrishield 763 or alternative as approved by the Authority.

6.4.1.3 Part 3 Execution

6.4.1.3(1) Not applicable.

6.4.2 Section 04 26 00 – Masonry Veneer

6.4.2.1 Part 1 General

6.4.2.1(1) References

6.4.2.1(1)(a) ASTM A82, Specification for Steel Wire, Plain, for Concrete Reinforcement.

6.4.2.1(1)(b) ASTM A276, Standard Specification for Stainless Steel Bars and Shapes.

6.4.2.1(1)(c) ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.4.2.1(1)(d) ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.

6.4.2.1(1)(e) ASTM C216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).

6.4.2.1(1)(f) ASTM C615, Standard Specification for Granite Dimension Stone.

6.4.2.1(1)(g) ASTM E514/E514M, Standard Test Method for Water Penetration and Leakage Through Masonry.

6.4.2.1(1)(h) CMCA, Canadian Masonry Contractors Association, Masonry Practices Manual.

6.4.2.1(1)(i) CSA A82, Fired Masonry Brick Made from Clay or Shale.

6.4.2.1(1)(j) CAN/CSA A179, Mortar and Grout for Unit Masonry.

6.4.2.1(1)(k) CSA A370, Connectors for Masonry.

6.4.2.1(1)(l) CSA A371, Masonry Construction for Buildings.

6.4.2.1(1)(m) CAN/CSA A3000, Cementitious Materials Compendium.

6.4.2.1(1)(n) CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

6.4.2.1(1)(o) CSA S304, Design of Masonry Structures.

6.4.2.1(1)(p) CSA S478, Durability in Buildings.

6.4.2.1(1)(q) CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

6.4.2.1(1)(r) NBGQA, National Building Granite Quarries Association.

6.4.2.1(2) Performance Requirements

6.4.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.4.2.1(2)(b) Design for durability of building envelope materials in accordance with requirements of CSA S478. Select materials with proven record of durability and provide proof of durability from suppliers.

6.4.2.1(2)(c) Design exterior envelope cavity walls based on Rain Screen Principle advocated by NRCC and

provide for drainage of water entering envelope cavity wall system. Provide for compartments in long cavity wall and at corners to achieve appropriate pressure equalization in exterior envelope cavity wall design.

6.4.2.1(2)(d) Design wall to provide for thermal movement of component materials caused by ambient temperature range from -30 to 80 degrees C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

6.4.2.1(2)(e) Design masonry walls for maximum deflection of L/720 under design wind loads.

6.4.2.1(2)(f) Design exterior masonry walls to requirements of CAN/CSA S304, CAN/CSA A370, CAN/CSA A371, and the BCBC, except where more stringent requirements are indicated herein. Corrugated ties are not acceptable for use in brick veneer construction.

6.4.2.1(2)(g) Seismic Performance: Design materials specified in this Section to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.

6.4.2.1(2)(h) Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with BCBC and meet the structural requirements of a post-disaster building.

6.4.2.1(2)(i) Design exterior walls to provide continuous, complementary and compatible air / vapour / thermal barriers throughout building envelope. Provide continuity of air seal materials and assemblies.

6.4.2.1(2)(j) Design exterior walls to minimize thermal bridging using proven installation methods and details consisting of a combination of low conductivity materials, thermal breaks, and insulation to minimize heat loss and enhance assemblies' effective R-values.

6.4.2.1(2)(k) Design exterior brick veneer walls with adjustable brick ties, air spaces, rigid insulation, air / vapour

barrier membrane, sheathing and structural back-up system to suit design requirements. Provide only stainless steel reinforcement for exterior envelope walls.

6.4.2.1(2)(l) Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

6.4.2.1(2)(m) Masonry Design and Construction will comply with Canadian Masonry Contractors Association (CMCA) Masonry Practices Manual.

6.4.2.1(2)(n) Exterior wall systems comprising brick or stone masonry as a finish veneer to concrete, concrete masonry or metal framing will be a Rain Screen or cavity wall system.

6.4.2.1(2)(o) Exterior veneer cladding support will be designed as a complete system to include all loading and attachments to all structural components including adjacent concrete, miscellaneous steel, load bearing steel stud framing, lateral bracing and brick ties.

6.4.2.1(2)(p) Brick masonry below grade for exterior applications is not permitted.

6.4.2.1(2)(q) Brick masonry in interior applications is to have integral finish and construction compatible with the Authority’s infection prevention and control requirements, refer to Infection Control.

6.4.2.1(3) Quality Assurance

6.4.2.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.4.2.1(3)(b) Contractor Qualifications: Masonry contractor will be a member in good standing of the Masonry Institute of British Columbia and be qualified under the Technical Masonry Certification (TMC) program.

6.4.2.1(3)(c) Requirements of Regulatory Agencies: Installation to comply with governing regulations and to approval of AHJ.

6.4.2.1(3)(d) Temporary wind bracing for masonry during construction will conform to CSA A371. Provide temporary bracing for masonry work during erection to prevent damage due to winds or other lateral loads until permanent structure provides adequate bracing.

6.4.2.1(3)(e) Low-lift and high-lift grouting of reinforced concrete block walls will conform to CSA A371.

6.4.2.1(3)(f) Conform to requirements of Canadian Masonry Contractors Association (CMCA), Masonry Practices Manual, CSA S304 for determination of loads acting on connectors and design requirements and to CSA A370 and CSA A371 for construction requirements, except where more stringent requirements are noted.

6.4.2.1(3)(g) Concrete masonry practices and work standards to conform where applicable to the "Concrete Masonry Handbook" published by the Portland Cement Association and CSA A371.

6.4.2.1(3)(h) Ensure masonry units meet efflorescence test requirements of CSA A82.

6.4.2.2 Part 2 Products

6.4.2.2(1) Manufacturers

6.4.2.2(1)(a) Acceptable Products: Subject to conformance with requirements of this Section, provide brick and stone units from one of the following:

6.4.2.2.1.(a).1 BC Brick Supplies Ltd.

6.4.2.2.1.(a).2 Brock White Canada.

6.4.2.2.1.(a).3 Or alternative as approved by the Authority.

6.4.2.2(2) Clay Brick Units

6.4.2.2(2)(a) Solid Face Brick: CAN/CSA A82 and ASTM C216; Type FBX, Grade SW. Smooth face finish.

6.4.2.2(2)(b) Manufactured from one continuous batch to eliminate colour and texture variations.

6.4.2.2(2)(c) Special shapes: provide special units as required.

6.4.2.2(2)(d) Solid brick: use where necessary to avoid exposing brick cores.

6.4.2.2(3) Stone Masonry Units

6.4.2.2(3)(a) Stone Veneer Units:

6.4.2.2.3.(a).1 Acceptable Products: Subject to compliance with requirements, Granite by Cold Spring Granite Company or alternative as approved by the Authority.

6.4.2.2.3.(a).2 Granite stone, conforming to ASTM C615, standard architectural grade, and NBGQA reference; sound, hard and durable, well seasoned and of uniform strength, colour and texture, free of quarry sap, flaws, cracks, seams, sand holes, starts, iron pyrites or other mineral or organic defects that could impair structural integrity or function.

6.4.2.2.3.(a).3 Stone will be sound, hard and durable, well-seasoned and of uniform strength, colour and texture, and free of quarry sap, flaws, seams, sand holes, iron pyrites or other mineral or organic defects. 30 mm minimum thickness.

6.4.2.2.3.(a).4 Manufactured stone products will not be used.

6.4.2.2(3)(b) Temporary Setting Shims: Rigid plastic shims, non-staining to stone, sized to suit joint thickness.

6.4.2.2(3)(c) Setting shims: Strips of resilient plastic or neoprene, non-staining to stone, of thickness required to prevent point loading of stone on anchors and of depths to suit anchors without intruding into depths of pointing materials.

6.4.2.2(4) Reinforcing

6.4.2.2(4)(a) Joint Reinforcement: CSA A370, CSA A371, ASTM A82 and ASTM A480/A480M, all components to be stainless steel, Type 304, complete with separator or isolator to prevent galvanic reaction where required.

6.4.2.2(4)(b) Connectors: CSA A370 and CSA S304.

6.4.2.2(4)(c) Reinforcing steel: CSA G30.18, Grade 400.

6.4.2.2(4)(d) Shims and Thermal Break: Hi-impact resistant plastic as supplied by Precision Wall Systems Inc or alternative as approved by the Authority.

6.4.2.2(5) Mortar Materials

6.4.2.2(5)(a) Exterior non-loadbearing masonry: CSA A179, Premixed 1-1-6 Type N, portland cement/lime, proportion method.

6.4.2.2(5)(b) Cement: to CANCSA A3000, normal portland cement, Type GU, grey. Provide white cement where required for white or light coloured mortars.

6.4.2.2(5)(c) Mortar Aggregate: to CAN/CSA A179, washed, clean, sharp and free from organic materials.

6.4.2.2(5)(d) Hydrated lime: ASTM C207, Type S.

6.4.2.2(5)(e) Mortar pigment: In colour to suit masonry.

6.4.2.2(5)(f) No anti-freeze liquid, salts or other substances to be used in the mortar to lower the freezing point.

6.4.2.2(5)(g) Water: Clean and free of injurious amounts of salts, oil, acid, alkali, organic matter and other deleterious substances.

6.4.2.2(5)(h) Integral Water Repellent: Provide integral water repellent liquid polymeric admixture to all exterior masonry units and mortar to yield resistance to water penetration. Material to achieve Class E rating in accordance with ASTM E514/E514M.

6.4.2.2(5)(i) Sealer: Clear water repellant penetrating coating composed of silane/siloxane. Acceptable Products: Fabrikem Fabrishield 763 or alternative as approved by the Authority.

6.4.2.3 Part 3 Execution

6.4.2.3(1) Not applicable.

6.4.3 Section 04 42 00 – Stone Cladding

6.4.3.1 Part 1 General

6.4.3.1(1) References

6.4.3.1(1)(a) ASTM A276, Standard Specification for Stainless Steel Bars and Shapes.

6.4.3.1(1)(b) ASTM C615, Standard Specification for Granite Dimension Stone.

6.4.3.1(1)(c) ASTM E514/E514M, Standard Test Method for Water Penetration and Leakage Through Masonry.

6.4.3.1(1)(d) ASTM C1242, Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems.

6.4.3.1(1)(e) CSA S478, Durability in Buildings.

6.4.3.1(1)(f) CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

6.4.3.1(1)(g) NBGQA, National Building Granite Quarries Association.

6.4.3.1(2) Performance Requirements

6.4.3.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.4.3.1(2)(b) Design for durability of building envelope materials in accordance with requirements of CSA S478. Select materials with proven record of durability and provide proof of durability from suppliers.

6.4.3.1(2)(c) Design exterior envelope cavity walls based on Rain Screen Principle advocated by NRCC and provide for drainage of water entering envelope cavity wall system. Provide for compartments in long cavity wall and at corners to achieve appropriate pressure equalization in exterior envelope cavity wall design.

6.4.3.1(2)(d) Design wall to provide for thermal movement of component materials caused by ambient temperature range from -30 to 80 degrees C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

6.4.3.1(2)(e) Design exterior stone cladding to requirements of ASTM C1242 and BCBC, except where more stringent requirements are indicated herein.

6.4.3.1(2)(f) Seismic Performance: Design materials specified in this Section to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.

6.4.3.1(2)(g) Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with BCBC.

6.4.3.1(2)(h) Design exterior walls to provide continuous, complementary and compatible air / vapour / thermal barriers throughout building envelope. Provide continuity of air seal materials and assemblies.

6.4.3.1(2)(i) Design exterior walls to minimize thermal bridging using proven installation methods and details consisting of a combination of low conductivity materials, thermal breaks, and insulation to minimize heat loss and enhance assemblies' effective R-values.

6.4.3.1(2)(j) Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

6.4.3.1(2)(k) Exterior stone cladding system will be a Rain Screen or cavity wall system.

6.4.3.1(2)(l) Exterior stone cladding support will be designed as a complete system to include all loading and attachments to all structural components including adjacent concrete, miscellaneous steel, load bearing steel stud framing, anchors and ties.

6.4.3.1(3) Quality Assurance

6.4.3.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design stone cladding system, and verify that the following will comply with the requirements of the BCBC:

6.4.3.1.3.(a).1 Fabricator Qualifications: Company specializing in fabricating the Products specified in this section with minimum three years documented experience;

6.4.3.1.3.(a).2 Installer Qualifications: Company specializing in installing the Products specified in this section with minimum three years documented experience; and

6.4.3.1.3.(a).3 Requirements of Regulatory Agencies: Installation to comply with governing regulations and to approval of AHJ.

6.4.3.2 Part 2 Products

6.4.3.2(1) Stone Cladding

6.4.3.2(1)(a) Acceptable Products: Subject to conformance with requirements of this Section, provide granite stone cladding by Cold Spring Granite Company or alternative as approved by the Authority.

6.4.3.2(1)(b) Granite stone, conforming to ASTM C615, standard architectural grade, and NBGQA reference; sound, hard and durable, well seasoned and of uniform strength, colour and texture, free of quarry sap, flaws, cracks, seams, sand holes, starts, iron pyrites or other mineral or organic defects that could impair structural integrity or function.

6.4.3.2(1)(c) Stone will be sound, hard and durable, well-seasoned and of uniform strength, colour and texture, and free of quarry sap, flaws, seams, sand holes, iron pyrites or other mineral or organic defects.

6.4.3.2(1)(d) Manufactured stone products will not be used.

6.4.3.2(2) Reinforcing

6.4.3.2(2)(a) Dowels, cramps, bolts and anchors:

6.4.3.2.2.(a).1 Stainless steel, ASTM A276, Type 304 and in accordance with requirements of AHJ.

6.4.3.2.2.(a).2 Acceptable Products: Halfen, Hohmann & Barnard or alternative as approved by the Authority.

6.4.3.2(2)(b) Shims and Thermal Break: Hi-impact resistant plastic as supplied by Precision Wall Systems Inc or alternative as approved by the Authority.

6.4.3.2(3) Adhesive Materials

6.4.3.2(3)(a) Epoxy stone joining adhesive: Two component, UV stable, 100% solid epoxy adhesive, designed to provide permanent, water resistant, non-yellowing bond.

6.4.3.2(4) Sealants

6.4.3.2(4)(a) Sealant:

6.4.3.2.4.(a).1 Sealants will not stain stone.

6.4.3.2.4.(a).2 ASTM C920, Type S, Grade NS; silicone sealant, complete with joint backing and primer recommended by manufacturer.

6.4.3.2.4.(a).3 Acceptable Products: Dowsil 790 by Dow Corning Corporation, Spectrem 3 by Tremco Limited or alternative as approved by the Authority.

6.4.3.3 Part 3 Execution

6.4.3.3(1) Not applicable.

6.4.4 Section 04 42 10 – Composite Stone Cladding

6.4.4.1 Part 1 General

6.4.4.1(1) References

6.4.4.1(1)(a) ASTM A276, Standard Specification for Stainless Steel Bars and Shapes.

6.4.4.1(1)(b) ASTM C615, Standard Specification for Granite Dimension Stone.

6.4.4.1(1)(c) ASTM E514/E514M, Standard Test Method for Water Penetration and Leakage Through Masonry.

6.4.4.1(1)(d) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.4.4.1(1)(e) CSA S478, Durability in Buildings.

6.4.4.1(1)(f) CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

6.4.4.1(1)(g) CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

6.4.4.1(1)(h) CAN/ULC-S114, Test for Determination of Non-Combustibility in Building Materials.

6.4.4.1(1)(i) CAN/ULC-S134, Standard Method of Fire Test of Exterior Wall Assemblies.

6.4.4.1(1)(j) NBGQA, National Building Granite Quarries Association.

6.4.4.1(2) Performance Requirements

6.4.4.1(2)(a)	Perform work in accordance with AHJ and as outlined herein.
6.4.4.1(2)(b)	Design for durability of building envelope materials in accordance with requirements of CSA S478. Select materials with proven record of durability and provide proof of durability from suppliers.
6.4.4.1(2)(c)	Design exterior envelope cavity walls based on Rain Screen Principle advocated by NRCC and provide for drainage of water entering envelope cavity wall system. Provide for compartments in long cavity wall and at corners to achieve appropriate pressure equalization in exterior envelope cavity wall design.
6.4.4.1(2)(d)	Design wall to provide for thermal movement of component materials caused by ambient temperature range from -30 to 80 degrees C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
6.4.4.1(2)(e)	Design exterior composite stone cladding to requirements of BCBC, except where more stringent requirements are indicated herein.
6.4.4.1(2)(f)	Seismic Performance: Design materials specified in this Section to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.
6.4.4.1(2)(g)	Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with BCBC.
6.4.4.1(2)(h)	Design exterior walls to provide continuous, complementary and compatible air / vapour / thermal barriers throughout building envelope. Provide continuity of air seal materials and assemblies.
6.4.4.1(2)(i)	Design composite stone cladding for maximum deflection of L/720 under design wind loads.
6.4.4.1(2)(j)	Design exterior walls to minimize thermal bridging using proven installation methods and details consisting of a combination of low conductivity materials, thermal breaks, and insulation to

minimize heat loss and enhance assemblies' effective R-values.

6.4.4.1(2)(k) Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

6.4.4.1(2)(l) Exterior composite stone cladding system will be a Rain Screen or cavity wall system.

6.4.4.1(2)(m) Exterior composite stone cladding support will be designed as a complete system to include all loading and attachments to all structural components including adjacent concrete, miscellaneous steel, load bearing steel stud framing.

6.4.4.1(2)(n) Size of holes (porosities) in panels must not be larger than 1.5 mm.

6.4.4.1(3) Quality Assurance

6.4.4.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design composite stone cladding system, and verify that the following will comply with the requirements of the BCBC:

6.4.4.1.3.(a).1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience; and

6.4.4.1.3.(a).2 Installer Qualifications: Company specializing in installing the Products specified in this section with minimum three years documented experience.

6.4.4.2 Part 2 Products

6.4.4.2(1) Manufacturers

6.4.4.2(1)(a) Acceptable Products: Subject to conformance with requirements of this Section, provide composite stone cladding by one of the following:

6.4.4.2.1.(a).1 Stone Lamina.

6.4.4.2.1.(a).2 StonePly Co.

6.4.4.2.1.(a).3 Or alternative as approved by the Authority.

6.4.4.2(2) Composite Stone Cladding

6.4.4.2(2)(a) Composite stone panels:

6.4.4.2.2.(a).1 Minimum 6 mm thick stone facing panel bonded on minimum 12 mm thick honeycomb composite with high strength epoxy.

6.4.4.2.2.(a).2 Average weight of panel:16 kg/sq. m.

6.4.4.2.2.(a).3 Fire resistance: Conforms to CAN/ULC-S114, CAN/ULC-S134, and ASTM E84 or CAN/ULC-S102, Class A fire rated.

6.4.4.2.2.(a).4 Stone facing:

(a).4.1 Granite stone facing, conforming to ASTM C615, standard architectural grade, and NBGQA reference; sound, hard and durable, well seasoned and of uniform strength, colour and texture, free of quarry sap, flaws, cracks, seams, sand holes, starts, iron pyrites or other mineral or organic defects that could impair structural integrity or function.

(a).4.2 Stone will be sound, hard and durable, well-seasoned and of uniform strength, colour and texture, and free of quarry sap, flaws, seams, sand holes, iron pyrites or other mineral or organic defects.

6.4.4.2.2.(a).5 Dimensional tolerance: Plus or minus 3.2 mm in all directions. Plus or minus 3.2 mm diagonally.

6.4.4.2(2)(b) Anchorage and connection hardware:

6.4.4.2.2.(b).1 Anchorage and connection hardware to include Z-clips, locking channels, concealed anchor plates, angle clips, structural silicone, epoxy and threaded metal inserts.

6.4.4.2.2.(b).2 Provide with concealed fastener system.

6.4.4.2(2)(c) Shims and Thermal Break: Hi-impact resistant plastic as supplied by Precision Wall Systems Inc or alternative as approved by the Authority.

6.4.4.3 Part 3 Execution

6.4.4.3(1) Not applicable.

6.5 Metals (Division 5)

6.5.1 Section 05 12 00 – Structural Steel

6.5.1.1 General

6.5.1.1(1) Design structural steel and steel deck to comply with the deflection and vibration criteria set out in Section 5.12 Structural Design.

6.5.1.1(2) Erection tolerances for steel construction will be in accordance with CSA S16 Clause 29.3.

6.5.1.1(3) Steel floor and roof construction will be designed to account for the deflection of steel beams, joists, and girders due to the wet weight of concrete topping slabs. Floor levelness tolerances will be maintained. The Design of the structure will account for the additional concrete ponding weight.

6.5.1.1(4) Steel floor/roof decking is to be wide rib profile for ease of attachment of current and future services, equipment, and fixtures using drilled insert expansion anchors into the bottom of the deck ribs.

6.5.1.1(5) Steel floor/roof decking plus the concrete topping slab thickness will satisfy the requirements of a ULC-rated assembly meeting the BC Building Code requirements.

6.5.1.1(6) Fireproofing will be mechanically fastened compressed mineral wool fire protection board, thin film intumescent fireproofing or cementitious fireproofing.

6.5.1.2 Quality Requirements

6.5.1.2(1) Quality assurance testing and monitoring of workmanship to be carried out by an approved testing laboratory using testing procedures as specified in the CAN/CSA standards referenced in Section 2.4 Standards and Guidelines of this Schedule, including CSA S16 Design of Steel Structures, to verify soundness of representative shop and field welds. Test all full strength welds.

6.5.1.2(2) Material quality including sourcing and welding quality will be monitored by a testing agency as approved by the Authority.

6.5.1.2(3) Exterior exposed structural steel will be hot-dipped galvanized to 600 g/m2, in accordance with CSA G164 Hot Dip Galvanizing of Irregularly Shaped Articles and, where visible to the public, Patients and Staff, painted with either a quality two-part epoxy paint system with one coat epoxy zinc rich primer, one coat high-build epoxy coating, and two coats of polyurethane coating as specified in Section 09 91 00 or, where feasible, a powder coating. All fasteners will be either hot-dipped galvanized or stainless steel.

6.5.1.2(4) All dissimilar metal components in contact and subject to potential galvanic corrosion will be galvanically isolated with insulation such as polyamide washers.

6.5.1.2(5) All exposed structural steel and its fittings connecting to exterior grade subject to potential de-icing chemicals/salts and damage from snow removal will be supported on 150 mm high concrete pedestals.

6.5.2 Section 05 41 00 – Cold-Formed Metal Framing

6.5.2.1 Part 1 General

6.5.2.1(1) References

6.5.2.1(1)(a) ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

6.5.2.1(1)(b) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.5.2.1(1)(c) ASTM C1002, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

6.5.2.1(1)(d) AWCC, Association of Wall and Ceiling Contractor’s Specification Standards Manual.

6.5.2.1(1)(e) CSA-A660, Certification of Manufacturers of Steel Building Systems.

6.5.2.1(1)(f) CSA S136, North American Specification for Design of Cold Formed Steel Structural Members.

6.5.2.1(1)(g) CSA W47.1, Certification of Companies for Fusion Welding of Steel.

6.5.2.1(1)(h) CSA W55.3, Certification of Companies for Resistance Welding of Steel and Aluminum.

6.5.2.1(1)(i) CSA W59, Welded Steel Construction (Metal Arc Welding).

6.5.2.1(1)(j) CSSBI 30M, Standard for Steel Building System.

6.5.2.1(2) Performance Requirements

6.5.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.5.2.1(2)(b) Steel stud framing to be independent of the principle structural system.

6.5.2.1(2)(c) Steel stud framing to comply with CSA-S136 and all applicable CAN/CSA standards.

6.5.2.1(2)(d) Maximum deflection:

6.5.2.1.2.(d).1 Design steel studs for all applicable design loads including wind load with the following deflection limits:

(d).1.1 Brick, stone veneer, composite stone, terra cotta and thin veneer precast concrete cladding: L/720;

(d).1.2 Aluminum composite panels and aluminum plate cladding: L/360;

(d).1.3 Metal siding: L/240;

(d).1.4 Cementitious panels: L/360; and

(d).1.5 Phenolic and wood cladding: L/360.

6.5.2.1.2.(d).2 All interior partition walls will be minimum L/240 unless otherwise required to support the applicable loads such as wall mounted/hung items.

6.5.2.1.2.(d).3 Conform to maximum panel deflection as specified or less when tested in accordance with positive and negative pressures without cracking or damage to panel facing.

6.5.2.1(2)(e) Design components to accommodate erection tolerances of the structure.

6.5.2.1(2)(f) Design wind bearing stud end connections to accommodate floor/roof deflections and to ensure that studs are not loaded axially.

6.5.2.1(2)(g) Design steel stud framing to take into account the anchorage of other materials being supported including sub-girts supporting metal cladding and composite panels, soffit finishes and the provision of lateral support at window heads.

6.5.2.1(2)(h) All dissimilar metal components in contact and subject to potential galvanic corrosion will be galvanically isolated with insulation such as polyamide washers.

6.5.2.1(2)(i) Exterior Wall Design: Design exterior walls to minimize thermal bridging using proven installation methods and details consisting of a combination of low conductivity materials, thermal breaks, and

insulation to minimize heat loss and enhance assemblies' effective R-values. Refer to Building Envelope Thermal Bridging Guide Version 1.6 (2021) prepared by Morrison Hershfield.

6.5.2.1(2)(j) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.5.2.1(3) Quality Assurance

6.5.2.1(3)(a) Retain a Professional Engineer registered in the Province of British Columbia for the design of all cold-formed, steel stud construction, for exterior walls and interior partitions, and verify that the following will comply with the requirements of the BCBC:

6.5.2.1(3)(b) Manufacturers qualifications:

6.5.2.1.3.(b).1 The steel stud manufacturer will be certified in accordance with CSSBI 30MStandard for Steel Building Systems and all applicable CAN/CSA standards including CSA-A660; and

6.5.2.1.3.(b).2 Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.5.2.1(3)(c) Installers qualifications:

6.5.2.1.3.(c).1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer;

6.5.2.1.3.(c).2 Conform to the Association of Wall and Ceiling Contractor's Specification Standards Manual (AWCC); and

6.5.2.1.3.(c).3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

6.5.2.2 Part 2 Products

6.5.2.2(1) Materials

6.5.2.2(1)(a) Steel: To CSA S136, Grade A to D steel with Z275 zinc coating designation in accordance with ASTM A653/A653M.

6.5.2.2(1)(b) Welding materials: To CSA W59 and certified by Canadian Welding Bureau.

6.5.2.2(1)(c) Screws: Pan head, self-drilling, self-tapping sheet metal screws, corrosion protected to minimum requirements of CSSBI, length to suit intended end use.

6.5.2.2(1)(d) Anchors: Concrete expansion anchors or other suitable drilled type fasteners.

6.5.2.2(1)(e) Bolts, nuts, washers: Hot dipped galvanized to ASTM A123, 600 g/m² zinc coating.

6.5.2.2(1)(f) Batt insulation: In accordance with Section 07 21 19.

6.5.2.2(1)(g) Sill plate gasket: Polyethylene foam, moisture resistant.

6.5.2.2(1)(h) Isolation materials: Black bituminous isolation coating, acid and alkali resistant material or neoprene isolation material.

6.5.2.2(1)(i) Sheathing screws: To ASTM C1002, Type S, corrosion resistant, 12.7 mm penetration into steel, complete with washers.

6.5.2.2(1)(j) Exterior grade gypsum sheathing: In accordance with Section 09 21 16.

6.5.2.2(2) Metal Framing

6.5.2.2(2)(a) Metal studs: To CAN/CSA S136, fabricated from zinc coated steel. Minimum steel thickness to be 0.91 mm.

6.5.2.2(2)(b) Stud tracks: Fabricated from same material and finish as metal studs, depth to suit.

6.5.2.2(2)(c) Bottom track: Single piece.

6.5.2.2(2)(d) Top track: Two-piece telescoping or single piece as required by design.

6.5.2.2(2)(e) Bridging: Fabricated from same material and finish as studs, 38 x 12 x 1.22 mm minimum thickness.

6.5.2.2(2)(f) Angle clips: Fabricated from same material and finish as studs, 38 x 38 mm x depth of metal stud, 1.22 mm minimum thickness.

6.5.2.2(2)(g) Tension straps and accessories: To suit stud design and as recommended by stud manufacturer.

6.5.2.3 Part 3 Execution

6.5.2.3(1) Not applicable.

6.5.3 Section 05 50 00 – Metal Fabrications

6.5.3.1 Part 1 General

6.5.3.1(1) References

6.5.3.1(1)(a) ANSI-ASC A14.3, Standard for Ladders – Fixed – Safety Requirements.

6.5.3.1(1)(b) ASME A17.1, Safety Code for Elevators and Escalators.

6.5.3.1(1)(c) ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

6.5.3.1(1)(d) ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

6.5.3.1(1)(e) ASTM A307, Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.

6.5.3.1(1)(f) ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.5.3.1(1)(g) ASTM A510/A510M, Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.

6.5.3.1(1)(h) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

6.5.3.1(1)(i) ASTM B209/B209M, Specification for Aluminum and Aluminum -Alloy Sheet and Plate.

6.5.3.1(1)(j) ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

6.5.3.1(1)(k) ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.

6.5.3.1(1)(l) ASTM F3125/F3125M, Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

6.5.3.1(1)(m) CISC, Canadian Institute for Steel Construction - Handbook of Steel Construction.

6.5.3.1(1)(n) CSA B651, Accessible Design for the Built Environment.

6.5.3.1(1)(o) CSA G40.20/G40.21, Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.

6.5.3.1(1)(p) CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

6.5.3.1(1)(q) CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

6.5.3.1(1)(r) CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

6.5.3.1(1)(s) CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.

6.5.3.1(1)(t) CSA W59, Welded Steel Construction (Metal Arc Welding).

6.5.3.1(1)(u) CSA W117.2, Safety in Welding, Cutting and Allied Processes.

6.5.3.1(1)(v) MPI, Master Painters Institute.

6.5.3.1(1)(w) NAAMM, The National Association of Architectural Metal Manufacturers.

6.5.3.1(2) Performance Requirements

6.5.3.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.5.3.1(2)(b) Provide metal fabrications including:

6.5.3.1.2.(b).1 steel framing and supports for suspended toilet partitions;

6.5.3.1.2.(b).2 steel framing and supports for sliding doors/side coiling grilles;

6.5.3.1.2.(b).3 steel framing and supports for overhead openings;

6.5.3.1.2.(b).4 steel framing and supports for architectural woodwork elements;

6.5.3.1.2.(b).5 steel framing and supports for mechanical and electrical equipment;

6.5.3.1.2.(b).6 steel framing and supports for openings including sliding doors, oversized doors and similar openings;

6.5.3.1.2.(b).7 steel framing and supports for medical equipment;

6.5.3.1.2.(b).8 metal ladders and safety cages;

6.5.3.1.2.(b).9 ship’s ladders;

6.5.3.1.2.(b).10 metal floor plates and supports;

6.5.3.1.2.(b).11 metal bollards;

6.5.3.1.2.(b).12 steel pipe handrails and guardrails;

6.5.3.1.2.(b).13 metal gratings;

6.5.3.1.2.(b).14 miscellaneous sections and framing for applications where framing and supports are required;

6.5.3.1.2.(b).15 Shop-fabricated stainless steel items as specified herein;

6.5.3.1.2.(b).16 Metal framing system for mounting of mechanical and electrical panels and components; and

6.5.3.1.2.(b).17 All miscellaneous sections and framing as required to complete the Work and as indicated in the Canadian Institute for Steel Construction (CISC) - Handbook of Steel Construction for applications where framing and supports are not explicitly specified in this section.

6.5.3.1(2)(c) Design-Builder will provide all shop-fabricated stainless steel items, including:

6.5.3.1.2.(c).1 Countertops;

6.5.3.1.2.(c).2 Wall panels with access doors including wall panels as infill between equipment, such as MDR cart washers, with piano hinged doors;

6.5.3.1.2.(c).3 Integral sinks, counters, removable under-counter shelves, backsplash, and skirt;

6.5.3.1.2.(c).4 Exhaust hoods as required; and

6.5.3.1.2.(c).5 Wall caps for partial-height walls in MDR, as required.

6.5.3.1(2)(d) Refer to Appendix 1H [Equipment and Furniture] for reprocessing sink requirements in areas such as MDR.

6.5.3.1(2)(e) Provide all required steel plates affixed to the concrete side walls, end wall and ceiling of the Treatment Bunker Interior room to facilitate laser system installation.

6.5.3.1(2)(f) Design work of this Section to withstand within acceptable deflection limitations, specified tolerances in vertical and horizontal planes, its own weight, forces applied by movements of building structure and attached adjacent components, and maximum design loads due to pressure and suction of wind, snow, ice, rain and hail.

6.5.3.1(2)(g) Design metal fabrication work that functions to resist forces by dead and live loads to conform to the BCBC and requirements of AHJ.

6.5.3.1(2)(h) Design materials specified in this Section to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.

6.5.3.1(2)(i) Allow for thermal and structural movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

6.5.3.1.2.(i).1 Temperature Change: 120°F (67°C), ambient; 180°F (100°C), material surfaces.

6.5.3.1(2)(j) Ladders, typical access and ship’s ladders:

6.5.3.1.2.(j).1 Design ladders and fabricate capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI-ASC A14.3, ASME A17.1 (elevator pit ladders) and Occupational Health and Safety Regulations of AHJ, complete with safety cages as required for typical access ladders.

6.5.3.1.2.(j).2 Design access and ship’s ladders connecting to roof hatches so that top rung of ladder is approximately 175 mm from top lip of hatch,

for safe access out of hatch and onto roof system. Rungs level with bottom of hatch will not be permitted. Refer to Section 6.7.22 for roof hatch types to be used on the Project.

6.5.3.1.2.(j).3 Ensure ladders are rigid and free from deflection after installation. Provide all supporting and anchoring members required. Positively and accurately secure ladders to building structure.

6.5.3.1.2.(j).4 Ship's ladder and wall rails:

(j).4.1 Provide ship's ladders and wall pipe rails in required locations.

(j).4.2 Design ship's ladders and railings to meet requirements as specified in this Section, complete with steel channel stringers, angles, plates and other miscellaneous steel required.

(j).4.3 Fabricate ladder treads of steel checkered plate with leading edge turned down to form nosing.

6.5.3.1(2)(k) Railings and Handrails:

6.5.3.1.2.(k).1 Provide continuous raised steel rails along floor, corner guards and bumpers constructed of extra heavy duty steel angles and plates to protect Back-of-House corridors at loading dock floor level where pallet jack traffic is anticipated.

6.5.3.1.2.(k).2 Paint all steel rails, corner guards and bumpers in hazard yellow or as otherwise required by the Authority.

6.5.3.1.2.(k).3 Design freestanding handrails and guardrails to the requirements of the BCBC and CSA B651. Ensure handrails and guardrails connections are made of welded constructions unless noted otherwise.

6.5.3.1.2.(k).4 Design railing assemblies to withstand a minimum uniform load of 0.75 kN/m or a concentrated load of 1.0 kN at any point applied horizontally to top rail and a minimum of 1.5 kN/m applied vertically to top rail, with individual elements within the assembly designed for a concentrated load of 0.5 kN at any point in the element in accordance with the BCBC.

6.5.3.1(2)(l) Modular Ceiling System:

6.5.3.1.2.(l).1 Where required, provide a special, modular structural ceiling system, such as Unistrut, attached to main structure and designed to support all ceiling mounted equipment indicated in Appendix 1H [Equipment and Furniture].

6.5.3.1.2.(l).2 Refer to Section 11 76 00 for Fully Integrated Modular Diffuser System requirements.

6.5.3.1(2)(m) Provide stainless steel sinks and stainless steel assemblies, as follows:

6.5.3.1.2.(m).1 Sinks with removable under-counter shelf, backsplash and skirts with indented mount for taps;

6.5.3.1.2.(m).2 Over-counter shelves;

6.5.3.1.2.(m).3 Exhaust shrouds to span sinks;

6.5.3.1.2.(m).4 Vacuum canister holders;

6.5.3.1.2.(m).5 Dividers between counters or sinks;

6.5.3.1.2.(m).6 Removable sink covers; and

6.5.3.1.2.(m).7 Exhaust shrouds.

6.5.3.1(3) Quality Assurance

6.5.3.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design metal fabrication items that are required to resist live, dead, lateral, wind and seismic loads, and verify that the following will comply with the requirements of the BCBC:

6.5.3.1.3.(a).1 Provide materials with smooth, flat surfaces unless noted otherwise. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes;

6.5.3.1.3.(a).2 Ensure metal fabrications conform to Class 1, Class 2 and Class 3 as defined in NAAMM AMP 555, paragraph 8.3 of Section 8, Quality Control or Assurance and as follows:

(a).2.1 Class 1 Workmanship: Items that are exposed to view in finished spaces in completed Work;

(a).2.2 Class 2 Workmanship: Items that are exposed to view in Utility areas of the completed Work; and

(a).2.3 Class 3 Workmanship: Items that are concealed from view in the completed Work.

6.5.3.1.3.(a).3 Ensure metal stairs conform to NAAMM AMP 555, Section 1, Classification of Stairs, and Classes of Stairs as follows:

(a).3.1 Metal Pan Stairs Class Designation: Commercial Class; and

(a).3.2 Metal Grating Stairs Class Designation: Commercial Class.

6.5.3.1.3.(a).4 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work; and

6.5.3.1.3.(a).5 Perform stainless steel work in accordance with NAAMM, Code of Standard Practice for the Metal Industry, Workmanship, Class 1.

6.5.3.2 Part 2 Products

6.5.3.2(1) Materials

6.5.3.2(1)(a) General:

6.5.3.2.1.(a).1 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.

6.5.3.2.1.(a).2 Incorporate only metals that are free from defects which impair strength or durability, or which are visible.

6.5.3.2.1.(a).3 Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharp defined profiles.

6.5.3.2(1)(b) Steel:

6.5.3.2.1.(b).1 Structural Shapes, Plates, etc.: Conforming to CSA G40.20/G40.21, Grade 300W.

6.5.3.2.1.(b).2 Hollow Structural Sections: Conforming to CSA G40.20/G40.21, Grade 350W, Class H.

6.5.3.2.1.(b).3 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.

6.5.3.2.1.(b).4 Steel Pipe: Conforming to ASTM A53/A53M, Type E or S, Grade A or B, Standard Weight, Schedule 40 and Schedule 80, new material.

6.5.3.2.1.(b).5 Metal framing system:

(b).5.1 Provide metal framing system for mounting of mechanical and electrical panels and components at concrete block wall and concrete wall

substrates in Mechanical and Electrical Rooms.

(b).5.2 Galvanized steel framing system sized as required to suit intended application.

6.5.3.2.1.(b).6 Acceptable Products: Subject to conformance to requirements of this Section, provide metal framing system by Unistrut or alternative as approved by the Authority.

6.5.3.2(1)(c) Expanded Steel Mesh: 10 ga; flattened, expanded, carbon steel mesh. Minimum Weight: 1.12 lbs/ft².

6.5.3.2.1.(c).1 Acceptable Products: "1.330" SWD x 3.200" LWD, 11-1/2" - No.9" by Gerard Daniel Worldwide, or alternative as approved by the Authority.

6.5.3.2(1)(d) Welded Steel Wire Mesh: ASTM A510/A510M, 50 mm (2") x 50 mm (2") x 0.135" diameter, welded carbon steel wire mesh.

6.5.3.2(1)(e) Metal grating ladder/stair treads: Galvanized steel grating safety treads with checkered plate nosing

6.5.3.2(1)(f) Aluminum:

6.5.3.2.1.(f).1 Aluminum Extrusions: ASTM B221 extruded aluminum alloy AA-6063- T5 or T6.

6.5.3.2.1.(f).2 Aluminum Plate and Sheet: ASTM B209/B209M, Minimum thickness 3 mm (1/8"); of type and characteristics to match finished extrusions.

6.5.3.2(1)(g) Stainless steel materials:

6.5.3.2.1.(g).1 Sheet and plate: To ASTM A480/A480M, type 304 with No. 4 finish.

6.5.3.2.1.(g).2 Extrusions and shapes: To ASTM A276, type 304 with No. 4 finish.

6.5.3.2(1)(h) Modular ceiling system:

6.5.3.2.1.(h).1 Prefabricated structural support system designed to support all ceiling mounted equipment.

6.5.3.2.1.(h).2 Acceptable Products: Unistrut or alternative as approved by the Authority.

6.5.3.2(2) Accessories

6.5.3.2(2)(a) Welding Materials: Conforming to CSA W48 and CSA W59.

6.5.3.2(2)(b) Fasteners: Select fasteners for type, grade, and class required. Supply each type and size of bolt and nut of same manufacturer and of same lot.

6.5.3.2.2.(b).1 Provide Tamper Resistant fasteners at all exterior locations.

6.5.3.2.2.(b).2 High Strength Bolts: Supply bolts, nuts and washers conforming with ASTM F3125/F3125M. Supply each type and size of bolt and nut of same manufacture and of same lot.

6.5.3.2.2.(b).3 Stainless Steel Bolts and Nuts: To suit applications and conforming to ASTM F593.

6.5.3.2.2.(b).4 Machine Screws: Galvanized to ASTM A653/A653M, to suit applications.

6.5.3.2.2.(b).5 Common or Ordinary Bolts and Anchor Bolts: Unfinished bolts conforming with ASTM A307, Grade A, with hexagon heads and nuts where exposed in the finish work. Supply common bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm (1/4") beyond nut, without the use of washers.

6.5.3.2(2)(c) Sound deadening compound:

6.5.3.2.2.(c).1 Liquid sound damping compound.

6.5.3.2.2.(c).2 Acceptable Products: Aquaplas by Vibra-Sonic Control or alternative as approved by the Authority.

6.5.3.2(3) Fabrication

6.5.3.2(3)(a) Fabricate, fit and assemble work in shop where possible. Where shop fabrication is not possible, make trial assembly in shop.

6.5.3.2(3)(b) Provide exposed metal fastenings and accessories of same material, texture, colour and finish as base metal to which they are applied or fastened.

6.5.3.2(3)(c) Fabricate components carefully and accurately to enable erection within required limits so as not to induce excessive stresses, deflection, or distortion into the structure. Do not allow contact between dissimilar materials. Finished components to be rigid, free from discolouration and marks.

6.5.3.2(3)(d) Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of the same material, colour and finish as the base material on which they occur.

6.5.3.2(3)(e) Fabricate each item of work of this Section in accordance with following general requirements:

- 6.5.3.2.3.(e).1 members square and straight;
- 6.5.3.2.3.(e).2 members plumb and true;
- 6.5.3.2.3.(e).3 joints accurately and tightly fitted;
- 6.5.3.2.3.(e).4 intersecting members in true, flush planes;
- 6.5.3.2.3.(e).5 fasteners concealed; and
- 6.5.3.2.3.(e).6 steel connections.

6.5.3.2(3)(f) Welding:

- 6.5.3.2.3.(f).1 Weld connections unless noted otherwise.
- 6.5.3.2.3.(f).2 Should there be, in the opinion of Consultant or Inspection Company, doubt as to adequacy of welds, they will be tested for efficiency and any work not meeting Standards be removed and replaced with new work satisfactory to Consultant.
- 6.5.3.2.3.(f).3 Carry out welding in accordance with following standards:
  - (f).3.1 CSA W48 - for Electrodes (If rods are used, only coated rods are allowed);
  - (f).3.2 CSA W59 - for design of connections and workmanship; and
  - (f).3.3 CSA W117.2 - for safety.
- 6.5.3.2.3.(f).4 Thoroughly clean welded joints and steel exposed for a sufficient space to properly perform welding operation. Ensure welds exposed to view and finish painted are continuous and ground smooth.

6.5.3.2(3)(g) Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

6.5.3.2(3)(h) Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

6.5.3.2(3)(i) Finishes, general:

- 6.5.3.2.3.(i).1 Primers and paints of miscellaneous metals will conform to MPI Architectural Specification Standards Manual.

6.5.3.2.3.(i).2 Exterior elements will be hot-dipped galvanized with 600 g/m2 to CSA G164 or and, where visible to the public, Patients and Staff, painted with a quality polyurethane finish coating system as specified in Section 09 91 00.

6.5.3.2(3)(j) Galvanize following members:

6.5.3.2.3.(j).1 members exposed to elements in final location (exterior steel);

6.5.3.2.3.(j).2 members exposed to moisture in final location (interior or exterior);

6.5.3.2.3.(j).3 members in service locations

6.5.3.2.3.(j).4 members embedded on exterior side of exterior walls; and

6.5.3.2.3.(j).5 members embedded in concrete.

6.5.3.2(3)(k) Fabricate countertops, backsplashes and aprons out of one piece of stainless steel. Counter and sink assemblies welded into single units without seams or joints.

6.5.3.2(3)(l) Form integral sinks with all-welded rounded corners, seamless construction.

6.5.3.2(3)(m) Slope tops for sinks and adjacent drain boards to sinks.

6.5.3.2(3)(n) Provide sinks with drain outlets with removable stainless steel strainers.

6.5.3.2(3)(o) Marine finished front edge to countertops.

6.5.3.2(3)(p) Apply sound deadening to underside of counters and backsplashes.

6.5.3.2(3)(q) Cove internal corners of sheet metal to 12 mm radius.

6.5.3.2(3)(r) Hem exposed edges a minimum of 12 mm.

6.5.3.2(3)(s) Finish exposed edges and surfaces in same manner for working surface of countertop material.

6.5.3.2(3)(t) Joints: field welded and mechanical watertight.

6.5.3.2(3)(u) Corners welded, ground, polished and crevice-free.

6.5.3.2(3)(v) Grind exposed welds flush and smooth, burnish to match adjacent surfaces.

6.5.3.2(3)(w) Polish all joints of stainless steel to match #4 finish.

6.5.3.2(3)(x) Align end panels, top rails, bottoms and vertical posts, at intersections in same plane, without overlap.

6.5.3.2(3)(y) Connect steel reinforced tops to cabinets with bolts.

6.5.3.3 Part 3 Execution

6.5.3.3(1) Not applicable.

6.5.4 Section 05 73 13 – Glazed Decorative Metal Railings

6.5.4.1 Part 1 General

6.5.4.1(1) References

6.5.4.1(1)(a) AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.

6.5.4.1(1)(b) ANSI Z97.1, Safety Glazing Materials Used in Buildings.

6.5.4.1(1)(c) ASTM A312/A312M, Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

6.5.4.1(1)(d) ASTM A554, Specification for Welded Stainless Steel Mechanical Tubing.

6.5.4.1(1)(e) ASTM A666, Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

6.5.4.1(1)(f) ASTM A781/A781M, Standard Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use.

6.5.4.1(1)(g) ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.

6.5.4.1(1)(h) ASTM B209/B209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate.

6.5.4.1(1)(i) ASTM B210/B210M, Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

6.5.4.1(1)(j) ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

6.5.4.1(1)(k) ASTM B247, Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings.

6.5.4.1(1)(l) ASTM B429/A429M, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

6.5.4.1(1)(m) ASTM C920, Specification for Elastomeric Joint Sealants.

6.5.4.1(1)(n) ASTM E1300, Standard Practice for Determining Load Resistance of Glass in Building.

6.5.4.1(1)(o) BS 14179, Glass in Building.

6.5.4.1(1)(p) CSA A500, Building Guards.

6.5.4.1(1)(q) CAN/CGSB 12.1, Safety Glazing.

6.5.4.1(1)(r) CAN/CGSB 12.20-M, Structural Design of Glass for Buildings.

6.5.4.1(1)(s) GANA, Glass Association of North America, Glazing Manual.

6.5.4.1(2) Performance Requirements

6.5.4.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.5.4.1(2)(b) Design glass railing, balustrade and guard requirements to BCBC and to AHJ; whichever is more stringent.

6.5.4.1(2)(c) Design glazed decorative metal railings to withstand within acceptable deflection limitations, specified tolerances in vertical and horizontal planes, its own weight, forces applied by movements of building structure and attached adjacent components.

6.5.4.1(2)(d) Design permanent metal railing system and rails in accordance with requirements of CSA A500.

6.5.4.1(2)(e) Design glass and glazing to requirements as specified herein, CAN/CGSB-12.20-M, ASTM E1300, the BCBC and regulations of AHJ. In case of conflict, comply with most stringent requirements.

6.5.4.1(2)(f) Where applicable, ensure tempered glass is heat soaked in accordance with BS EN 14179

6.5.4.1(2)(g) Work to conform with GANA - Glazing Manual; glazing installation methods.

6.5.4.1(2)(h) For human impact load resistance, provide glazing materials listed and labeled as complying with testing requirements of ANSI Z97.1 - Class A.

6.5.4.1(2)(i) Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies with a minimum safety factor of 2.0.

6.5.4.1(3) Quality Assurance

6.5.4.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design glazed decorative guardrails, and verify that the following will comply with the requirements of the BCBC:

6.5.4.1.3.(a).1 Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials;

6.5.4.1.3.(a).2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience; and

6.5.4.1.3.(a).3 Installer Qualifications: Company specializing in installation of the Products specified in this section with minimum five years documented experience.

6.5.4.2 Part 2 Products

6.5.4.2(1) Materials

6.5.4.2(1)(a) Aluminum: Alloy and temper recommended by aluminum producer and finisher for use and finish indicated, and with not less than the strength and durability of the alloy and temper designated below:

6.5.4.2.1.(a).1 Extruded Bar and Tube: ASTM B221, alloy 6063-T5/T52.

6.5.4.2.1.(a).2 Extruded Structural Pipe and Tube: ASTM B429/B429M, alloy 6063-T6.

6.5.4.2.1.(a).3 Drawn Seamless Tube: ASTM B210/B210M, alloy 6063-T832.

6.5.4.2.1.(a).4 Plate and Sheet: ASTM B209/B209M, alloy 6061-T6.

6.5.4.2.1.(a).5 Die and Hand Forgings: ASTM B247, alloy 6061-T6.

6.5.4.2.1.(a).6 Castings: ASTM B26/B26M, alloy A356-T6.

6.5.4.2(1)(b) Aluminum Sheet: ASTM B209/B209M, Minimum thickness 3 mm (1/8") of type and characteristics to match finished extrusions; sheet which is not exposed will be Utility Aluminum mill finished; for intricate forming with decorative finishes use AA 1100 and for siding and exposed panels use AA-3003 with specified finish.

6.5.4.2(1)(c) Stainless steel Shoes, Caps and Upper Channel Frame:

6.5.4.2.1.(c).1 Tubing: ASTM A554, Grade MT, Type 316.

6.5.4.2.1.(c).2 Pipe: ASTM A312/A312M, Grade TP, Type 316.

6.5.4.2.1.(c).3 Castings: ASTM A781/A781M.

6.5.4.2.1.(c).4 Plate: ASTM A666, Type 316.

6.5.4.2.1.(c).5 Grain will run in one direction in any one assembly, and generally horizontal.

6.5.4.2(1)(d) Fasteners, bolts, screws and anchors: Stainless Steel Type 316 fasteners unless noted otherwise. Provide galvanic corrosion protection methods to ensure dissimilar metals are not in direct contact with each other.

6.5.4.2(1)(e) Glass:

6.5.4.2.1.(e).1 Tempered glass: CAN/CGSB-12.1, Type 2, Class B, Category II, clear.

6.5.4.2.1.(e).2 Thickness of glass: As required to sustain anticipated loads.

6.5.4.2.1.(e).3 Glazing gasket: EPDM roll-in glazing gasket.

6.5.4.2.1.(e).4 Frame sealant: Type as recommended by the glazed partition work manufacturer.

6.5.4.2.1.(e).5 Glazed partition work sealant: ASTM C920; Single-Component, silicone sealant. Provide joint backing compatible with joint sealant.

6.5.4.2.1.(e).6 Additional materials for installation of glass in metal railings: Wet seal tape, preformed dry gasket, primers or surface conditioners and cleaning solvents in accordance with decorative system manufacturers' recommendations and will be mutually compatible.

6.5.4.2(2) Finishes

6.5.4.2(2)(a) Aluminum: Anodized Aluminum Finish: Clear anodized in accordance with AAMA 611, Aluminum Association Finish Designation AA-M12C22A31, Non-Specular as fabricated- Medium Matte-Clear -

Architectural Class II - 0.4 to 0.7 Mil thick for interior exposure.

6.5.4.2(2)(b) Stainless Steel: Provide Type 316 AISI #4 finish for stainless steel exposed in finished work. Ensure grain runs in single generally horizontal direction in any one assembly.

6.5.4.2(3) Fabrication

6.5.4.2(3)(a) Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

6.5.4.2(3)(b) Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply frame sealant at joints for weatherproof seams.

6.5.4.2(3)(c) Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

6.5.4.2(3)(d) Do not expose manufacturer's identification labels on glazed assemblies.

6.5.4.3 Part 3 Execution

6.5.4.3(1) Not applicable.

6.6 Wood, Plastics and Composites (Division 6)

6.6.1 Section 06 10 00 – Rough Carpentry

6.6.1.1 Part 1 General

6.6.1.1(1) References

6.6.1.1(1)(a) APA – The Engineered Wood Association (formerly American Plywood Association).

6.6.1.1(1)(b) ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6.6.1.1(1)(c) ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

6.6.1.1(1)(d) ASTM D245, Standard Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber.

6.6.1.1(1)(e) ASTM F1667, Specification for Driven Fasteners: Nails, Spikes, and Staples.

6.6.1.1(1)(f) CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

6.6.1.1(1)(g) CSA O121, Douglas Fir Plywood.

6.6.1.1(1)(h) CSA O141, Softwood Lumber.

6.6.1.1(1)(i) CSA O151, Canadian Softwood Plywood.

6.6.1.1(1)(j) CAN/CSA O80 Series, Wood Preservation.

6.6.1.1(1)(k) NLGA, National Lumber Grades Authority.

6.6.1.1(1)(l) CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

6.6.1.1(2) Performance Requirements

6.6.1.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.6.1.1(2)(b) Provide all rough carpentry, wood backing materials, backing boards for mechanical rooms and electrical/Communications Rooms, roof sheathing, copings, cant strips, finish carpentry and architectural woodwork, including exterior fascia’s, cabinets, casework, frames, panelling, ceiling battens, trim, installation of doors and hardware, and other wood-related products and applications as required.

6.6.1.1(2)(c) Provide wood, plastics and composites to support functionality as defined in Appendix 1A [Clinical Specifications and Functional Space Requirements] and as required by the Authority for the operation of the Facility.

6.6.1.1(2)(d) Do not use products containing added urea formaldehyde in the Facility.

6.6.1.1(2)(e) Use pressure treated wood for exterior exposed wood.

6.6.1.1(2)(f) Dimensions of lumber will conform to dressed sizes specified in CSA O141 unless actual dimensions are noted otherwise or specified.

6.6.1.1(2)(g) Each piece of pressure treated lumber and fire retardant treated lumber will be shop marked with the pressure treatment brand and ULC monogram respectively, in accordance with CAN/CSA O80 Series.

6.6.1.1(2)(h) Dimensions of lumber will conform to dressed sizes specified in CSA O141 unless actual dimensions are noted otherwise or specified.

6.6.1.1(2)(i) Dimensional references to lumber on Drawings and in Specifications are to nominal sizes unless actual dimensions are indicated. Such actual dimensions will be dry size.

6.6.1.1(2)(j) Use pressure treated wood for all exterior work.

6.6.1.1(2)(k) Do not use products containing added urea formaldehyde.

6.6.1.1(2)(l) Use fire-retardant treated plywood and wood blocking framing for mechanical control panel boards in Mechanical Rooms and electrical panel boards in Electrical Rooms at gypsum board wall assemblies. Such applications are to be sealed with a minimum clear coat or painted with a compatible paint system. Refer to Section 05 50 00 for metal framing system upon which mechanical and electrical panels and components are to be mounted in Mechanical and Electrical Rooms with concrete block wall or concrete wall assemblies.

6.6.1.1(2)(m) Visual Characteristics: measure knots, checks, shakes and slope of grain in visually graded lumber in accordance with ASTM D245 with exceptions as noted under NLGA 120d.

6.6.1.1(3) Quality Assurance

6.6.1.1(3)(a) Lumber Identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board conforming to the Standard Grading Rules for Canadian Lumber published by the National Lumber Grades Authority.

6.6.1.1(3)(b) Plywood Grading Agency: Certified by APA The Engineered Wood Association.

6.6.1.1(3)(c) Preservative Pressure-Treated and Fire-Retardant-Treated Wood and Plywood identification: by grade

mark in accordance with the Canadian Wood Preservers Bureau and applicable ULC standards.

6.6.1.1(3)(d) Use CLS grade marked lumber conforming to the Standard Grading Rules for Canadian Lumber published by the National Lumber Grades Authority.

6.6.1.2 Part 2 Products

6.6.1.2(1) Wood

6.6.1.2(1)(a) Concealed Framing Lumber: No. 2 White Pine, No. 2 Red Pine, or No. 1 Construction S-P-F, kiln dried, free from sap, shakes, splits, knots, and other defects.

6.6.1.2(1)(b) Grounds, Nailing Strips and Blocking: No. 2 White Pine, No. 2 Red Pine, or No. 1 Construction S-P-F, kiln dried, free from sap, shakes, splits, knots, and other defects.

6.6.1.2(1)(c) Plywood Panels:

6.6.1.2.1.(c).1 Exterior Plywood: 19 mm (3/4”) thick, unsanded sheathing grade Douglas Fir Plywood (DFP), conforming to CSA O121.

6.6.1.2.1.(c).2 Interior Locations: minimum 19 mm (3/4”) thick, unless noted otherwise.

6.6.1.2(1)(d) Canadian softwood plywood: Conforming to CSA O151; G1S or G2S.

6.6.1.2(2) Hardware

6.6.1.2(2)(a) Nails and staples: to ASTM F1667; galvanized to CSA G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

6.6.1.2(2)(b) Bolts, nuts, washers, blind fasteners, lags and screws: Size and type to suit application.

6.6.1.2(2)(c) Exterior locations and treated lumber: Stainless steel nails and stainless steel fasteners, type 316.

6.6.1.2(2)(d) Corrosion-resistant treatments: Interior high humidity locations and hardware in contact with wood preservative treatments: hot dip galvanized in accordance with ASTM A123/A123M:

6.6.1.2.2.(d).1 Minimum weight of zinc coating: 600 g/m2 (185 ounces per sq. ft.) in accordance with ASTM A153/A153M;

6.6.1.2.2.(d).2 Do not use electroplated galvanized fasteners in contact with wood preservatives.

6.6.1.2(3) Treatments

6.6.1.2(3)(a) Preservative treatments:

6.6.1.2.3.(a).1 Provide chemical treatment acceptable to AHJ and containing no arsenic or chromium from one of the following manufacturers:

(a).1.1 Timber Specialties Co;

(a).1.2 Wolmanized Wood;

(a).1.3 Or alternative as approved by the Authority.

6.6.1.2(3)(b) Fire-Retardant-Treated Wood and Plywood:

6.6.1.2.3.(b).1 Provide chemical treatment acceptable to AHJ and containing no arsenic or chromium from one of the following manufacturers:

(b).1.1 Dricon;

(b).1.2 FireFree;

(b).1.3 Or alternative as approved by the Authority.

6.6.1.2.3.(b).2 Surface Burning Characteristics: Conforming to CAN/ULC S102 and UL FR-S rating.

(b).2.1 Flame Spread: ≤ 150.

6.6.1.2.3.(b).3 Do not resurface or rip fire treated wood if it affects the ULC label.

6.6.1.2(3)(c) For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colourants, or otherwise adversely affect finishes.

6.6.1.3 Part 3 Execution

6.6.1.3(1) Not applicable

6.6.2 Section 06 40 00 – Architectural Woodwork

6.6.2.1 Part 1 General

6.6.2.1(1) References

6.6.2.1(1)(a) ANSI/BHMA A156.9, Cabinet Hardware.

6.6.2.1(1)(b) ANSI/NEMA LD 3, High-Pressure Decorative Laminates.

6.6.2.1(1)(c) ASTM A240/A240M, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet,

and Strip for Pressure Vessels and for General Applications.

6.6.2.1(1)(d) AWMAC, Architectural Woodwork Manufacturers Association of Canada.

6.6.2.1(1)(e) CHPVA, Canadian Hardwood Plywood and Veneer Association.

6.6.2.1(1)(f) DHI, Door Hardware Institute.

6.6.2.1(1)(g) NAAWS, North American Architectural Woodwork Standards.

6.6.2.1(1)(h) NAPRA, National Association of Pharmacy Regulatory Authorities.

6.6.2.1(1)(i) USP 797, United States Pharmacopeia; Pharmaceutical Compounding - Sterile Preparations.

6.6.2.1(1)(j) USP 800, United States Pharmacopeia; Hazardous Drugs - Handling in Healthcare Settings.

6.6.2.1(2) Requirements

6.6.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.6.2.1(2)(b) Material, workmanship, and installation will meet or exceed recommendations and requirements of AWMAC’s Standards and NAAWS.

6.6.2.1(2)(c) References in this section to Premium and Custom Grades will be as defined by AWMAC and NAAWS.

6.6.2.1(2)(d) The Design-Builder will provide Millwork and casework for the Facility as required to meet the Authority’s functional and operational requirements as described in this Schedule including Appendix 1A [Clinical Specifications and Functional Space Requirements].

6.6.2.1(2)(e) The Design-Builder will provide Millwork and casework according to the category of each space listed Appendix 1B [Minimum Room Requirements].

6.6.2.1(2)(f) The Design-Builder will provide Millwork and casework in the quantities, dimensions, design and layout, including heights, motorized height adjustability, spacing of drawers, doors, cupboards

	and openings, to meet the functional requirements of the Authority including Section 5.14 Infection Control and Section 5.15.3 Ergonomic Design.
6.6.2.1(2)(g)	Where upper and/or lower cupboards are indicated on Appendix 1B [Minimum Room Requirements], provide the same length of cupboards to match the minimum Millwork length.
6.6.2.1(2)(h)	The category will be calculated based on the amount of Millwork or casework in the space expressed as a percentage of the total NSM program area of that space.
6.6.2.1(2)(i)	Regardless of whether the Millwork or casework is floor mounted or wall-mounted, the amount will be calculated as the horizontal area footprint projected onto the total floor area. Refer to Millwork and Specialty Casework Area Methodology Diagram, Attachment 1 to Appendix 1B [Minimum Room Requirements].
6.6.2.1(2)(j)	The category and minimum length dimensions provided in Appendix 1B [Minimum Room Requirements] are intended to describe the minimum requirements and will be increased as required to accommodate the Equipment listed in Appendix 1H [Equipment and Furniture] and to accommodate the functionality requirements of the Authority as described in Appendix 1A [Clinical Specifications and Functional Space Requirements].
6.6.2.1(2)(k)	The greater quantity requirement between the category and minimum length dimensions provided in Appendix 1B [Minimum Room Requirements] will govern.
6.6.2.1(2)(l)	Refer to Section 6.11.2 Food Services and Equipment section for Millwork requirements specific to Food Services.
6.6.2.1(2)(m)	The Design-Builder may provide specialty casework to satisfy the requirements of Millwork provided it meets the functionality requirements of Authority.
6.6.2.1(2)(n)	Where specialty casework has been identified in Appendix 1B [Minimum Room Requirements], the Design-Builder will provide specialty casework, as

required for proper function and activities occurring in that room or area; refer to Section 6.12.2.

6.6.2.1(2)(o) All woodwork panels will be constructed with plywood substrate unless noted otherwise. Do not use fibreboard or particle board. MDF materials will only be used for specific applications if approved by the Authority.

6.6.2.1(2)(p) Cabinets, general:

- 6.6.2.1.2.(p).1 All cabinets to be flush overlay construction.
- 6.6.2.1.2.(p).2 At all upper cabinets or cupboards; provide either GB bulkhead or matching panels extended full height to underside of the ceiling to close in the top of the unit.
- 6.6.2.1.2.(p).3 Provide upper and/or lower cupboards designed to fit binders stacked vertically.
- 6.6.2.1.2.(p).4 Provide upper and/or lower cupboards with sliding doors where required.

6.6.2.1(2)(q) The Design-Builder will incorporate multifunctional printers and scanners into the Millwork design by providing counters placed at an ergonomically appropriate height to set the printer such that Staff can easily reach the device without use of steps.

6.6.2.1(2)(r) The Design-Builder will provide downtime chart storage at all Care Team Stations. The downtime chart storage will consist of shelving units comprised of multiple rows of shelves designed to store charts. Refer to Authority's Ergonomic Standard for Design of Storage, Shelving and Racks for maximum shelving height.

6.6.2.1(2)(s) In addition to the requirements set out in Appendix 1B [Minimum Room Requirements], the Design-Builder will provide workbenches in the locations described in Appendix 1A [Clinical Specifications and Functional Space Requirements], Appendix 1H [Equipment and Furniture] and where otherwise required by the Authority to meet its functional Requirements.

6.6.2.1(2)(t) Bottom sink cabinet boxes are to be used minimally in Millwork design and avoided wherever possible. Where incorporated in design, such cabinet boxes are to be fabricated from solid acrylic polymer material to avoid damage due to contact with water.

6.6.2.1(2)(u) Use minimum 19 mm (3/4”) plywood substrate for countertops. Do not use fibreboard or particle board. Where appropriate, provide support brackets (knee bracing) to support countertops throughout the Facility. Do not support countertops with legs extending to the floor.

6.6.2.1(2)(v) Plastic laminate work, joints:

- 6.6.2.1.2.(v).1 Place jointing at logical locations in intended Millwork item and to meet overall aesthetic intent of the Authority.
- 6.6.2.1.2.(v).2 Minimize joints in plastic laminate work.
- 6.6.2.1.2.(v).3 Do not install joints in plastic laminate work in less than 2400 mm o.c.
- 6.6.2.1.2.(v).4 Locate joints minimum 610 mm from cut-outs.
- 6.6.2.1.2.(v).5 Offset core and plastic laminate facing joints.

6.6.2.1(2)(w) Edge banding:

- 6.6.2.1.2.(w).1 All edges, whether exposed or not are to be edge banded.
- 6.6.2.1.2.(w).2 All cabinet door, drawer and laminate counter edges will have applied a minimum 3 mm PVC or ABS edge banding strip, heat applied except in locations as follows:
  - (w).2.1 Clean/Sterile Rooms and Laboratories;
  - (w).2.2 Procedure Rooms;
  - (w).2.3 Commercial Kitchens, Coolers and Freezers;
  - (w).2.4 Wet Rooms (Shower/Tub/Pool); and
  - (w).2.5 Janitor/Utility/Soiled Rooms.
- 6.6.2.1.2.(w).3 All PVC or ABS edging to match tone of adjacent woodwork.
- 6.6.2.1.2.(w).4 No high-pressure plastic laminate (HPL) edges will be permitted.

6.6.2.1(2)(x) Adhesives to be non-toxic, low VOC, non-solvent glue to comply with NAAWS Quality Standards Manual, Canadian ‘Eco-Logo’ program, and the applicable LEED credits.

6.6.2.1(2)(y) Design Woodwork to have no exposed sharp edges or corners. Provide minimum 25 mm radiused corner to countertops.

6.6.2.1(2)(z) Provide a Millwork base equal to the height of the flash cove floor base for flash cove flooring to return up at all floor mounted lower cabinet locations.

6.6.2.1(2)(aa) Provide built-in valance lighting underneath upper cupboards, except in locations where ceiling pot lights are determined to be acceptable to the Authority.

6.6.2.1(2)(bb) Seismic Performance:

6.6.2.1.2.(bb).1 Design work of this Section to withstand seismic motions determined in accordance with the requirements of BCBC.

6.6.2.1.2.(bb).2 Design all cabinets and shelving over 1.2 m high or where units are likely to be a hazard from overturning with seismic anchorage.

6.6.2.1(2)(cc) Non-cabinet supported counters:

6.6.2.1.2.(cc).1 Provide engineered framing support steel for non-cabinet supported counters, consisting of a cantilevered horizontal angle welded to a vertical angle, which is welded to a bottom plate; centred on plate and screwed to steel stud at 800 mm o.c. maximum.

6.6.2.1.2.(cc).2 Gable supports will not be accepted.

6.6.2.1(2)(dd) Do not use products containing added urea formaldehyde in the Facility.

6.6.2.1(3) Coordination with Services and Systems

6.6.2.1(3)(a) Incorporate all required mechanical, electrical and communication services into the Millwork, systems furniture and specialty casework so that wires, cords, vents and pipes are hidden from view.

6.6.2.1(3)(b) The Design-Builder is responsible for coordination of all fixtures, including plumbing, to be provided.

6.6.2.1(3)(c) For locations where countertops, workbenches or workstations are flush to the wall, provisions for cord management through and under the work surface will be provided.

6.6.2.1(3)(d) Provide access panels to all services to allow for future adjustment.

6.6.2.1(3)(e) Coordinate with Equipment indicated in Appendix 1H [Equipment and Furniture] and Appendix 1I [Food Services Equipment List].

6.6.2.1(4) Hardware Requirements

6.6.2.1(4)(a) All Millwork, Systems Furniture and specialty casework to be lockable. Keying will be as determined in consultation with the Authority.

6.6.2.1(4)(b) All hardware to be stainless steel of durable quality to meet ANSI/BHMA, A156.9.

6.6.2.1(5) Solid Polymer Fabricated Surface Requirements

6.6.2.1(5)(a) Provide solid polymer fabricated surfacing for all counters required in Appendix 1B [Minimum Room Requirements], that incorporate lavatory sinks, Utility sinks and kitchen sinks as described in Appendix 1B [Minimum Room Requirements], with the exception of where counters are required to be stainless steel such as Soiled Utility rooms.

6.6.2.1(5)(b) Provide countertop vanities with integral lavatory sinks consisting of solid polymer fabricated surfacing for washrooms (excluding ensuite washrooms), locker rooms and change rooms; refer to Appendix 1B [Minimum Room Requirements] plumbing remarks for additional information and quantities.

6.6.2.1(5)(c) For Pharmacy areas, countertops will be solid polymer fabricated with integral sinks, which will provide long-term durability and resists chipping and staining from medical agents expected to be used.

6.6.2.1(5)(d) For the laboratory pathology areas such as Frozen Section, provide laboratory grade solid surfacing acrylic resin counters.

6.6.2.1(6) Hardwood Countertops and Work Surface Requirements

6.6.2.1(6)(a) Provide butcher block counter tops for the hardwood work surfaces where required in Appendix 1B [Minimum Room Requirements] and wherever otherwise required by the Authority to meet their functional requirements.

6.6.2.2 Recycling Accommodation Requirements

6.6.2.2(1) Provide recycling accommodation as follows:

6.6.2.2(1)(a) In accordance with GreenCare Waste Management Space Design Guidelines and Recycling Equipment Purchasing Catalogues;

6.6.2.2(1)(b) Freestanding 5 opening unit systems at the following locations:

6.6.2.2.1.(b).1 All Staff lounges, Videoconference/Seminar Room and meeting rooms.

6.6.2.2(1)(c) Freestanding 3 opening unit systems at the following locations:

6.6.2.2.1.(c).1 All waiting rooms, waiting areas and at public entrances to the Facility.

6.6.2.2(1)(d) Provide changeable messaging display on each recycling accommodation waste disposal and bin;

6.6.2.2(1)(e) Provide access to enable ease of servicing;

6.6.2.2(1)(f) Provide interchangeable inserts to create a recycling centre that fits the needs of the Authority;

6.6.2.2(1)(g) Provide shaped inserts and recycling icons that provide clear direction for disposal and recycling;

6.6.2.2(1)(h) Meet the following minimum size requirements:

6.6.2.2.1.(h).1 5-opening will be 36″H x 60″W x 25″D; and

6.6.2.2.1.(h).2 3-opening will be 36"H x 36"W x 18"D.

6.6.2.2(1)(i) All recycling accommodations will be accessible to Persons with Disabilities; and

6.6.2.2(1)(j) Recycling accommodation will be compatible with standard recycling bins.

6.6.2.2(2) Pneumatic Tube Station Requirements

6.6.2.2(2)(a) The Design-Builder to provide directly adjacent to the PTS a dedicated standing height Millwork countertop with deep drawers below and storage for carriers. The exact number of carriers will be as determined in consultation with the Authority. Refer to Appendix 1B [Minimum Room Requirements] for Millwork requirements at pneumatic tube stations.

6.6.2.2(3) Patient Wardrobe Requirements

6.6.2.2(3)(a) The Design-Builder will provide Patient wardrobes in all Patient Rooms including:

6.6.2.2.3.(a).1 Patient Room – Private;

6.6.2.2.3.(a).2 Patient Room – Double;

6.6.2.2.3.(a).3 Patient Room - AIR – Bariatric;

6.6.2.2.3.(a).4 Patient Room - AIR – Bariatric - HAU;

6.6.2.2.3.(a).5 Patient Room - Private - Shielded; and

6.6.2.2.3.(a).6 Patient Room - Private – HAU.

6.6.2.2(3)(b) Provide two (2) Patient wardrobes in double occupancy rooms.

6.6.2.2(3)(c) Design Patient wardrobe to meet the following criteria:

6.6.2.2.3.(c).1 Have a sloped top to prevent objects from being stored on top of the wardrobe and prevent dust collection;

6.6.2.2.3.(c).2 Have a combination of cupboards, compartments, drawers and a clothing rod for storage of personal items;

6.6.2.2.3.(c).3 Have locks on all cupboards and drawers;

6.6.2.2.3.(c).4 Have light supplied from a lighting fixture located inside the wardrobe when room lighting is not positioned to provide 50 Lux in the wardrobe with a person standing in front of it;

6.6.2.2.3.(c).5 Be Ligature Resistant; and

6.6.2.2.3.(c).6 Have minimum interior dimensions of 610 mm in width, 535 mm in depth, and 2.135 m in overall height.

6.6.2.3 Quality Assurance

6.6.2.3(1) Qualifications

6.6.2.3(1)(a) Manufacturer will be a firm specializing in the fabrication of architectural woodwork with a satisfactory record of performance on projects of comparable size and quality.

6.6.2.3(1)(b) Installer Qualifications: A firm specializing in Millwork installation with a satisfactory record of performance on projects of comparable size and quality and approved by the fabricator.

6.6.2.3(2) Standards

6.6.2.3(2)(a) Remove and replace architectural woodwork which does not conform to the NAAWS or as amended by this Section.

6.6.2.3(3) Inspection

6.6.2.3(3)(a) The Design-Builder is to engage AWMAC and pay for the Guarantee and Inspection Service (GIS).

6.6.2.3(4) Guarantee

6.6.2.3(4)(a) If the manufacturer is a member of AWMAC, obtain the two (2) year AWMAC Guarantee.

6.6.2.3(4)(b) If the manufacturer is not a member of AWMAC, provide a maintenance bond in lieu of the AWMAC Guarantee.

6.6.2.4 Part 2 Products

6.6.2.4(1) Materials

6.6.2.4(1)(a) General: Do not use products containing added urea formaldehyde.

6.6.2.4(2) Wood Materials

6.6.2.4(2)(a) Concealed framing lumber and plywood:

6.6.2.4.2.(a).1 To CAN/CSA O141, NLGA and NAAWS Custom Grade, S4S, average moisture content 7% +/- 2% at installation.

6.6.2.4.2.(a).2 Softwood plywood: CSA O151-M; 19 mm unless noted otherwise (G2S).

6.6.2.4(2)(b) Hardwood Lumber: NAAWS Section 3 - Lumber requirements. Maple species, of quality suitable for transparent finish.

6.6.2.4(2)(c) Softwood Lumber: To NAAWS Section 3 - Lumber requirements.

6.6.2.4(2)(d) Hardwood Plywood: CHPVA. Select white birch or maple face species.

6.6.2.4(3) Laminate and Edge Banding Materials

6.6.2.4(3)(a) Plastic Laminate Sheet and Liner Sheets, Cabinets:

6.6.2.4.3.(a).1 Flatwork face sheet: ANSI/NEMA LD 3, 1.2 mm thick, heavy wear resistance.

6.6.2.4.3.(a).2 Vertical interior face sheets: 0.8 mm thick.

6.6.2.4.3.(a).3 Backing sheet: Thickness to match face sheet, high pressure laminate, manufactured by same manufacturer as face sheet.

6.6.2.4.3.(a).4 Edge banding: Cabinet doors and drawers to be complete with minimum 3 mm thick PVC or ABS edge banding.

6.6.2.4(3)(b) Plastic Laminate Countertop:

6.6.2.4.3.(b).1 ANSI/NEMA LD 3, Grade HGS, high pressure laminate, post-formed with shaped nosing where indicated.

6.6.2.4.3.(b).2 Edge banding: Provide minimum 3 mm thick PVC or ABS edge banding treatment.

6.6.2.4(3)(c) Butcher block counter tops: 50 mm (2 inch) thick solid laminated wood top with 19 mm (3/4 inch) plywood core.

6.6.2.4(3)(d) Stainless Steel Sheet: ASTM A240/A240M, Type 316 alloy, minimum 1.2 mm (18 gauge) thick, with No 4 Satin finish; free of buckles, pits, warps and imperfections.

6.6.2.4(4) Solid Surfacing

6.6.2.4(4)(a) Acceptable Products:

6.6.2.4.4.(a).1 Avonite Surfaces by Aristech Surfaces LLC.

6.6.2.4.4.(a).2 Corian by DuPont de Nemours, Inc.

6.6.2.4.4.(a).3 Or alternative as approved by the Authority.

6.6.2.4(4)(b) Solid acrylic polymer surfacing:

6.6.2.4.4.(b).1 Fabricated surfacing consisting of reacted monomers and resins, mineral fillers and pigments manufactured in sheets of 13 mm nominal thickness.

6.6.2.4.4.(b).2 Integral sinks:

(b).2.1 Provide countertops with integral, seamless coved side and backsplashes.

(b).2.2 Provide integral bowls with offset overflow drains to accommodate installation of Millwork panels with clearance for Persons with Disabilities.

6.6.2.4(5) Adhesives

6.6.2.4(5)(a) Adhesives to be non-toxic, low VOC, non-solvent glue to comply with NAAWS Quality Standards Manual, Canadian ‘Eco-Logo’ program, and the applicable LEED credits.

6.6.2.4(6) Hardware

6.6.2.4(6)(a) Manufacturers: Subject to conformance to requirements of this Section, provide cabinet and drawer hardware by one of the following:

6.6.2.4.6.(a).1 Blum Canada Limited.

6.6.2.4.6.(a).2 Hafele Canada Inc.

6.6.2.4.6.(a).3 Richelieu Hardware Ltd.

6.6.2.4.6.(a).4 Or alternative as approved by the Authority.

6.6.2.4(6)(b) All hardware to be durable quality to meet ANSI/BHMA A156.9, grade 1. Pulls and handles will be constructed of stainless steel.

6.6.2.4(7) Fabrication

6.6.2.4(7)(a) Fabricate components in shop to greatest extent practical, to size and configurations required; ease edges of surfacing materials.

6.6.2.4(7)(b) Fabricate units to permit entry into building and rooms where required. Check entrance dimensions. Construct large units for separation for delivery and join at the Project Site with concealed cam lock fasteners. Knock-down joint locations will be subject to review and approval by Finish Carpentry and Millwork Inspector.

6.6.2.4(7)(c) Form joints using manufacturer's standard joint adhesive, without voids and inconspicuous in appearance.

6.6.2.4(8) Finishing

6.6.2.4(8)(a) Stain, Varnish and Finishing Materials: As selected by the Authority.

6.6.2.5 Part 3 Execution

6.6.2.5(1) Not applicable.

6.7 Thermal and Moisture Protection (Division 7)

6.7.1 Section 07 11 51 – Liquid Applied Foundation Waterproofing

6.7.1.1 Part 1 General

6.7.1.1(1) Summary

6.7.1.1(1)(a) Liquid membrane products and systems for backfilled or blindside concrete foundation walls.

6.7.1.1(1)(b) Types include bituminous and hybrid polyurethane.

6.7.1.1(2) References

6.7.1.1(2)(a) ASTM C836/C836M, Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.

6.7.1.1(2)(b) ASTM D6622/D6622M-20 Standard Guide for Application of Fully Adhered Hot-Applied Reinforced Waterproofing Systems.

6.7.1.1(2)(c) CGSB 37.50 Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing (withdrawn).

6.7.1.1(3) Performance Requirements

6.7.1.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.1.1(3)(b) Waterproofing treatment will prevent passage of water under pressure and capable of spanning cracks up to 1.5 mm without failure.

6.7.1.1(3)(c) Waterproofing to have a Design Life as set out in Section 3.8.

6.7.1.1(4) Quality Assurance

6.7.1.1(4)(a) Source Limitations: Obtain waterproofing components from single source from single manufacturer.

6.7.1.1(4)(b) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.7.1.1(4)(c) Applicator Qualifications: Company specializing in application of the Products specified in this section approved by the manufacturer, with minimum three years documented experience.

6.7.1.2 Part 2 Products

6.7.1.2(1) Acceptable Products/Systems:

6.7.1.2(1)(a) Colphene LM Barr, by SOPREMA, single component, liquid applied, 98% solids content, STPE (silyl terminated polyether – hybrid silicone polyurethane);

6.7.1.2(1)(b) TREMproof 260, by TREMCO, single component liquid applied asphalt emulsion;

6.7.1.2(1)(c) TREMproof 250, by TREMCO, rapid curing, high solids, VOC compliant, modified polyurethane;

6.7.1.2(1)(d) Monolithic Membrane 6125-FR (MM6125-FR), by HYDROTECH, assembly of reinforced rubberized asphalt;

6.7.1.2(1)(e) Or alternative approved by the Authority.

6.7.1.2(2) Accessories:

6.7.1.2(2)(a) Primer, sealant, reinforcement, and additional accessories as required for complete and watertight installation, from the manufacturer of the membrane product.

6.7.1.2(2)(b) Drainage and protection boards as required, from the manufacturer of the membrane product, or approved by the manufacturer of the membrane product, as required for warranty.

6.7.1.3 Part 3 Execution

6.7.1.3(1) Not applicable.

6.7.2 Section 07 13 26 – Self Adhering Sheet Membrane Foundation Waterproofing

6.7.2.1 Part 1 General

6.7.2.1(1) Summary

6.7.2.1(1)(a) Single ply, self-adhering membrane for foundation waterproofing 1.5 mm thick, self-sealing, rubberized asphalt, bonded to a cross-laminated high-density polyethylene film.

6.7.2.1(2) Performance Requirements

6.7.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.2.1(2)(b) Waterproofing treatment will prevent passage of water under pressure and capable of spanning cracks up to 1.5 mm without failure.

6.7.2.1(2)(c) Waterproofing to have a Design Life as set out in Section 3.8.

6.7.2.1(3) Quality Assurance

6.7.2.1(3)(a) Source Limitations: Obtain waterproofing components from single source from single manufacturer.

6.7.2.1(3)(b) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.7.2.1(3)(c) Installer Qualifications: Company specializing in installation of the Products specified in this section, approved by the manufacturer, with minimum three (3) years documented experience.

6.7.2.2 Part 2 Products

6.7.2.2(1) Acceptable Products:

6.7.2.2(1)(a) Blueskin WP 200, by Henry Company Canada Inc.

6.7.2.2(1)(b) COLPHENE 3000, by SOPREMA.

6.7.2.2(1)(c) Or alternative approved by the Authority.

6.7.2.2(2) Accessories:

6.7.2.2(2)(a) Primer, sealant, reinforcement, and additional accessories as required for complete and watertight installation, from and/or approved by the manufacturer of the membrane product.

6.7.2.2(2)(b) Drainage and protection boards as required, from the manufacturer of the membrane product, or approved by the manufacturer of the membrane product, as required for warranty.

6.7.2.3 Part 3 Execution

6.7.2.3(1) Not applicable.

6.7.3 Section 07 13 52 – Modified Bituminous Sheet Waterproofing

6.7.3.1 Part 1 General

6.7.3.1(1) Summary

6.7.3.1(1)(a) Heat welded 2-ply membrane system of composite reinforced SBS modified bitumen for conventional backfill foundation arrangements.

6.7.3.1(1)(b) Heat welded membrane system of composite reinforced SBS modified bitumen for blindside foundation arrangements.

6.7.3.1(2) References

6.7.3.1(2)(a) ASTM D5147/D5147M, Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.

6.7.3.1(2)(b) ASTM D5385/D5385M, Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.

6.7.3.1(2)(c) ASTM E154/E154M, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

6.7.3.1(2)(d) CAN/ULC S478 Durability in Buildings.

6.7.3.1(3) Performance Requirements

6.7.3.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.3.1(3)(b) Design construction assemblies to prevent the ingress of moisture through below grade walls.

6.7.3.1(3)(c) The below grade waterproofing protection system will meet the requirements of the City’s current Ground Water Management Bulletin.

6.7.3.1(3)(d) Waterproofing to have a Design Life as stipulated in Section 3.8.

6.7.3.1(3)(e) Resistance to Hydrostatic Head in accordance with ASTM D5385/D5385M modified: 114 m (374 ft.) min.

6.7.3.1(3)(f) Low Temperature Flexibility in accordance with ASTM D5147/D5147M: Pass at -30 deg. C.

6.7.3.1(3)(g) Tensile Strength in accordance with ASTM D5147/D5147M: 15 / 13.5 kN/m.

6.7.3.1(3)(h) Puncture Resistance in accordance with ASTM E154/E154M: 1210 N.

6.7.3.1(4) Quality Assurance

6.7.3.1(4)(a) Installation to follow manufacturer’s directions.

6.7.3.1(4)(b) Source Limitations: Obtain waterproofing components from single source from single manufacturer.

6.7.3.1(4)(c) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.7.3.1(4)(d) Installer Qualifications: Perform work of this Section by company approved by Product manufacturer and having five (5) years recent experience in work of comparable complexity and scope.

6.7.3.2 Part 2 Products

6.7.3.2(1) Acceptable Products/Systems for conventional backfill foundation walls:

6.7.3.2(1)(a) COLPHENE FLAM 180 and COLPHENE TORCH'N STICK by SOPREMA Canada;

6.7.3.2(1)(b) Or alternative as approved by Authority;

6.7.3.2(1)(c) Accessories, as required for complete and watertight installation, from and/or approved by manufacturer of the membrane, will include:

6.7.3.2.1.(c).1 Primer, to prepare concrete surfaces;
6.7.3.2.1.(c).2 Liquid applied waterproofing and reinforcement for sealing penetrations/ openings; and
6.7.3.2.1.(c).3 Drainage Board, dimpled HDPE with factory laminated geotextile.

6.7.3.2(2) Acceptable Products/Systems for blindside foundation walls:

6.7.3.2(2)(a) COLPHENE BSW V and COLPHENE BSW H by SOPREMA Canada;

6.7.3.2(2)(b) Or alternative as approved by Authority;

6.7.3.2(2)(c) Accessories, as required for complete and watertight installation, from and/or approved by manufacturer of the membrane, will include:

6.7.3.2.2.(c).1 Drainage Board, dimpled HDPE with factory laminated geotextile;
6.7.3.2.2.(c).2 Primer, to prepare geotextile surfaces; and
6.7.3.2.2.(c).3 Liquid applied waterproofing and reinforcing, for sealing penetrations/openings.

6.7.3.3 Part 3 Execution

6.7.3.3(1) Not applicable.

6.7.4 Section 07 16 00 – Cementitious Waterproofing

6.7.4.1 Part 1 General

6.7.4.1(1) Summary

6.7.4.1(1)(a) Cementitious crystalline waterproofing with blend of portland cement, fine treated silica sand active proprietary chemicals. When mixed with water and applied as cementitious coating, active chemicals cause a catalytic reaction which generates a non-soluble crystalline formation of dendritic fibres within pores and capillary tracts of concrete. This process will cause concrete to become permanently sealed against penetration of liquids from any direction.

6.7.4.1(1)(b) Provide cementitious crystalline waterproofing at elevator and sump pits.

6.7.4.1(1)(c) Provide cementitious crystalline waterproofing at occupied spaces below grade such as Components located below grade with the boundary of that Component along a foundation wall; refer to Section 6.3.1.2(5).

6.7.4.1(1)(d) Cementitious crystalline waterproofing will be provided in addition to exterior waterproofing systems as set out in the Agreement.

6.7.4.1(2) References

6.7.4.1(2)(a) ASTM C39/C39M, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

6.7.4.1(3) Performance Requirements

6.7.4.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.4.1(3)(b) Compressive Strength: When tested in accordance with ASTM C39/C39M will have a minimum of 14% increase compared with untreated control specimens.

6.7.4.1(3)(c) Waterproofing treatment will prevent passage of water under pressure and capable of spanning cracks up to 1.5 mm without failure.

6.7.4.1(3)(d) Crystalline Penetration: Crystallizing capability of waterproofing material will be evidenced by

independent SEM (Scanning Electron Microscope) photographs documenting penetration of crystal-forming waterproofing material to a depth of 50 mm.

6.7.4.1(4) Quality Assurance

6.7.4.1(4)(a) Source Limitations: Obtain waterproofing components from single source from single manufacturer.

6.7.4.1(4)(b) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.7.4.1(4)(c) Applicator Qualifications: Company specializing in application of the Products specified in this section with minimum five years documented experience.

6.7.4.2 Part 2 Products

6.7.4.2(1) Acceptable Products

6.7.4.2(1)(a) Subject to conformance with requirements of this Section, provide cementitious waterproofing by one of the following:

6.7.4.2.1.(a).1 Krystol Waterstop Treatment by Kryton International Inc.;

6.7.4.2.1.(a).2 Permaquik 200 Crystaline Waterproofing, by TREMCO;

6.7.4.2.1.(a).3 Xypex Concentrate by Xypex Chemical Corporation;

6.7.4.2.1.(a).4 Or alternative as approved by Authority.

6.7.4.3 Part 3 Execution

6.7.4.3(1) Not applicable.

6.7.5 Section 07 18 16 – Vehicular Traffic Coatings

6.7.5.1 Part 1 General

6.7.5.1(1) Summary

6.7.5.1(1)(a) Heavy duty traffic deck waterproofing system for suspended concrete vehicle parking decks.

6.7.5.1(2) References

6.7.5.1(2)(a) ASTM C920, Specification for Elastomeric Joint Sealants.

6.7.5.1(2)(b) ASTM C957, Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface.

6.7.5.1(2)(c) CSA S413, Parking Structures.

6.7.5.1(3) Performance Requirements

6.7.5.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.5.1(3)(b) Design topping to allow for structural movement or deflection of building, and span cracks in substrate surfaces to maximum 1.5 mm wide which may occur after installation of coatings.

6.7.5.1(3)(c) Design traffic deck coating for vehicular traffic in accordance with CSA S413.

6.7.5.1(3)(d) Provide traffic coatings to prevent the ingress of moisture and protect suspended structural concrete floor slabs from vehicular and pedestrian traffic.

6.7.5.1(3)(e) Provide fluid applied integral flashings at all locations where a horizontal surface butts a vertical surface.

6.7.5.1(3)(f) Extend vehicular traffic coating a minimum of 150 mm up all vertical surfaces in parking garage.

6.7.5.1(4) Quality Assurance

6.7.5.1(4)(a) Installers qualifications: Firm with a crew trained and certified by the manufacturer to install the waterproofing system and has reference documentation that the installer has completed at least five (5) similar projects.

6.7.5.1(4)(b) Mock-up

6.7.5.1.4.(b).1 Apply full thickness mock-up for 1.2 m x 1.2 m area selected by the Authority.

6.7.5.1.4.(b).2 Approved mock-up may become part of the completed Work if undisturbed at time of installation.

6.7.5.2 Part 2 Products

6.7.5.2(1) Acceptable Products/Systems

6.7.5.2(1)(a) Conipur II Deck Coating System, by BASF. High-solids polyurethane waterproofing, traffic bearing membrane system for vehicular areas.

6.7.5.2(1)(b) Sikalastic-3900 Traffic System, by Sika. High-performance, multi-component, solvent-free traffic deck waterproof system, by Sika.

6.7.5.2(1)(c) Vulkem 350/346/346, by TREMCO. Elastomeric Waterproof Traffic Deck Coating System.

6.7.5.2(1)(d) Auxiliary Materials

6.7.5.2.1.(d).1 Primer: As recommended by membrane manufacturer;

6.7.5.2.1.(d).2 Sealant: ASTM C920, polyurethane type, compatible with system and adjacent materials; and

6.7.5.2.1.(d).3 Traffic paint: White or yellow colour as approved by the Authority; type as recommended by traffic coating manufacturer.

6.7.5.3 Part 3 Execution

6.7.5.3(1) Not applicable.

6.7.6 Section 07 19 00 – Water Repellant Sealer

6.7.6.1 Part 1 General

6.7.6.1(1) References

6.7.6.1(1)(a) ASTM C920, Specification for Elastomeric Joint Sealants.

6.7.6.1(1)(b) CSA S413, Parking Structures.

6.7.6.1(2) Performance Requirements

6.7.6.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.6.1(2)(b) Design water repellant sealer for vehicular traffic in accordance with CSA S413.

6.7.6.1(2)(c) Extend sealer a minimum of 150 mm up all vertical surfaces in parking garage.

6.7.6.1(3) Quality Assurance

6.7.6.1(3)(a) Applicator qualifications: Perform work of this Section by a company that has a minimum of five

years proven experience in water repellent sealer applications of a similar size and nature and that is approved by manufacturer.

6.7.6.2 Part 2 Products

6.7.6.2(1) Materials

6.7.6.2(1)(a) Sealer: Clear, penetrating, breathable 100% active silane-based sealer designed for vehicular traffic. For use on concrete slabs on grade at underground parking garage.

6.7.6.2(1)(b) Traffic paint: White or yellow colour as approved by the Authority; type as recommended by sealer manufacturer.

6.7.6.2(1)(c) Sealant: ASTM C920, Type M, Grade P, Class 25, two-part, self-levelling type, polyurethane.

6.7.6.3 Part 3 Execution

6.7.6.3(1) Not applicable.

6.7.7 Section 07 21 13 – Foundation Insulation

6.7.7.1 Part 1 General

6.7.7.1(1) References

6.7.7.1(1)(a) CAN/ULC S701, Thermal Insulation, Polystyrene Boards.

6.7.7.1(2) Performance Requirements

6.7.7.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.7.1(2)(b) Provide thermal insulation as part of the building envelope to prevent the transfer of heat both from the interior to the exterior and vice versa, depending on seasonal conditions, and to resist the absorption of water.

6.7.7.1(3) Quality Assurance

6.7.7.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.7.2 Part 2 Products

6.7.7.2(1) Materials

6.7.7.2(1)(a) Extruded Polystyrene (Foundation Walls):

6.7.7.2.1.(a).1 Conform to CAN/ULC S701, Type 4, ship-lapped edges.

6.7.7.2.1.(a).2 Acceptable Products: Styrofoam SM by Dupont de Nemours Inc., Foamular C-300 by Owens Corning Canada Inc. or alternative as approved by the Authority.

6.7.7.2(1)(b) Foundation insulation fastening system: Provide purpose made galvanized steel clips and continuous galvanized steel flashing as recommended by insulation manufacturer.

6.7.7.3 Part 3 Execution

6.7.7.3(1) Not applicable.

6.7.8 Section 07 21 19 – Cavity Insulation

6.7.8.1 Part 1 General

6.7.8.1(1) References

6.7.8.1(1)(a) ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Board Type Thermal Insulation.

6.7.8.1(1)(b) ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

6.7.8.1(1)(c) ASTM C665, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

6.7.8.1(1)(d) ASTM C1136, Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

6.7.8.1(1)(e) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.7.8.1(1)(f) ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.

6.7.8.1(1)(g) CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

6.7.8.1(1)(h) CAN/ULC-S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

6.7.8.1(1)(i) CAN/ULC-S702, Mineral Fibre Thermal Insulation for Buildings.

6.7.8.1(2) Performance Requirements

6.7.8.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.8.1(2)(b) Provide thermal insulation as part of the building envelope to prevent the transfer of heat both from the interior to the exterior and vice versa, depending on seasonal conditions, and to resist the absorption of water.

6.7.8.1(2)(c) Use thermal protection materials of a type and quality that will provide consistent environmental quality to enclosed spaces.

6.7.8.1(2)(d) Mineral Wool Insulation used in fire rated assemblies will conform to the BCBC requirements for fire rated assemblies.

6.7.8.1(3) Quality Assurance

6.7.8.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.8.2 Part 2 Products

6.7.8.2(1) Materials

6.7.8.2(1)(a) General: Insulation thickness as required to provide intended thermal values and to fill stud cavities.

6.7.8.2(1)(b) Semi-rigid stone wool insulation board, typical: Conform to ASTM C612, Type IVB and CAN/ULC S702 and with the following characteristics:

6.7.8.2.1.(b).1 Density: ASTM C303, minimum 48 kg/m3.

6.7.8.2.1.(b).2 Fire performance characteristics: ASTM E84 and CAN/ULC-S102, flame spread and smoke developed ratings of 0.

6.7.8.2.1.(b).3 Non-combustibility: To CAN/ULC-S114.

6.7.8.2.1.(b).4 Acceptable Products:

(b).4.1 Rainbarrier by Owens Corning Canada Inc.
(b).4.2 CavityRock by Rockwool.
(b).4.3 Or alternative approved by the Authority.

6.7.8.2(1)(c) Extruded polystyrene (exterior walls):
6.7.8.2.1.(c).1 Conform to CAN/ULC S701, Type 3, square or ship-lapped edges to suit cavity.
6.7.8.2.1.(c).2 Acceptable Products:
(c).2.1 Dupont de Nemours Inc.
(c).2.2 Owens Corning Canada Inc.
(c).2.3 Or alternative as approved by the Authority.

6.7.8.2(1)(d) Thermal batt insulation:
6.7.8.2.1.(d).1 Batt insulation (non-rated): Conform to CAN/ULC S702, Type 1, friction fit.
6.7.8.2.1.(d).2 Batt insulation (fire rated and acoustic): Conform to ASTM C665, paperless, semi-rigid, spun stone wool mats.

6.7.8.2(1)(e) Unfaced mineral wool board insulation (soffits):
6.7.8.2.1.(e).1 Stone wool:
(e).1.1 ASTM C612, Type IVA; semi-rigid mineral wool board, density 64 kg/m3 (4 pcf).
6.7.8.2.1.(e).2 Fire performance characteristics: ASTM E84 and CAN/ULC S102, Class A rated.

6.7.8.2(1)(f) Foil faced mineral wool board insulation (uninsulated precast concrete walls):
6.7.8.2.1.(f).1 For underside of concrete slab ceilings at parking garage and uninsulated precast concrete walls.
6.7.8.2.1.(f).2 Stone wool:
(f).2.1 ASTM C612, Type IVA; semi-rigid mineral wool board, density of 56 kg/m^3 (3.5 pcf) or 64 kg/m^3 (4 pcf).
(f).2.2 Fire performance characteristics: ASTM E84 and CAN/ULC S102, Class A rated.
6.7.8.2.1.(f).3 Foil facing: Aluminum foil with fibreglass reinforcement meeting criteria as follows:
(f).3.1 Vapour permeance: ASTM E96, 0.02% grains/hr.ft^2.in Hg.
(f).3.2 Fire resistance: ASTM E84, flame spread rating of 20 and smoke developed rating of 35.

6.7.8.2.1.(f).4 Acceptable Products: Foil Faced Fabrock LT or Rockboard 40 by Rockwool or alternative as approved by the Authority.

6.7.8.2(1)(g) Insulation fasteners: Type as recommended by insulation manufacturer and suitable for intended application.

6.7.8.2(1)(h) Pressure sensitive tape:

6.7.8.2.1.(h).1 Pressure sensitive tape having adhesive compatible with facing surface and fabricated from a material that matches the performance criteria and surface of the facing material.

6.7.8.2.1.(h).2 Type as recommended by facing manufacturer.

6.7.8.2(1)(i) Faced mineral wool board for underside of concrete floor slabs below conditioned space such as underground parking garage. Facing perforated for breathability.

6.7.8.2.1.(i).1 Product/Fabricator

(i).1.1 CROSSROCK PG Pin Perf, by Crossroads C& I.

(i).1.2 Or alternative as approved by Authority.

6.7.8.2.1.(i).2 Base Materials of listed product.

(i).2.1 Stone wool insulation board 4 lb/ft^3 (64 kg/m^3), ROCKBOARD 40, by Rockwool.

(i).2.2 Laminated facing of white polypropylene film, fiberglass/polyester reinforcing, proprietary core material, metalized polyester film, and flame resistant adhesive, with pin perforations 16/in^2 by composite fabricator, WMP-50 by LAMTEC Corporation.

6.7.8.2.1.(i).3 Insulation Fastening Systems

(i).3.1 HDPE retention and stainless steel fasteners, installed with gas-actuated nailer, X-IE-G Insulation Fasteners, by HILTI, or

(i).3.2 Insulation hanger system of galvanized steel components: impaling pins with perforated base plates secured with s.s. screw anchors, and self locking retention washers, by

AGM Insulation Fasteners Canada Inc.

(i).3.3 Or alternative as approved by Authority.

6.7.8.3 Part 3 Execution

6.7.8.3(1) Not applicable.

6.7.9 Section 07 21 29 – Spray Foam Insulation

6.7.9.1 Part 1 General

6.7.9.1(1) References

6.7.9.1(1)(a) ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

6.7.9.1(1)(b) ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

6.7.9.1(1)(c) ASTM D1623, Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

6.7.9.1(1)(d) ASTM D2842, Standard Test Method for Water Absorption of Rigid Cellular Plastics.

6.7.9.1(1)(e) ASTM D6226, Standard Test Method for Open Cell Content of Rigid Cellular Plastics.

6.7.9.1(1)(f) ASTM E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials.

6.7.9.1(1)(g) Canadian Urethane Foam Contractors Association/National Energy Conservation Association (CUFCA/NECA).

6.7.9.1(1)(h) CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

6.7.9.1(1)(i) CAN/ULC-S127, Standard Corner Wall Method of Test for Flammability Characteristics of Non-Melting Foam Plastic Building Materials.

6.7.9.1(1)(j) CAN/ULC-S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Specification.

6.7.9.1(2) Performance Requirements

6.7.9.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.9.1(2)(b) Provide thermal insulation as part of the building envelope to prevent the transfer of heat both from the interior to the exterior and vice versa, depending on seasonal conditions, and to resist the absorption of water.

6.7.9.1(2)(c) Use thermal protection materials of a type and quality that will provide consistent environmental quality to enclosed spaces and small spaces. Spray foam insulation is not permitted for use in bulk or large scale applications.

6.7.9.1(2)(d) Use foamed plastic insulation that is CFC-free and HCFC-free and in compliance with the Province of British Columbia Ozone Depleting Substances Regulations.

6.7.9.1(2)(e) In all circumstances, any foamed plastic insulation applications where exposed will require a BC Building Code compliant fire rated thermal protective cover/barrier. Provide the following as a minimum:

6.7.9.1.2.(e).1 R20 (U-Value 0.05) for exterior walls; and

6.7.9.1.2.(e).2 R30 (U-Value 0.033) for roof areas.

6.7.9.1(3) Quality Assurance

6.7.9.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.9.1(3)(b) Applicator qualifications: Company specializing in applying the products specified in this section with minimum three years documented experience and a certified member of the Canadian Urethane Foam Contractors Association/National Energy Conservation Association (CUFCA/NECA).

6.7.9.2 Part 2 Products

6.7.9.2(1) Spray Foam Insulation

6.7.9.2(1)(a) Provide one of the below specified spray foam insulation types for the Project. Spray foam insulation must be suitable for use at intended condition.

6.7.9.2(1)(b) Spray Applied Foam Insulation (One Component): CAN/ULC S705.1, single component, closed-cell, sprayed/frothed polyurethane foam with a low global warming potential, utilizing an HFO blowing agent, forming an air barrier and meeting the following minimum requirements:

- 6.7.9.2.1.(b).1 Density: ASTM D1622, 29.6 kg/m3.
- 6.7.9.2.1.(b).2 Open cell content: ASTM D6226, 5.6%.
- 6.7.9.2.1.(b).3 Tensile strength: ASTM D1623, 313 kPa.
- 6.7.9.2.1.(b).4 Compressive strength: ASTM D1621, 236 kPa.
- 6.7.9.2.1.(b).5 ASTM D2842, 0.6% by volume.
- 6.7.9.2.1.(b).6 Water vapour permeance: ASTM E96/E96M, 50 mm sample 56 ng/Pa.s.m2 (0.98 Perms).
- 6.7.9.2.1.(b).7 Flame spread: CAN/ULC-S102 including CAN/ULC-S127, <500.
- 6.7.9.2.1.(b).8 Acceptable Products: Walltite CM01 by BASF Canada Inc.

6.7.9.2(1)(c) Spray Applied Foam Insulation (Two Component): CAN/ULC S705.1, two-component, closed-cell, foamed-in-place, polyurethane foam with zero ozone depletion potential (ODP) and a global warming potential (GWP) of 1, forming an air barrier and meeting the following minimum requirements:

- 6.7.9.2.1.(c).1 Density: ASTM D1622, 34.5 kg/m3.
- 6.7.9.2.1.(c).2 Open cell content: ASTM D6226, 2.5%.
- 6.7.9.2.1.(c).3 Tensile strength: ASTM D1623, 445 kPa.
- 6.7.9.2.1.(c).4 Compressive strength: ASTM D1621, 175 kPa.
- 6.7.9.2.1.(c).5 Water absorption: ASTM D2842, 3.3% by volume.
- 6.7.9.2.1.(c).6 Water vapour permeance: ASTM E96/E96M, 50 mm sample 39 ng/Pa.s.m2 (0.68 Perms).
- 6.7.9.2.1.(c).7 Flame spread: CAN/ULC-S127, 330.
- 6.7.9.2.1.(c).8 Acceptable Products: Sopra-SPF 202 by Soprema Canada.

6.7.9.2(1)(d) Accessories:

- 6.7.9.2.1.(d).1 Provide components and accessories as required for complete installation including primers, transition membranes and sheet metal closures.
- 6.7.9.2.1.(d).2 Types as recommended by spray foam insulation manufacturer.

6.7.9.3 Part 3 Execution

6.7.9.3(1) Not applicable.

6.7.10 Section 07 26 00 – Vapour Retarders

6.7.10.1 Part 1 General

6.7.10.1(1) References

6.7.10.1(1)(a) ASTM C755, Standard Practice for Selection of Water Vapor Retarders for Thermal Insulation.

6.7.10.1(1)(b) ASTM C1136, Standard Specification for Flexible, Low Permeance Vapour Retarders for Thermal Insulation.

6.7.10.1(1)(c) ASTM D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

6.7.10.1(1)(d) ASTM D1709, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

6.7.10.1(1)(e) ASTM E1643, Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

6.7.10.1(1)(f) ASTM E1745, Standard Specification for Water Vapour Retarders used in Contact with Soil or Granular Fill under Concrete Slabs.

6.7.10.1(1)(g) ASTM F1249, Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

6.7.10.1(2) Performance Requirements

6.7.10.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.10.1(2)(b) Design construction assemblies to prevent the ingress and passage of water vapour through the building envelope.

6.7.10.1(2)(c) Prevent water vapour transmission and condensation in wall assemblies, roofing assemblies, and under concrete slabs-on-grade within the Facility perimeter by means of a continuous vapour barrier membrane.

6.7.10.1(2)(d) Ensure above grade polyethylene sheet vapour retarder installation conforms to requirements of ASTM C1136.

6.7.10.1(2)(e) Ensure below grade polyethylene sheet vapour retarder installation conforms to requirements of ASTM E1643.

6.7.10.1(3) Quality Assurance

6.7.10.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.10.1(3)(b) Conduct dew-point analysis to determine correct placement of vapour barrier within wall and roof assemblies.

6.7.10.1(3)(c) Coordinate locations of thermal insulation, waterproof membranes, and air and vapour barriers to prevent creation of dew point, resulting in condensation within assemblies.

6.7.10.2 Part 2 Products

6.7.10.2(1) Manufacturers

6.7.10.2(1)(a) Manufacturers (self-adhesive air/vapour retarder): Subject to conformance to requirements of this Section, provide self-adhering vapour retarders by one of the following:

6.7.10.2.1.(a).1 Henry Company Canada Inc.
6.7.10.2.1.(a).2 Soprema Canada.
6.7.10.2.1.(a).3 Or alternative as approved by the Authority.

6.7.10.2(1)(b) Manufacturers (below grade sheet vapour retarder): Subject to conformance to requirements of this Section, provide below grade sheet vapour retarders by one of the following:

6.7.10.2.1.(b).1 Stego Industries, LLC.
6.7.10.2.1.(b).2 W.R. Meadows of Canada.
6.7.10.2.1.(b).3 Or alternative as approved by the Authority.

6.7.10.2(2) Materials

6.7.10.2(2)(a) Vapour Retarder 0.15 mm (6 mil) polyethylene film conforming to ASTM C755.

6.7.10.2(2)(b) Self-Adhesive Air/Vapour Retarder: 1 mm thick membrane air/vapour retarder membrane; single-ply, self-sealing, SBS modified bitumen laminated to cross-laminated, high-density polyethylene film with release liner on adhesive side.

6.7.10.2(2)(c) Under slab vapour retarder (finished floors): ASTM E1745, Class A, 0.38 mm (15 mil) thick high density polyethylene sheet.

6.7.10.2.2.(c).1 Water Vapour Permeance: ASTM F1249, not more than 0.6 ng/Pa-s-sq.m (0.01 perms);

6.7.10.2.2.(c).2 Puncture Resistance: ASTM D1709, not less than 3,200 grams; and

6.7.10.2.2.(c).3 Tensile Strength: ASTM D882, not less than 12.6kN/m (70lbf/in).

6.7.10.2(2)(d) Under slab vapour retarder (parking): ASTM E1745, Class A, 0.25 mm (10 mil) thick high density polyethylene sheet.

6.7.10.2.2.(d).1 Water Vapour Permeance: ASTM F1249, not more than 1.7ng/Pa-s-sq.m (0.03 perms);

6.7.10.2.2.(d).2 Puncture Resistance: ASTM D1709, not less than 2,200 grams; and

6.7.10.2.2.(d).3 Tensile Strength: ASTM D882, not less than 7.9 kN/m (45 lbf/in).

6.7.10.2(2)(e) Accessories:

6.7.10.2.2.(e).1 Provide accessories as required for complete and watertight installation including primers, mastics, fastening bar and tapes.

6.7.10.2.2.(e).2 Types as recommended by vapour retarder manufacturer and as required to suit vapour retarder type.

6.7.10.3 Part 3 Execution

6.7.10.3(1) Not applicable.

6.7.11 Section 07 27 00 – Air Barriers

6.7.11.1 Part 1 General

6.7.11.1(1) Performance Requirements

6.7.11.1(1)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.11.1(1)(b) Air barrier testing will be conducted in compliance with City’s Green Buildings Policy for Rezoning and BCBC.

6.7.11.1(1)(c) Limit air exfiltration and infiltration through materials of the assembly, joints in the assembly, joints in components of the wall assembly, and junctions with other Facility elements including the roof.

6.7.11.1(1)(d) Prevent air leakage caused by air pressure across the wall and roof assembly, including interruptions to the integrity of wall and roof systems such as junctions with dissimilar constructions.

6.7.11.1(1)(e) Concealed air barrier of Rain Screen wall assembly to have a Design Life as set out in Section 3.8.

6.7.11.1(2) Quality Assurance

6.7.11.1(2)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.11.2 Part 2 Products

6.7.11.2(1) Manufacturers

6.7.11.2(1)(a) Manufacturers: Subject to conformance to requirements of this Section, provide air barriers by one of the following:

6.7.11.2.1.(a).1 Henry Company Canada Inc.
6.7.11.2.1.(a).2 Soprema Canada.
6.7.11.2.1.(a).3 Or alternative as approved by the Authority.

6.7.11.2(2) Materials

6.7.11.2(2)(a) Self Adhesive Air Barrier: Vapour permeable air barrier: 23 mils thick, single-ply, self adhering membrane consisting of engineered film and permeable adhesive with poly-release film.

6.7.11.2(2)(b) Accessories: Provide accessories as required for complete and air tight installation including primers and sealants. Types as recommended by air barrier manufacturer.

6.7.11.3 Part 3 Execution

6.7.11.3(1) Not applicable.

6.7.12 Section 07 42 13 – Aluminum Composite Materials

6.7.12.1 Part 1 General

6.7.12.1(1) Summary

6.7.12.1(1)(a) Aluminum Composite Material (ACM) cladding panels for exterior wall assemblies, and interior wall and ceiling finishes.

6.7.12.1(2) References

6.7.12.1(2)(a) AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

6.7.12.1(2)(b) ANSI B.18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

6.7.12.1(2)(c) ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.7.12.1(2)(d) ASTM A792/A792M, Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

6.7.12.1(2)(e) ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.7.12.1(2)(f) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.7.12.1(2)(g) CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

6.7.12.1(2)(h) CAN/ULC-S134 Fire Test of Exterior Wall Assemblies.

6.7.12.1(2)(i) CSA S136, Cold Formed Steel Structural Members.

6.7.12.1(2)(j) CSA A478 – Durability in Buildings.

6.7.12.1(3) Performance Requirements

6.7.12.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.12.1(3)(b) Design for durability of building envelope materials in accordance with requirements of Section 3.8 and CSA S478. Select materials with proven record of durability and provide proof of durability from suppliers.

6.7.12.1(3)(c) Design composite panel system to accommodate thermal movements of the components and structural movements to provide an installation free of oil canning, buckling, delamination, failure of joint

seals, excessive stress on fasteners or any other detrimental effects.

6.7.12.1(3)(d) Design composite panel system to prevent rattling and vibration of panels, overstressing of fasteners and clips, and other detrimental effects on the system.

6.7.12.1(3)(e) Panel removal: System design to allow removal of individual panels within wall system.

6.7.12.1(3)(f) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.7.12.1(4) Quality Assurance

6.7.12.1(4)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design composite panel systems, and verify that the following will comply with the requirements of the BCBC:

6.7.12.1.4.(a).1 Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience; and

6.7.12.1.4.(a).2 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in panel installations of a similar size and nature and that is approved by manufacturer.

6.7.12.2 Part 2 Products

6.7.12.2(1) Composite Metal Panels

6.7.12.2(1)(a) Panel consisting of two sheets of smooth 0.51 mm (0.020”) aluminum thermo-bonded to fire retardant plastic core, produced in a continuous process with no adhesives between dissimilar materials. Panel thickness to be minimum 4 mm (0.157”).

6.7.12.2(1)(b) Fire Resistance: ASTM E84, Class A (flame spread 0, smoke developed 0),

6.7.12.2(1)(c) Aluminum face sheets: ASTM B209 AA3003 Series alloy, minimum thickness 0.51 mm (0.02”).

6.7.12.2(1)(d) Finish:

6.7.12.2.1.(d).1 Fluoropolymer finish:

(d).1.1 Shop pre-coat exposed metal surfaces with three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both colour coat and clear topcoat, producing a coating thickness of 1.6 mil.

(d).1.2 Acceptable Products: Duranar XL by PPG Industries, Inc. or alternative approved by the Authority.

6.7.12.2(1)(e) Acceptable Products:

6.7.12.2.1.(e).1 Alucobond by 3A Composites USA Inc.

6.7.12.2.1.(e).2 Larson by Alucoil North America.

6.7.12.2.1.(e).3 Alpolic by Mitsubishi Chemical America.

6.7.12.2.1.(e).4 Or alternative as approved by the Authority.

6.7.12.2(2) Framing, Furring and Fasteners

6.7.12.2(2)(a) Structural shapes, plates, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 350W.

6.7.12.2(2)(b) Metal framing: CSA S136, cold-formed, metallic-coated steel to ASTM A653/A653M, Z275 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation.

6.7.12.2(2)(c) C channels or Z-girts: CSA S136, provide C or Z shaped sections, galvanized steel.

6.7.12.2(2)(d) Fasteners:

6.7.12.2.2.(d).1 Fasteners for Attachment to Building Framing: Of type, material, size, corrosion resistance, holding capacity, and other properties required to fasten miscellaneous metal framing members to substrates.

6.7.12.2.2.(d).2 Fasteners, Panels: Concealed fastening, ANSI B.18.6.4, stainless steel, Type 304.

6.7.12.2.2.(d).3 Provide isolation material as specified herein for fasteners.

6.7.12.2(2)(e) Gaskets within the panel system will be as per distributor/fabricator standards.

6.7.12.2(2)(f) Isolation material: Bitumastic isolation coating, acid and alkali resistant material or neoprene isolation material.

6.7.12.2(3) Tolerances

6.7.12.2(3)(a) Panel Bow: Maximum 0.8% of panel dimension in width and length of any 1828 mm (72”) panel dimension.

6.7.12.2(3)(b) Panel fabrication tolerances for length or width to be maximum of ± 1 mm (3/64”) and the variation from theoretical diagonal dimensions of the finished panel cannot exceed 3 mm (1/8”).

6.7.12.2(3)(c) Joints will not vary more than 5% of their dimensioned width at any location along the full joint length and will not be wavy, out of line or of different width from panel to panel.

6.7.12.2(3)(d) Maximum deviation from vertical and horizontal alignment of erected panels: 6mm (1/4") in 6m (20') non-accumulative.

6.7.12.2(3)(e) Panel removal: System design to allow removal of individual panels within wall system.

6.7.12.3 Part 3 Execution

6.7.12.3(1) Not applicable.

6.7.13 Section 07 42 16 – Aluminum Plate Cladding

6.7.13.1 Part 1 General

6.7.13.1(1) Summary

6.7.13.1(1)(a) Solid aluminum cladding panels for exterior wall and soffit assemblies, and interior wall and ceiling finishes.

6.7.13.1(2) References

6.7.13.1(2)(a) AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

6.7.13.1(2)(b) ANSI B.18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

6.7.13.1(2)(c) ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.7.13.1(2)(d) ASTM A792/A792M, Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

6.7.13.1(2)(e) ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.7.13.1(2)(f) CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

6.7.13.1(2)(g) CSA S136, Cold Formed Steel Structural Members.

6.7.13.1(2)(h) CAN/ULC-S135 “Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter”.

6.7.13.1(3) Performance Requirements

6.7.13.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.13.1(3)(b) Design aluminum plate system to accommodate thermal movements of the components and structural movements to provide an installation free of oil canning, buckling, delamination, failure of joint seals, excessive stress on fasteners or any other detrimental effects.

6.7.13.1(3)(c) Design aluminum plate system to prevent rattling and vibration of panels, overstressing of fasteners and clips, and other detrimental effects on the system.

6.7.13.1(3)(d) Panel removal: System design to allow removal of individual panels within wall system.

6.7.13.1(3)(e) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.7.13.1(4) Quality Assurance

6.7.13.1(4)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design metal plate cladding systems, and verify that the following will comply with the requirements of the BCBC:

6.7.13.1.4.(a).1 Manufacturer qualifications: Company specializing in manufacturing the products

specified in this section with minimum three years documented experience; and

6.7.13.1.4.(a).2 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in panel installations of a similar size and nature and that is approved by manufacturer.

6.7.13.2 Part 2 Products

6.7.13.2(1) Manufacturers

6.7.13.2(1)(a) Manufacturers: Subject to conformance to requirements in this Section, provide solid aluminum plate cladding by one of the following:

6.7.13.2.1.(a).1 Altium Building Corp.

6.7.13.2.1.(a).2 Kanalco Ltd.

6.7.13.2.1.(a).3 Or alternative as approved by the Authority.

6.7.13.2(2) Solid Aluminum Plate Cladding

6.7.13.2(2)(a) Minimum 3 mm aluminum alloy panels, pre-finished, using proprietary aluminum extrusions.

6.7.13.2(2)(b) Aluminum: ASTM B209 AA3003 Series alloy.

6.7.13.2(2)(c) Finish:

6.7.13.2.2.(c).1 Fluoropolymer finish:

(c).1.1 Shop pre-coat exposed metal surfaces with three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both colour coat and clear topcoat, producing a coating thickness of 1.6 mil.

(c).1.2 Acceptable Products: Duranar XL by PPG Industries, Inc. or alternative approved by the Authority.

6.7.13.2(3) Framing, Furring and Fasteners

6.7.13.2(3)(a) Structural shapes, plates, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 350W.

6.7.13.2(3)(b) Metal framing: CSA S136, cold-formed, metallic-coated steel to ASTM A653/A653M, Z275 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation.

6.7.13.2(3)(c) C channels or Z-girts: CSA S136, provide C or Z shaped sections, galvanized steel.

6.7.13.2(3)(d) Fasteners:

6.7.13.2.3.(d).1 Fasteners for Attachment to Building Framing: Of type, material, size, corrosion resistance, holding capacity, and other properties required to fasten miscellaneous metal framing members to substrates.

6.7.13.2.3.(d).2 Fasteners, Panels: Concealed fastening, ANSI B.18.6.4, stainless steel, Type 304.

6.7.13.2.3.(d).3 Provide isolation material as specified herein for fasteners.

6.7.13.2(3)(e) Isolation material: Bitumastic isolation coating, acid and alkali resistant material or neoprene isolation material.

6.7.13.2(4) Tolerances

6.7.13.2(4)(a) Panel Bow: Maximum 0.8% of panel dimension in width and length of any 1828 mm (72”) panel dimension.

6.7.13.2(4)(b) Panel fabrication tolerances for length or width to be maximum of ± 1 mm (3/64”) and the variation from theoretical diagonal dimensions of the finished panel cannot exceed 3 mm (1/8”).

6.7.13.2(4)(c) Joints will not vary more than 5% of their dimensioned width at any location along the full joint length and will not be wavy, out of line or of different width from panel to panel.

6.7.13.2(4)(d) Maximum deviation from vertical and horizontal alignment of erected panels: 6mm (1/4") in 6m (20') non-accumulative.

6.7.13.2(4)(e) Panel removal: System design to allow removal of individual panels within wall system.

6.7.13.3 Part 3 Execution

6.7.13.3(1) Not applicable.

6.7.14 Section 07 42 29 – Terra Cotta Wall Panels

6.7.14.1 Part 1 General

6.7.14.1(1) References

6.7.14.1(1)(a) ASTM C373, Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products.

6.7.14.1(1)(b) CSA S136, Cold Formed Steel Structural Members.

6.7.14.1(1)(c) CSA S478, Durability in Buildings.

6.7.14.1(1)(d) CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

6.7.14.1(1)(e) CSSBI 20M, Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications.

6.7.14.1(1)(f) CAN/ULC S114, Fire Testing for Determination of Non-Combustibility in Building Materials.

6.7.14.1(1)(g) DIN 105, Clay Bricks - Part 4: Ceramic Bricks.

6.7.14.1(1)(h) DIN EN 539, Clay Roofing Tiles for Discontinuous Laying - Determination of Physical Characteristics - Part 2: Test for Frost Resistance.

6.7.14.1(1)(i) DIN EN 1304, Clay Roofing Tiles and Fittings - Product Definitions and Specifications.

6.7.14.1(1)(j) EOTA TR001, Determination of Impact Resistance of Panels and Panel Assemblies.

6.7.14.1(2) Performance Requirements

6.7.14.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.14.1(2)(b) Design for durability of building envelope materials in accordance with requirements of Section 3.8 and CSA S478. Select materials with proven record of durability and provide proof of durability from suppliers.

6.7.14.1(2)(c) Design exterior envelope cavity walls based on Rain Screen Principle advocated by NRCC and provide for drainage of water entering envelope cavity wall system. Provide for compartments in long cavity wall and at corners to achieve appropriate pressure equalization in exterior envelope cavity wall design.

6.7.14.1(2)(d) Design terra cotta wall panels to requirements of BCBC, except where more stringent requirements are indicated herein.

6.7.14.1(2)(e) Seismic Performance: Design materials specified in this Section to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.

6.7.14.1(2)(f) Maximum deflection not to exceed L/180 under systems own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the BC Building Code Climatic Data, wind load 1:30 years.

6.7.14.1(2)(g) Calculate live load deflections in accordance with CSSBI 20M, as modified by the requirements of this Section.

6.7.14.1(2)(h) All terra cotta wall cladding must have been tested to CAN/ULC-S114.

6.7.14.1(2)(i) Provide for movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range from -40 deg.C (-40 deg.F) to +50 deg.C (120 deg.F), and wind loads noted above.

6.7.14.1(2)(j) Design all terra cotta panels and trims to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with BCBC.

6.7.14.1(2)(k) Design exterior walls to provide continuous, complementary and compatible air / vapour / thermal barriers throughout building envelope. Provide continuity of air seal materials and assemblies.

6.7.14.1(2)(l) Design exterior walls to minimize thermal bridging using proven installation methods and details consisting of a combination of low conductivity materials, thermal breaks, and insulation to minimize heat loss and enhance assemblies' effective R-values.

6.7.14.1(2)(m) Include expansion joints to accommodate movement in wall system and between wall system and building structure, where these movements are caused by deflection of building structure, and

accommodate these movements without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

6.7.14.1(2)(n) Provide for positive drainage to the exterior of all water entering or condensation occurring within the system.

6.7.14.1(2)(o) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.7.14.1(3) Quality Assurance

6.7.14.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design terra cotta wall panel systems, and verify that the following will comply with the requirements of the BCBC.

6.7.14.1(3)(b) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.14.1(3)(c) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in panel installations of a similar size and nature and that is approved by manufacturer.

6.7.14.1(3)(d) Final review and acceptance of work completed by this Section will be carried out by manufacturers' representative, subtrades and the Authority.

6.7.14.2 Part 2 Products

6.7.14.2(1) Manufacturers

6.7.14.2(1)(a) Manufacturers: Subject to conformance to requirements in this Section, provide terra cotta wall panels by one of the following:

6.7.14.2.1.(a).1 NBK Terracotta.
6.7.14.2.1.(a).2 Cladding Corporation.
6.7.14.2.1.(a).3 Or alternative as approved by the Authority.

6.7.14.2(2) Terra Cotta Wall Panels

6.7.14.2(2)(a) Terra Cotta Wall Panels: Work of this Section to include the following:

6.7.14.2.2.(a).1 Exterior clay tile façade extruded hollow double wall clay panels/tiles;
6.7.14.2.2.(a).2 Interior clay tile façade extruded hollow double wall clay panels/tile;
6.7.14.2.2.(a).3 Clay “baguette” shading system;
6.7.14.2.2.(a).4 Clip support system;
6.7.14.2.2.(a).5 Horizontal clip carrier support channel; and
6.7.14.2.2.(a).6 Z-girt framing.

6.7.14.2(2)(b) Terra cotta tile panels:
6.7.14.2.2.(b).1 30 mm thick, hollow double skin clay panels.
6.7.14.2.2.(b).2 Sizes to be vertical modules of 150 mm to 300 mm and lengths to vary up to 1500 mm.
6.7.14.2.2.(b).3 Tile panels to meet the following criteria and features:
(b).3.1 Tolerances as specified herein;
(b).3.2 Cut edges: Minimize chipping at cut edges;
(b).3.3 Density: >2.0 g/cm^3 to DIN 105 part 4 Ceramic Clinker;
(b).3.4 Moisture absorption: <3% measured using ASTM C373;
(b).3.5 Frost resistance: Conform to DIN EN 539 part 2 (150 frost cycles);
(b).3.6 Appearance and structure: Conform to DIN EN 1304 Appendix B;
(b).3.7 Impact load resistances: As per EOTA TR001 impact resistance of panels and panel assemblies;
(b).3.8 Air cavity: Minimum 25 mm from face of insulation, drained to exterior; and
(b).3.9 Combustibility: Conform to CAN/ULC S114.

6.7.14.2(3) Framing, Furring, Fasteners and Components

6.7.14.2(3)(a) Fastening system: Façade fastening system consisting of the following components:
6.7.14.2.3.(a).1 Clip fasteners: Key clips;
6.7.14.2.3.(a).2 Closed support rails (for spans up to 1.5 m);
6.7.14.2.3.(a).3 Open support rails (for spans up to 0.75 m);
6.7.14.2.3.(a).4 Z-girts: CAN/CSA S136-M; Minimum 1.2 mm thick, Z275 galvanized. Z-girts to be thermally broken at mid-point of insulation thickness;
6.7.14.2.3.(a).5 Screw fasteners: Stainless steel, of type to suit installation and to support all

superimposed loads, complete with isolation material as required; and

6.7.14.2.3.(a).6 Acceptable Products: Gen 06 by Alphaton or alternative approved by the Authority.

6.7.14.2(3)(b) Cavity wall insulation: In accordance with Section 07 21 19.

6.7.14.2(3)(c) Air/vapour retarder membrane: In accordance with Section 07 26 00.

6.7.14.2(3)(d) Metal flashings: In accordance with Section 07 62 00.

6.7.14.2(3)(e) Isolation material: Bitumastic isolation coating, acid and alkali resistant material or neoprene isolation material.

6.7.14.2(4) Tolerances

6.7.14.2(4)(a) Fabrication tolerances:

6.7.14.2.4.(a).1 Length: Maximum +/-2 mm.

6.7.14.2.4.(a).2 Height: Maximum +/- 1.2%.

6.7.14.2.4.(a).3 Flatness: Maximum 0.7% over length of panel.

6.7.14.2(4)(b) Installed tolerances: Ensure terra cotta installation does not vary more that +/- 6 mm in 2400 mm.

6.7.14.3 Part 3 Execution

6.7.14.3(1) Not applicable.

6.7.15 Section 07 42 42 – Cementitious Panels

6.7.15.1 Part 1 General

6.7.15.1(1) References

6.7.15.1(1)(a) ASTM C1186, Specification for Flat Fiber-Cement Sheets.

6.7.15.1(1)(b) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.7.15.1(1)(c) ASTM E136, Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750C.

6.7.15.1(1)(d) ASTM E330/E330M, Standard Test Method for Structural Performance of Exterior Windows, Doors,

Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

6.7.15.1(1)(e) CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

6.7.15.1(1)(f) CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

6.7.15.1(2) Performance Requirements

6.7.15.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.15.1(2)(b) Comply with applicable seismic requirements including BCBC.

6.7.15.1(2)(c) Provide a rear ventilated Rain Screen designed to drain water and condensation to exterior. Provide a complete pre-engineered system including cementitious cladding, aluminum support structure, closure pieces, trim and flashing.

6.7.15.1(2)(d) Wall panels will be removable and fasteners are concealed.

6.7.15.1(2)(e) Panels will be secured to an aluminum support structure and secured to cold-formed metal framing.

6.7.15.1(2)(f) Design system to accommodate positive drainage for moisture entering or condensation occurring within panel system for 100 year rain cycle.

6.7.15.1(2)(g) Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.

6.7.15.1(2)(h) Wind Performance: System will withstand a design load of positive and negative pressures up to 40 psf in accordance with ASTM E330/E330M without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for

ambient temperature at time of fabrication, assembly, and erection procedures.

6.7.15.1(2)(i) Design cementitious panel system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design cementitious panel system to prevent vibration when subject to the effects of wind.

6.7.15.1(2)(j) Design cementitious panel system to be complete with special formed corners.

6.7.15.1(2)(k) Prevent rain penetration through panel system. Incorporate means of draining to the exterior.

6.7.15.1(2)(l) Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

6.7.15.1(2)(m) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.7.15.1(3) Quality Assurance

6.7.15.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design cementitious panel systems, and verify that the following will comply with the requirements of the BCBC:

6.7.15.1.3.(a).1 Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience;

6.7.15.1.3.(a).2 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in panel installations of a similar size and nature and that is approved by manufacturer; and

6.7.15.1.3.(a).3 Rain Screen weather resistive barrier membrane will be visually inspected for breaches and repaired if required.

6.7.15.2 Part 2 Products

6.7.15.2(1) Cementitious Panels

6.7.15.2(1)(a) Cementitious panels:

6.7.15.2.1.(a).1 13 mm thick panels constructed concrete (sand cement, water) and reinforced with alkali-resistant (AR) glass fibres, through coloured with iron oxide and natural additives.

6.7.15.2.1.(a).2 Cementitious panels to meet the following minimum criteria:

(a).2.1 Comply with ASTM C1186.

(a).2.2 Meet Class A per ASTM E84.

(a).2.3 Be classified as non-combustible per ASTM E136 & CAN/ULC S114

(a).2.4 Contain no detectable amounts of Crystalline Silica. Panels that do contain Crystalline Silica will be rejected.

(a).2.5 Comply with ICC-ES Acceptance Criteria for Fibre Cement Siding Evaluation report ESR-2810.

(a).2.6 Cementitious panels to have concealed fastening system.

6.7.15.2.1.(a).3 Acceptable Products:

(a).3.1 Fibre C Oko Skin by Reider

(a).3.2 Façade Panels by Swisspearl.

(a).3.3 Or alternative as approved by the Authority.

6.7.15.2(2) Framing System

6.7.15.2(2)(a) Structural shapes, plates, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 350W.

6.7.15.2(2)(b) Aluminum support structure: Provide aluminum support structure with concealed fastened system complete with:

6.7.15.2.2.(b).1 Support bracket using angle bracket anchored directly through wall substrate into support framing.

6.7.15.2.2.(b).2 Vertical L profile to suspend cement panels.

6.7.15.2.2.(b).3 Horizontal support rail and panel clips for concealed fastener system use horizontal rails attached directly to L profile. Panel clips attach to cement panels with expansion anchors that hang on horizontal rail. Adjustments of panels will be accommodated through adjustable screw elements integral to panel clips.

6.7.15.2.2.(b).4 Use corrosion resistant fasteners and anchors of type, size, and spacing required for type of

substrate and project conditions to meet performance requirements specified and indicated in design calculations.

6.7.15.2.2.(b).5 Acceptable Products: Alpha Vci 40 System by Eco Cladding or alternative as approved by the Authority.

6.7.15.2(2)(c) Isolation material: Bitumastic isolation coating, acid and alkali resistant material or neoprene isolation material.

6.7.15.3 Part 3 Execution

6.7.15.3(1) Not applicable.

6.7.16 Section 07 42 43 – Wood Faced Phenolic Panels

6.7.16.1 Part 1 General

6.7.16.1(1) References

6.7.16.1(1)(a) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.7.16.1(1)(b) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.7.16.1(1)(c) CAN/ULC-S134, Standard Method of Fire Test of Exterior Wall Assemblies.

6.7.16.1(1)(d) CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

6.7.16.1(1)(e) CSA S136, Cold Formed Steel Structural Members.

6.7.16.1(2) Performance Requirements

6.7.16.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.16.1(2)(b) Comply with applicable seismic requirements including BCBC.

6.7.16.1(2)(c) Provide a rear ventilated Rain Screen designed to drain water and condensation to exterior.

6.7.16.1(2)(d) Design system to accommodate positive drainage for moisture entering or condensation occurring within panel system for 100 year rain cycle.

6.7.16.1(2)(e) Design panel system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design panel system to prevent vibration when subject to the effects of wind.

6.7.16.1(2)(f) Construct panel system per listed designs certified to have passed CAN/ULC-S134.

6.7.16.1(3) Quality Assurance

6.7.16.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.7.16.2 Part 2 Products

6.7.16.2(1) Materials

6.7.16.2(1)(a) Phenolic panels:

6.7.16.2.1.(a).1 Prefinished high-density panels with Class A fire rating conforming to ASTM E84 and CAN/ULC S134 and consisting of Grade A 0.8 mm thick hardwood veneer bonded to core material.

6.7.16.2.1.(a).2 Phenolic panels to have concealed fastening system.

6.7.16.2.1.(a).3 Acceptable Products:

(a).3.1 Parklex Facade F HPL Wall Panels by Parklex USA Inc.

(a).3.2 Prodex by Prodema.

(a).3.3 Or alternative as approved by the Authority.

6.7.16.2(1)(b) Structural shapes, plates, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 350W.

6.7.16.2(1)(c) Framing: CSA 136, support framing system, aluminum or galvanized steel to ASTM A653/A653M, Z275 hot-dip galvanized coating designation.

6.7.16.3 Part 3 Execution

6.7.16.3(1) Not applicable.

6.7.17 Section 07 46 00 – Decorative Wood Cladding

6.7.17.1 Part 1 General

6.7.17.1(1) References

6.7.17.1(1)(a) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.7.17.1(1)(b) CAN/ULC-S134, Standard Method of Fire Test of Exterior Wall Assemblies.

6.7.17.1(1)(c) National Lumber Grades Authority (NLGA), Standard Grading Rules for Canadian Lumber.

6.7.17.1(2) Performance Requirements

6.7.17.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.17.1(2)(b) Provide a rear ventilated Rain Screen designed to drain water and condensation to exterior.

6.7.17.1(2)(c) Design cladding system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design siding system to prevent vibration when subject to the effects of wind.

6.7.17.1(2)(d) Construct panel system per listed designs certified to have passed CAN/ULC-S134 and in accordance with BCBC requirements and the Wood First Act.

6.7.17.1(3) Quality Assurance

6.7.17.1(3)(a) Installer Qualifications: Company specializing in installing the Products specified in this section with minimum five years documented experience.

6.7.17.2 Part 2 Products

6.7.17.2(1) Materials

6.7.17.2(1)(a) Decorative Wood Cladding

6.7.17.2.1.(a).1 To NLGA Standard Grading Rules for Canadian Lumber.

6.7.17.2.1.(a).2 Bevel siding, Douglas Fir, Clear V. G. Heart grade.

6.7.17.2.1.(a).3 Wood cladding to be complete with weather resistant fire retardant treatment as specified herein.

6.7.17.2(1)(b) Exterior fire retardant treatment:

6.7.17.2.1.(b).1 Clear, odour free, non-toxic, penetrating, exterior fire retardant treatment, Class A rated to ASTM E84, suitable for use in exterior conditions.

6.7.17.2.1.(b).2 Acceptable Products: FX Lumber Guard XT by Fire Retardant Coatings of Texas, LLC or alternative as approved by the Authority.

6.7.17.2(1)(c) Accessories: Starter strips, mouldings, exposed trim, closures, cap and corner pieces of manufacturer's standard.

6.7.17.2(1)(d) Wood strapping: In accordance with Section 06 10 00.

6.7.17.2(1)(e) Fasteners:

6.7.17.2.1.(e).1 Provide stainless steel screws, sized as required, incorporating plastic screw cap in colour to match siding.

6.7.17.2.1.(e).2 Acceptable Products: GRK Fasteners, Spax or alternative as approved by the Authority.

6.7.17.2.1.(e).3 Nails will not be permitted.

6.7.17.3 Part 3 Execution

6.7.17.3(1) Not applicable.

6.7.18 Section 07 46 19 – Metal Siding

6.7.18.1 Part 1 General

6.7.18.1(1) References

6.7.18.1(1)(a) AAMA 2604, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

6.7.18.1(1)(b) ANSI B18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

6.7.18.1(1)(c) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.7.18.1(1)(d) CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

6.7.18.1(1)(e) CSA S136, Cold Formed Steel Structural Members.

6.7.18.1(1)(f) CSA S136.1, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

6.7.18.1(2) Performance Requirements

6.7.18.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.18.1(2)(b) Comply with applicable seismic requirements including BCBC.

6.7.18.1(2)(c) Design metal siding system to comply with CSA S136 and CSA S136.1.

6.7.18.1(2)(d) Design metal siding system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design metal siding system to prevent vibration when subject to the effects of wind.

6.7.18.1(2)(e) Design system to accommodate positive drainage for moisture entering or condensation occurring within panel system for 100 year rain cycle.

6.7.18.1(3) Quality Assurance

6.7.18.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.7.18.2 Part 2 Products

6.7.18.2(1) Manufacturers

6.7.18.2(1)(a) Acceptable Products: Subject to conformance with requirements of this Section, provide metal siding from one of the following:

6.7.18.2.1.(a).1 Agway Metals Inc.
6.7.18.2.1.(a).2 Vicwest Building Products.
6.7.18.2.1.(a).3 Westform.
6.7.18.2.1.(a).4 Or alternative as approved by the Authority.

6.7.18.2(2) Materials

6.7.18.2(2)(a) Metal siding:

6.7.18.2.2.(a).1 ASTM A653/A653M, Z275 galvanized steel, 0.76 mm minimum base metal thickness.

Panels to be installed as concealed fastener system.

6.7.18.2.2.(a).2 Finish: Two-coat, silicone modified polyester (SMP) finish conforming to AAMA 2604.

6.7.18.2(2)(b) Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.

6.7.18.2(2)(c) Hollow structural sections: CAN/CSA-G40.20/G40.21-M Grade 350W, Class H.

6.7.18.2(2)(d) Z-girts and C channels: CAN/CSA S136-M; Minimum 1.2 mm thick, Z275 galvanized. Z-girts to be thermally broken at mid-point of insulation thickness.

6.7.18.2(2)(e) Fasteners: Concealed fastening, ANSI B.18.6.4, stainless steel, Type 304.

6.7.18.3 Part 3 Execution

6.7.18.3(1) Not applicable.

6.7.19 Section 07 52 16 – SBS Modified Bituminous Membrane Roofing

6.7.19.1 Part 1 General

6.7.19.1(1) References

6.7.19.1(1)(a) ASTM C1177/C1177M, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

6.7.19.1(1)(b) ASTM D6162/D6162M, Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

6.7.19.1(1)(c) ASTM E1980, Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

6.7.19.1(1)(d) RCABC, Roofing Contractors Association of British Columbia.

6.7.19.1(1)(e) CAN/ULC S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

6.7.19.1(1)(f) UL 580, Standard for Tests for Uplift Resistance of Roof Assemblies.

6.7.19.1(1)(g) CAN/ULC S478 Durability in Buildings.

6.7.19.1(2) Performance Requirements

6.7.19.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.19.1(2)(b) Design conventional roof assembly consisting of deck, vapour barrier, insulation, board stock, and membranes, all components to comply with BCBC for fire classifications and with RGC requirements for wind uplift requirements, as well as requirements for live loads, dead loads, snow loads and wind uplift. Comply with UL 580 Class 60 wind uplift classification.

6.7.19.1(2)(c) Ponding of water on roofs will not be accepted.

6.7.19.1(2)(d) For flat roofs, drains will be positioned a minimum of 2 m away from unguarded roof edges.

6.7.19.1(2)(e) All wood that is exposed to the exterior will be covered by an overhang or provided with flashing above of wood members, with drip edges that protect the wood from water exposure.

6.7.19.1(2)(f) Ensure torching is performed by skilled workers who have successfully completed and passed a course of instruction by membrane manufacturer in torch-applied-membrane techniques.

6.7.19.1(2)(g) Solar Reflectance Index: Precast concrete paver slab ballast and walkways will have a minimum solar reflectance of not less than 78 when calculated according to ASTM E1980.

6.7.19.1(2)(h) System to include reinforced non-slip walkway pad over cap sheet membrane at all rooftop access pathways and equipment maintenance and removal pathways.

6.7.19.1(2)(i) Roof assembly to have a Design Life as set out in Section 3.8.

6.7.19.1(3) Quality Assurance

6.7.19.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.19.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.7.19.1(3)(c) Comply with the RCABC Guarantee Corp's RoofStar Guarantee Program, latest standards and requirements for a fifteen (15) year guarantee as offered by the Roofing Contractors Association of British Columbia. Confirm design and perform work with quality inspections as required by the program to obtain the guarantee.

6.7.19.2 Part 2 Products

6.7.19.2(1) Manufacturers

6.7.19.2(1)(a) Manufacturers: Subject to conformance with requirements, provide modified bituminous roofing system by one of the following:

6.7.19.2.1.(a).1 Henry Company Canada Inc.
6.7.19.2.1.(a).2 Iko Industries Ltd.
6.7.19.2.1.(a).3 Siplast.
6.7.19.2.1.(a).4 Soprema Canada.
6.7.19.2.1.(a).5 Or alternative as approved by the Authority.

6.7.19.2(2) Materials

6.7.19.2(2)(a) Approved products for two (2) ply roof membrane systems, all from one manufacturer as approved for torch-applied base sheet and base sheet striping and torch-applied cap sheet and cap sheet stripping systems providing compliance with ULC Standards for a Class A Roof, as listed in RCABC Approved Products Listing and approved by the Authority.

6.7.19.2(2)(b) Sheathing:

6.7.19.2.2.(b).1 Board: ASTM C1177/C1177M, 6 mm thick for overlay board and12.7 mm thick for roof sheathing.
6.7.19.2.2.(b).2 Sheathing adhesive: Single component, solvent free, moisture curing, low VOC, asphaltic urethane adhesive; meeting ULC.

6.7.19.2(2)(c) Vapour Retarder:

6.7.19.2.2.(c).1 Vapour retarder: Self adhesive membrane consisting of SBS modified bitumen adhesive

bottom and tri-laminated woven polyethylene top with silicone release film.

6.7.19.2.2.(c).2 Minimum membrane thickness to be used in roofing assemblies to be per RCABC warranty requirements.

6.7.19.2(2)(d) Insulation and Overlay Board:

6.7.19.2.2.(d).1 Base layer: CAN/ULC S704, rigid, closed cell, polyisocyanurate foam insulation integrally laminated to perforated black glass reinforced felt facers, square edges, use maximum size board possible. Insulation thickness under 50 mm use single layer board. Insulation thickness over 50 mm use two equal thickness boards.

6.7.19.2.2.(d).2 Tapered Insulation: CAN/ULC S704, Factory pre-engineered tapered polyisocyanurate insulation in thickness sufficient for slopes indicated.

6.7.19.2.2.(d).3 Overlay Board: Bituminous, multi-ply, semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners.

6.7.19.2.2.(d).4 Insulation adhesive: Single component, solvent free, moisture curing, low VOC, asphaltic urethane adhesive; meeting ULC and tested by the Design-Builder.

6.7.19.2(2)(e) Membrane:

6.7.19.2.2.(e).1 Base sheet: Conforming to ASTM D6162/D6162M, Type II, Grade S.

6.7.19.2.2.(e).2 Base sheet flashing: Conforming to ASTM D6162/D6162M, Grade S.

6.7.19.2.2.(e).3 Cap Sheet and Cap Sheet Flashings: Conforming to ASTM D6162/D6162M, Type II, Grade S.

6.7.19.2.2.(e).4 Traffic Cap Sheet: Conforming to ASTM D6162/D6162M, Grade G, granule colour subject to review by the Authority.

6.7.19.2(2)(f) Plastic cement: Trowel grade asphalt mastic.

6.7.19.2(2)(g) Roofing nails: Galvanized steel, minimum 19 mm head of length to penetrate wood nailer minimum 19 mm.

6.7.19.2(2)(h) Walkway pad:

6.7.19.2.2.(h).1 Minimum 5 mm thick, reinforced walkway pad with a width of approximately 1000 mm, fabricated from SBS modified bitumen and including a non-woven polyester reinforcement.

6.7.19.2.2.(h).2 Walkway pad to include a non-slip granule top surface and thermofusible plastic film underface suitable for heat welding.

6.7.19.2.2.(h).3 Colour of granule surface to be distinguishable and distinct from overall roof cap sheet colour.

6.7.19.2(2)(i) Roof accessories and specialties: In accordance with Section 07 72 00.

6.7.19.3 Part 3 Execution

6.7.19.3(1) Not applicable.

6.7.20 Section 07 55 00 – Protected Roof Membrane Hot Rubberized Asphalt

6.7.20.1 Part 1 General

6.7.20.1(1) References

6.7.20.1(1)(a) ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

6.7.20.1(1)(b) ASTM E1980, Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

6.7.20.1(1)(c) RCABC, Roofing Contractors Association of British Columbia.

6.7.20.1(1)(d) CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

6.7.20.1(1)(e) UL 580, Standard for Tests for Uplift Resistance of Roof Assemblies.

6.7.20.1(2) Performance Requirements

6.7.20.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.20.1(2)(b) Design inverted/protected roof assembly consisting of deck, fluid applied roofing membrane, insulation, ballast, and all components to comply with BCBC for fire classifications and with RGC requirements

for wind uplift requirements, as well as requirements for live loads, dead loads, snow loads and wind uplift. Comply with UL 580 Class 60 wind uplift classification.

6.7.20.1(2)(c) Design roofing system to accommodate green roof system.

6.7.20.1(2)(d) Ponding of water on roofs will not be accepted.

6.7.20.1(2)(e) For flat roofs, drains will be positioned a minimum of 2 m away from unguarded roof edges.

6.7.20.1(2)(f) Solar Reflectance Index: Stone ballast and precast concrete paver slab ballast and walkways will have a minimum solar reflectance of not less than 78 when calculated according to ASTM E1980.

6.7.20.1(2)(g) Design access pathways using suitable materials to accommodate loading requirements applied to paving areas such as weight of people and equipment.

6.7.20.1(2)(h) Protected membrane to have a Design Life as set out in Section 3.8.

6.7.20.1(3) Quality Assurance

6.7.20.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.20.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.7.20.1(3)(c) Comply with the RCABC Guarantee Corp latest standards and requirements for a ten (10) year Guarantee as published in the RCABC Roofing Practices Manual. Perform roofing quality inspections as required by the RCABC to obtain the RCABC warranty.

6.7.20.2 Part 2 Products

6.7.20.2(1) Materials

6.7.20.2(1)(a) Approved products for two (2) ply rubberized asphalt membrane systems, all from one manufacturer as approved for fluid applied roofing systems providing compliance with ULC Standards for a Class A Roof, as listed in RCABC Approved Products Listing and approved by the Authority.

6.7.20.2(1)(b) Roofing membrane:

6.7.20.2.1.(b).1 One-part, 100% solids, self-sealing, hot fluid applied rubberized asphalt, minimum two plies, fabric reinforced.

6.7.20.2.1.(b).2 Acceptable Products:

(b).2.1 790-11 by Henry Company Canada Inc.

(b).2.2 MM6125-FR by Hydrotech Membrane Corporation.

(b).2.3 Colphene H by Soprema Canada.

6.7.20.2(1)(c) Separation sheet: 0.2 mm thick minimum, polyethylene sheet.

6.7.20.2(1)(d) Polystyrene Insulation (typical):

6.7.20.2.1.(d).1 CAN/ULC S701, Type 4; extruded polystyrene, ship-lapped edges.

6.7.20.2.1.(d).2 Acceptable Products:

(d).2.1 Roofmate by Dupont de Nemours Inc., Foamular 350 by Owens Corning Canada Inc.

(d).2.2 Or alternative as approved by the Authority.

6.7.20.2(1)(e) High load polystyrene Insulation (pavers):

6.7.20.2.1.(e).1 ASTM C518, closed cell extruded polystyrene insulation with high-loading capacity.

6.7.20.2.1.(e).2 Provide high load insulation with suitable compressive strength to accommodate loading requirements such as weight of people and equipment at paver applications.

6.7.20.2.1.(e).3 Acceptable Products: Highload Insulation by Dupont de Nemours Inc., Owens Corning Canada Inc. or alternative as approved by the Authority.

6.7.20.2(1)(f) Fabric ballast reducer sheet: High density polyethylene filter fabric with UV inhibitors.

6.7.20.2(1)(g) Ballast:

6.7.20.2.1.(g).1 25 mm diameter clear, screened, crushed white calcite, free from fines or stones smaller than 15 mm or larger than 35 mm.

6.7.20.2.1.(g).2 Ballast to meet a minimum SRI of 78 and emissivity greater than 0.9.

6.7.20.2(1)(h) Roof pavers:

6.7.20.2.1.(h).1 Reflective precast pavers:

(h).1.1 610 x 610 x 45 mm thick, non-interlocking roof slabs, less then 5% absorption, minimum 55MPa compressive strength, matte finish, chamfered edges, patio quality, conforming to CSA A231.1/A231.2.

(h).1.2 Pavers to meet a minimum SRI of 78 and emissivity greater than 0.9.

6.7.20.2.1.(h).2 Pedestals:

(h).2.1 Provide pedestals at each corner of paving slabs to product a level, smooth surface for pedestrian traffic.

(h).2.2 Acceptable Products: Pave-el by Envirospec Inc. or alternative as approved by the Authority.

6.7.20.2(1)(i) Accessories:

6.7.20.2.1.(i).1 Provide accessories and components as required for complete roofing system including primer, fabric reinforcement, membrane reinforcements, securement bars and protection boards.

6.7.20.2.1.(i).2 Types as recommended by fluid applied roofing manufacturer.

6.7.20.2(1)(j) Roof specialties and accessories: In accordance with Section 07 72 00.

6.7.20.3 Part 3 Execution

6.7.20.3(1) Not applicable.

6.7.21 Section 07 62 00 – Sheet Metal Flashing and Trim

6.7.21.1 Part 1 General

6.7.21.1(1) References

6.7.21.1(1)(a) AAMA 2605, Voluntary Specification for High Performance Organic Coatings

6.7.21.1(1)(b) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.7.21.1(1)(c) ASTM B209/B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.7.21.1(1)(d) ASTM D1970/D1970M, Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

6.7.21.1(1)(e) CRCA, Canadian Roofing Contractors Association.

6.7.21.1(1)(f) FM-1-49, Factory Mutual Global, Property Loss Prevention Data Sheets; Perimeter Flashings.

6.7.21.1(1)(g) RCABC, Roofing Contractors Association of British Columbia.

6.7.21.1(1)(h) SMACNA, Sheet Metal and Air Conditioning Contractors’ National Association.

6.7.21.1(2) Performance Requirements

6.7.21.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.21.1(2)(b) Provide sheet metal flashings at roof that divert water away from membrane flashing termination and protect the membrane from deterioration due to the exterior elements and mechanical damage. Provide roofing membrane continuously under the metal flashings. Ensure that sheet metal components comply with wind uplift requirements established for roofing system.

6.7.21.1(2)(c) Design sheet metal flashings to conform to Roofing Contractors Association of British Columbia (RCABC). "Roofing Practices in British Columbia”.

6.7.21.1(2)(d) Sheet metal flashings and trim will comply with CRCA FL Series details by the Canadian Roofing Contractors Association (CRCA) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Architectural Sheet Metal Manual requirements.

6.7.21.1(2)(e) Design flashing elements and fastenings to withstand wind loading and perimeter and corner

uplift pressures for roof system in accordance with FM-1-49.

6.7.21.1(3) Quality Assurance

6.7.21.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.21.1(3)(b) Execute sheet metal work by skilled mechanics in best and most workmanlike manner.

6.7.21.2 Part 2 Products

6.7.21.2(1) Materials

6.7.21.2(1)(a) Aluminum Flashings:

6.7.21.2.1.(a).1 Aluminum Sheet Flashings: ASTM B209/B209M.

6.7.21.2.1.(a).2 Aluminum finish:

(a).2.1 Fluoropolymer finish:

(a).2.1.1 Three-coat fluoropolymer coating system, complying with AAMA 2605 Voluntary Specification for High Performance Organic Coatings, containing not less than 70 percent PVDF resin by weight in both colour coat and clear topcoat, producing a coating thickness of 1.6 mils.

(a).2.1.2 Acceptable Products: Duranar XL by PPG Industries, Inc. or alternative approved by the Authority.

6.7.21.2.1.(a).3 Underlayment: ASTM D1970, High temperature HT Grade, self-sealing, composite rubberized asphalt sheet membrane.

6.7.21.2.1.(a).4 Minimum 0.8 mm base metal thickness backed by continuous underlayment.

6.7.21.2(1)(b) Prefinished Steel Flashings:

6.7.21.2.1.(b).1 Pre-Coated Galvanized Steel: ASTM A653/A653M, Z275 zinc coating; shop pre-coated with silicone modified polyester paint-coating.

6.7.21.2.1.(b).2 Underlayment: ASTM D1970, High temperature HT Grade, self-sealing, composite rubberized asphalt sheet membrane.

6.7.21.2.1.(b).3 Minimum 0.6 mm base metal thickness backed by continuous underlayment.

6.7.21.2(1)(c) Accessories:

6.7.21.2.1.(c).1 Fasteners: DT2000 coated or stainless steel. Exposed fasteners permitted only on approval of the Authority.

6.7.21.2.1.(c).2 Exposed Sealant: Silicone type, as specified in Section 07 92 00.

6.7.21.2.1.(c).3 Bedding Sealant: Butyl, as specified in Section 07 92 00.

6.7.21.2.1.(c).4 Protective Backing Paint: Bituminous.

6.7.21.3 Part 3 Execution

6.7.21.3(1) Not applicable.

6.7.22 Section 07 72 00 – Roof Accessories and Specialties

6.7.22.1 Part 1 General

6.7.22.1(1) Performance Requirements

6.7.22.1(1)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.22.1(1)(b) Design roof hatches to withstand snow load, wind uplift and expected temperature range without damage to unit or permanent deformation to seals in accordance with the BCBC.

6.7.22.1(1)(c) Refer to Section 05 50 00 for design requirements regarding access and ship’s ladders and connection to roof hatches as required for safe access out of hatch and onto roof system.

6.7.22.1(2) Quality Assurance

6.7.22.1(2)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.22.2 Part 2 Products

6.7.22.2(1) Manufacturers: Subject to conformance with requirements, provide roof accessories and specialties by Bilco Canada or alternative as approved by the Authority.

6.7.22.2(2) Materials

6.7.22.2(2)(a) Preassembled Roof Hatch:

6.7.22.2.2.(a).1 Single leaf metal roof scuttle. EPDM rubber gasket adhered to hollow metal cover. Insulation 25 mm thick with metal liner protector. 305 mm high curb with integral flashing and full welded corners. Size: 915 x 762 mm.

6.7.22.2.2.(a).2 Hardware: Lifting mechanism will be compression spring operators enclosed in telescopic tubes. Slam latch with interior and exterior turn handles and padlock hasps.

6.7.22.2(2)(b) Preassembled Equipment Hatch:

6.7.22.2.2.(b).1 3000 mm x 5000 mm double leaf metal roof hatch to allow for the installation of cyclotron equipment. Hatch to be reinforced as necessary to support a minimum live load of 1956 kg/m2 with a maximum deflection of 1/150th of span. EPDM rubber gasket adhered to cover interior. Insulation 25 mm thick with metal liner protector. 305 mm high curb with integral flashing and full welded corners.

6.7.22.2.2.(b).2 Hardware: Lifting mechanism will be compression spring operators enclosed in telescopic tubes. Slam latch with interior and exterior turn handles and padlock hasps.

6.7.22.2(2)(c) Safety Railing:

6.7.22.2.2.(c).1 Fiberglass-reinforced polymer (FRP) posts and rails in high visibility, safety yellow colour, treated with a UV inhibitor.

6.7.22.2.2.(c).2 Hardware: 6 mm thick hot dip galvanized steel mounting brackets, type 302 stainless steel gate hinges and post guides. All fasteners are type 316 stainless steel.

6.7.22.2(2)(d) Safety Post:

6.7.22.2.2.(d).1 High strength square steel post with high visibility. Design post to automatically lock into position when fully extended and to have release lever to disengage. All fasteners are type 316 stainless steel.

6.7.22.2.2.(d).2 Finish: Powder coat finish in safety yellow colour.

6.7.22.3 Part 3 Execution

6.7.22.3(1) Not applicable.

6.7.23 Section 07 81 16 – Cementitious Fireproofing

6.7.23.1 Part 1 General

6.7.23.1(1) References

6.7.23.1(1)(a) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.7.23.1(1)(b) ASTM E605, Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

6.7.23.1(1)(c) ASTM E761/E761M, Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members.

6.7.23.1(1)(d) ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

6.7.23.1(1)(e) CAN/ULC S101, Standard Methods of Fire Endurance Test of Building Construction and Materials.

6.7.23.1(1)(f) CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

6.7.23.1(2) Performance Requirements

6.7.23.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.23.1(2)(b) Density: Minimum average applied dry density of 352.406 kg/m3 for fireproofing to perimeter beams and columns, and a minimum average dry density of 240.028 kg/m3 for fireproofing to interior structural steel columns and structural steel beams, steel deck floor and roof assemblies and all other areas in accordance with requirements of ASTM E605.

6.7.23.1(2)(c) Compressive Strength: Will not deform more than 10% when subjected to a crushing force of 1200

lb/ft2 (57 KPa) when tested in accordance with requirements of ASTM E761.

6.7.23.1(2)(d) Sprayed cementitious fireproofing products will have been tested and reported by Underwriters' Laboratories of Canada (ULC) in accordance with the procedures of CAN/ULC S101.

6.7.23.1(2)(e) Sprayed cementitious fireproofing products will be free of vermiculite and will be certified asbestos-free and fibrous free. Products will have a fire hazard classification in accordance with CAN/ULC S102 and ASTM E84, exhibiting Flame Spread and Smoke Developed of 0.

6.7.23.1(2)(f) Resistance to Mould: Sprayed cementitious fireproofing will be formulated with a mould inhibitor. Sprayed cementitious fireproofing material will be tested in accordance with ASTM G21 and will resistance to mould growth for a period of 21 days for general use and for 60 days for sprayed cementitious fireproofing materials used in plenums.

6.7.23.1(2)(g) In order to avoid breaching the fire barrier, ensure plastic forming materials, such as containers or cans, are removed from application area before spraying cementitious fireproofing material.

6.7.23.1(3) Quality Assurance

6.7.23.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.23.1(3)(b) Regulatory Requirements: Be responsible for securing approval of materials and installation of work from AHJ:

6.7.23.1.3.(b).1 Perform work in compliance with ULC or cUL listed designs for the required fire resistance ratings.

6.7.23.1.3.(b).2 Submit signed engineering proposals to AHJ for acceptance if there are no listed designs that match project conditions.

6.7.23.1.3.(b).3 Perform tests required by AHJ.

6.7.23.2 Part 2 Products

6.7.23.2(1) Materials

6.7.23.2(1)(a) Spray Fireproofing:

6.7.23.2.1.(a).1 Primer: As required by manufacturer for rating required.

6.7.23.2.1.(a).2 Concealed fireproofing: CAN/ULC S101, Spray applied, single component cementitious fireproofing with a density of 215 to 272 kg/m3. Provide latex based emulsion sealer.

6.7.23.2.1.(a).3 Exposed fireproofing: CAN/ULC S101, Spray applied, single component cementitious fireproofing with a density of 608 to 704 kg/m3.

6.7.23.2(1)(b) Accessories:

6.7.23.2.1.(b).1 Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire resistance designs acceptable to AHJ and fire resistive material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

6.7.23.2.1.(b).2 Water: Clean, free from organic and mineral impurities which would be harmful to application.

6.7.23.3 Part 3 Execution

6.7.23.3(1) Not applicable.

6.7.24 Section 07 81 23 – Thin Film Intumescent Fireproofing

6.7.24.1 Part 1 General

6.7.24.1(1) References

6.7.24.1(1)(a) ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness.

6.7.24.1(1)(b) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.7.24.1(1)(c) ASTM E605, Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

6.7.24.1(1)(d) ASTM E736, Standard test method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.

6.7.24.1(1)(e) ASTM E761, Standard test method for Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members.

6.7.24.1(2) Performance Requirements

6.7.24.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.24.1(3) Quality Assurance

6.7.24.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.24.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.7.24.2 Part 2 Products

6.7.24.2(1) Interior Fireproofing System

6.7.24.2(1)(a) Primer: As required for substrate being fireproofed.

6.7.24.2(1)(b) Base coat: As required for system.

6.7.24.2(1)(c) Intumescent coating:

- 6.7.24.2.1.(c).1 Hardness (Shore "D"): Durometer D72 in accordance with ASTM D2240.
- 6.7.24.2.1.(c).2 Surface Burning Characteristics: Flame Spread: 0 -20, Smoke Development: 0-50, Class "A", in accordance with ASTM E84.
- 6.7.24.2.1.(c).3 Density 1.42 g/cc.
- 6.7.24.2.1.(c).4 Dry Weight: 1.87 kg/m2 at 1.1 mm dry.
- 6.7.24.2.1.(c).5 Cohesion / Adhesion (Bond or Tensile): 862 kPa in accordance with ASTM E736.
- 6.7.24.2.1.(c).6 Compressive strength: 5.2 MPa in accordance with ASTM E761.

6.7.24.2(1)(d) Top coat: As required for system.

6.7.24.2(2) Exterior Fireproofing Systems

6.7.24.2(2)(a) Primer: As required for substrate being fireproofed.

6.7.24.2(2)(b) Intumescent coating: Two component, epoxy based, thermally activated, subliming coating conforming to the following:

6.7.24.2.2.(b).1 Hardness (Shore "D"): Durometer D55 in accordance with ASTM D2240.

6.7.24.2.2.(b).2 Surface Burning Characteristics: Flame Spread: 0 -20, Smoke Development: 0-50, Class "A", in accordance with ASTM E84.

6.7.24.2.2.(b).3 Density 1313 kg/cm to ASTM E605.

6.7.24.2.2.(b).4 Bond strength: 2.73 MPa in accordance with ASTM E736.

6.7.24.2.2.(b).5 Compressive strength: 19.65 MPa in accordance with ASTM E761.

6.7.24.2(2)(c) Top coat: As required for system.

6.7.24.3 Part 3 Execution

6.7.24.3(1) Not applicable.

6.7.25 Section 07 85 00 – Firestopping and Smoke Seals

6.7.25.1 Part 1 General

6.7.25.1(1) References

6.7.25.1(1)(a) ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Board Type Thermal Insulation.

6.7.25.1(1)(b) ASTM C1104, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

6.7.25.1(1)(c) ASTM E814, Standard Test Method for Fire Tests of Penetration Firestop Systems.

6.7.25.1(1)(d) CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

6.7.25.1(1)(e) CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.

6.7.25.1(1)(f) CAN/ULC S129, Standard Method of Test for Smoulder Resistance Of Insulation.

6.7.25.1(1)(g) CAN/ULC S702, Thermal Insulation, Mineral Fibre for Buildings.

6.7.25.1(1)(h) UL 1479, Fire Tests of Penetration Firestops.

6.7.25.1(2) Performance Requirements

6.7.25.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.25.1(2)(b) Integrate barriers into vertical and horizontal space separations to protect against the spread of fire and smoke. Apply protection to exposed building elements, structural and non-structural, susceptible to fire and subsequent damage.

6.7.25.1(2)(c) Apply protection around penetrations through vertical and horizontal, rated and non-rated fire separations.

6.7.25.1(2)(d) Use firestopping and smoke seal systems that consist of asbestos-free materials and systems, capable of maintaining an effective barrier against flame, smoke, and gases.

6.7.25.1(2)(e) Use firestopping that:

6.7.25.1.2.(e).1 is compatible with substrates;

6.7.25.1.2.(e).2 allows for movement caused by thermal cycles; and

6.7.25.1.2.(e).3 prevents the transmission of vibrations from pipe, conduit or duct to structure and structure to pipe, conduit or duct.

6.7.25.1(2)(f) When more than one product is required for an assembly, use products that are compatible with one another and from the same manufacturer. Products will comply with requirements established by ULC-tested assemblies.

6.7.25.1.2.(f).1 is compatible with substrates;

6.7.25.1.2.(f).2 allows for movement caused by thermal cycles; and

6.7.25.1.2.(f).3 prevents the transmission of vibrations from pipe, conduit or duct to structure and structure to pipe, conduit or duct.

6.7.25.1(2)(g) Firestopping will be capable of maintaining an effective barrier against flame, smoke and gases when tested to CAN/ULC-S115 or ASTM E814 or UL 1479, acceptable to all applicable AHJ, and not exceeding opening sizes for which they are intended.

6.7.25.1(2)(h) Firestopping will be designed to allow for the 25% spare capacity of the corresponding Building System.

6.7.25.1(2)(i) Use firestopping sealants and coatings that are silicone-based and guaranteed not to re-emulsify if subject to wetting or standing water. Do not use acrylic-based coatings and sealants.

6.7.25.1(2)(j) All fire stopped penetrations will be one consistent manufacturer where possible and labelled with appropriate information identifying the manufacturer's name, system used, product used, installer and installed date. Design-Builder will provide a full inventory of fire stopped penetrations, and these will be indicated on the as-built drawings as part of the Design-Builder close-out document submission. This inventory is to include penetrations in use and for future.

6.7.25.1(2)(k) Provide fire-resistance rated exterior and interior walls as required by BCBC and locate these separations to minimize impact on clinical adjacencies and flows.

6.7.25.1(2)(l) Provide resistance to the propagation and spread of fire for exterior walls and interior walls designated as fire-resistance rated separations where appropriate.

6.7.25.1(3) Quality Assurance

6.7.25.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.25.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer. Installer will be approved by FM Global or UL-qualified.

6.7.25.2 Part 2 Products

6.7.25.2(1) Materials

6.7.25.2(1)(a) Firestop sealant: single component, low modulus, silicone rubber, moisture curing, ULC labelled to CAN/ULC S115.

6.7.25.2(1)(b) Firestop insulation: to CAN/ULC S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application.

6.7.25.2.1.(b).1 Density: Minimum 64 kg/m3 when tested to ASTM C303.

6.7.25.2.1.(b).2 Combustibility: Non-combustible to CAN/ULC S114.

6.7.25.2.1.(b).3 Melt temperature: >1175 degrees C.

6.7.25.2.1.(b).4 Surface burning characteristics: to CAN/ULC S102, maximum flame spread of 0, smoke developed of 0.

6.7.25.2.1.(b).5 Moisture Absorption: 0.04 percent when tested to ASTM C1104.

6.7.25.2.1.(b).6 Smoulder Resistance: 0.01 percent when tested to CAN/ULC S129.

6.7.25.2(1)(c) Damming, back-up, supports, and anchorage: In accordance with manufacturer's fire rated systems and to acceptance of AHJ.

6.7.25.3 Part 3 Execution

6.7.25.3(1) Not applicable.

6.7.26 Section 07 92 00 – Joint Sealants

6.7.26.1 Part 1 General

6.7.26.1(1) References

6.7.26.1(1)(a) ASTM C834, Specification for Latex Sealants.

6.7.26.1(1)(b) ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.

6.7.26.1(1)(c) ASTM C920, Specification for Elastomeric Joint Sealants.

6.7.26.1(2) Performance Requirements

6.7.26.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.26.1(2)(b) Provide sealant around and over cavities, in or behind surface elements to meet infection control requirements, refer to Section 5.14 Infection Control. Sealant around door frames will include

joints at bottom of door frames between floor finish and frames.

6.7.26.1(2)(c) Sealed joints between dissimilar or similar materials to allow a smooth or even transitions.

6.7.26.1(2)(d) Sealed expansion or controls joints in the building envelope systems or structural systems to allow movement.

6.7.26.1(2)(e) Provide security pick proof sealants at all interior joints in areas where Patients are receiving care or treatment.

6.7.26.1(2)(f) Apply sealant materials to achieve:

- 6.7.26.1.2.(f).1 Seals to the building envelope systems and around openings in the building envelope systems, as required to prevent water ingress;
- 6.7.26.1.2.(f).2 Sealed joints between dissimilar or similar materials to allow a smooth or even transitions; and
- 6.7.26.1.2.(f).3 Sealed expansion or controls joints in the building envelope systems or structural systems to allow movement.

6.7.26.1(2)(g) Unsealed joints are not acceptable.

6.7.26.1(2)(h) For the exterior, use sealants to completely and continuously fill all joints.

6.7.26.1(2)(i) For the interior, use one component, acrylic emulsion, paintable type sealants at all frames to completely fill joints between dissimilar materials in order to:

- 6.7.26.1.2.(i).1 Seal all door frames to floor;
- 6.7.26.1.2.(i).2 Seal all top edge of equipment rails and wood hand, bumper or crash rails to wall.

6.7.26.1(2)(j) Use silicone caulking that is mildew-resistant and impervious to water for caulking washroom plumbing fixtures.

6.7.26.1(2)(k) Use sealants with self-levelling properties for expansion and control joints in concrete floors using two-component epoxy urethane sealants.

6.7.26.1(2)(l) Use non-sag sealants for exterior vertical expansion and control joints in masonry or wall cladding.

6.7.26.1(2)(m) Use sealants that allow for minimum 25% movement in joint width.

6.7.26.1(2)(n) In corridors and other traffic areas used by laundry carts, supply carts, material handling equipment etc., use traffic bearing type sealants suitable to support imposed load without deformation or failure.

6.7.26.1(3) Quality Assurance

6.7.26.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.26.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.7.26.2 Part 2 Products

6.7.26.2(1) Materials

6.7.26.2(1)(a) Aluminum Work Sealant

6.7.26.2.1.(a).1 Structural Silicone Sealant: 100% silicone rubber, medium modulus, moisture-curing, non-sagging, non-staining, non-bleeding.

6.7.26.2.1.(a).2 Perimeter Sealant: 100% silicone rubber, medium modulus, single component, moisture-curing, non-sagging, non-staining, non-bleeding.

6.7.26.2.1.(a).3 Sealant Used Within System (Not Used for Glazing): Silicone Sealant; Type as recommended by curtain wall manufacturer.

6.7.26.2(1)(b) General Sealants:

6.7.26.2.1.(b).1 Hybrid polyurethane: ASTM C920, Type S, Grade NS, Class 35; One-part, hybrid-polyurethane with silane end-capped polymer technology, non-bleeding and non-sag type.

6.7.26.2.1.(b).2 Silicone sealant: ASTM C920, Type S, Grade NS, Class 25; One-part, Silicone, non-sag type.

6.7.26.2.1.(b).3 Silicone sealant: ASTM C920, Type S, Grade NS; One-part mildew-resistant silicone.

6.7.26.2.1.(b).4 Acrylic sealant: ASTM C834; Pure acrylic siliconized sealant.

6.7.26.2.1.(b).5 Acoustical sealant: Qualifying to ASTM C919; Single component, non-skinning synthetic rubber.

6.7.26.2.1.(b).6 Hybrid sealant, single component polyurethane based.

6.7.26.2(1)(c) Epoxy Pick-Proof Sealant: Pick-proof gunned flexible epoxy joint filler: Two component 100% solids, gun-grade epoxy joint filler with flexible, pick-proof properties for sloped areas.

6.7.26.2(1)(d) Colour Selections: Sealants to be colour matched to adjacent surfaces unless noted otherwise.

6.7.26.3 Part 3 Execution

6.7.26.3(1) Not applicable.

6.7.27 Section 07 95 00 – Expansion/Seismic Joint Systems

6.7.27.1 Part 1 General

6.7.27.1(1) References

6.7.27.1(1)(a) AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

6.7.27.1(1)(b) ASCE/SEI 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

6.7.27.1(1)(c) ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

6.7.27.1(1)(d) ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

6.7.27.1(1)(e) ASTM D3574, Standard Test Methods for Flexible Cellular Materials – Slab, Bonded, and Molded Urethane Foams.

6.7.27.1(1)(f) ASTM D3575, Standard Test Methods for Flexible Cellular Materials Made from Olefin Polymers.

6.7.27.1(1)(g) ASTM E330/E330M, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

6.7.27.1(1)(h) ASTM E1966, Standard Test Method for Fire-Resistive Joint Systems.

6.7.27.1(1)(i) UL 2079, Standard for Safety Tests for Fire Resistance of Building Joint Systems.

6.7.27.1(2) Performance Requirements

6.7.27.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.7.27.1(2)(b) Joint Movement:

6.7.27.1.2.(b).1 General: Design to permit unrestricted horizontal omni-directional movement of up to ±50% of joint width without disengagement of cover and to provide a smooth and bump free transition between building elements or components.

6.7.27.1.2.(b).2 Thermal: Design exterior joint cover assemblies to accommodate expansion and contraction within service temperature range of -35C to 65C.

6.7.27.1.2.(b).3 Seismic: Joint systems will withstand the effects of earthquake motions determined according to ASCE/SEI 7 and BCBC seismic requirements. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.

6.7.27.1(2)(c) Interior expansion joint cover assemblies will conform to infection prevention and control requirements and guiding principles as set out in this Agreement.

6.7.27.1(2)(d) Fire resistance ratings:

6.7.27.1.2.(d).1 Where required, provide fire-barrier expansion/seismic joint systems tested for fire resistance per UL 2079 or ASTM E1966, rated and listed with an accredited testing and certification organization, such as UL, Intertek, or QAI.

6.7.27.1.2.(d).2 Hose Stream Test: Wall-to-wall and wall-to-ceiling systems will be subjected to hose stream testing.

6.7.27.1.2.(d).3 Extend fire barrier beyond expansion joint cover, in concealed locations to maintain fire rating, for full length of expansion joint.

6.7.27.1(2)(e) Traffic Closure/Cover

6.7.27.1.2.(e).1 Transition for primary pedestrian access locations to be smooth and bump free.

6.7.27.1.2.(e).2 Deflection will not exceed 1.5 mm at neutral position.

6.7.27.1(2)(f) Wind and Air Pressure

6.7.27.1(2)(g) Design preformed foam expansion joints to meet or exceed wind pressures (both positive and negative) up to 4954 Pa in accordance with ASTM E330/E330M (procedure A) with no deflection and completely bonded to joint opening surfaces.

6.7.27.1(3) Quality Assurance

6.7.27.1.3.(a).1 Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.7.27.2 Part 2 Products

6.7.27.2(1) Systems

6.7.27.2(1)(a) Prefabricated Roof Expansion Joint Cover System. Self supporting bellows for curb mounted installation, prefabricated lamination of membrane material and semi-rigid closed cell foam insulation with metal flanges. Subject to conformance with requirements of this Section, provide one of the roof expansion joint cover products:

6.7.27.2.1.(a).1 Expand-O-Flash by Johns Manville;

6.7.27.2.1.(a).2 674 Series, by Inpro;

6.7.27.2.1.(a).3 Or alternative as approved by the Authority.

6.7.27.2(1)(b) Fire Barrier Foam Joint Closure Systems, for wall and floors. Fire retardant impregnated foam, silicone seal bellows, adhesive and seal accessories per manufacturer’s directions, for rating required, in coordination with selected cover system.

6.7.27.2.1.(b).1 Emshield Series by EMSEAL (Sika);

6.7.27.2.1.(b).2 Or alternative as approved by the Authority.

6.7.27.2(1)(c) Fire Barrier Bellows Joint System, for wall and floors. Lamination of stainless steel foil, ceramic fiber, with mounting and seal accessories per selected listed design and manufacturer’s

directions, for rating required, coordinated with selected cover system:

6.7.27.2.1.(c).1 Pyro-Flex Series, by MM Systems;

6.7.27.2.1.(c).2 Or alternative as approved by the Authority.

6.7.27.2(1)(d) Interior Floor to Wall Joint Cover System. Wall mounted, hinged or semi-hinged, anodized aluminum assembly:

6.7.27.2.1.(d).1 EXSLM seismic series floor to wall, by Latham;

6.7.27.2.1.(d).2 Or alternative as approved by the Authority.

6.7.27.2(1)(e) Interior Wall Joint Cover Systems

6.7.27.2.1.(e).1 Coordinated with the interior design and determined in consultation with the Authority through the Review Procedure.

6.7.27.2(1)(f) Interior Ceiling Joint Cover System

6.7.27.2.1.(f).1 Coordinated with the interior design and determined in consultation with the Authority through the Review Procedure.

6.7.27.2(1)(g) Interior Wall to Ceiling Joint Cover System

6.7.27.2.1.(g).1 Coordinated with the interior design and determined in consultation with the Authority through the Review Procedure.

6.7.27.2(1)(h) Exterior Wall Joint Closure System. Impregnated foam, with silicone seal bellows, adhesive and seal accessories per manufacturer's directions.

6.7.27.2.1.(h).1 Seismic Colorseal – DS, by EMSEAL (Sika);

6.7.27.2.1.(h).2 1200 Series, by Inpro;

6.7.27.2.1.(h).3 Or alternative as approved by the Authority.

6.7.27.2(1)(i) Parking Deck Type Foam Joint Seal and Metal Cover System, for secondary exterior pedestrian access and interior access to radiation therapy vaults. Fire retardant impregnated foam, silicone seal bellows, extruded aluminum spline, structural stainless steel cover plate, stainless steel fasteners epoxy adhesive accessory, and UL certified 2 h fire rating.

6.7.27.2.1.(i).1 SJS-FR, by EMSEAL(Sika);

6.7.27.2.1.(i).2 Or alternative as approved by the Authority.

6.7.27.2(1)(j) Joint Slide Bearings

6.7.27.2.1.(j).1 Sliding load bearing components for perimeter precast concrete gap cover by the Design-Builder's Engineer of Record.

6.7.27.2(1)(k) Modular Bridge Type Expansion-Seismic Joint System, for primary pedestrian Facility access locations at grade. Engineered assembly of a series of steel runners and neoprene bellows secured to space equalizing restraint on span framing with swivel and sliding connections. All steel components galvanized and other metal components corrosion resistant.

6.7.27.2.1.(k).1 Modular Expansion Joint System (MEJS), by Techstar Inc.;

6.7.27.2.1.(k).2 Wabo Xcel Modular System, by Watson Bowman Acme;

6.7.27.2.1.(k).3 Or alternative as approved by the Authority.

6.7.27.2(1)(l) Supported and Rotatable Finger Joint Expansion-Seismic Joint System, for the driveway connection to the underground parking. Engineered assembly of series of paired, toothed, rotatable gap bridging steel components on sliding plate, anchored to concrete edges.

6.7.27.2.1.(l).1 Wabo Trident Finger Joint System, by Watson Bowman Acme (Sika);

6.7.27.2.1.(l).2 Or alternative as approved by the Authority.

6.7.27.3 Part 3 Execution

6.7.27.3(1) Not applicable.

6.8 Openings (Division 8)

6.8.1 Section 08 11 00 – Metal Doors and Frames

6.8.1.1 Part 1 General

6.8.1.1(1) References

6.8.1.1(1)(a) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.8.1.1(1)(b) ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

6.8.1.1(1)(c) CSDMA, Canadian Steel Door Manufacturers Association.

6.8.1.1(1)(d) DHI, Door Hardware Institute.

6.8.1.1(1)(e) MPI, Master Painters Institute.

6.8.1.1(1)(f) NFPA 80, Standard for Fire Doors and Other Opening Protectives.

6.8.1.1(1)(g) NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

6.8.1.1(1)(h) CAN/ULC S104, Standard Method for Fire Tests of Door Assemblies.

6.8.1.1(1)(i) CAN/ULC-S702, Thermal Insulation, Mineral Fibre for Buildings.

6.8.1.1(1)(j) CAN/ULC S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

6.8.1.1(2) Performance Requirements

6.8.1.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.1.1(2)(b) Perform work in accordance with requirements of the CSDMA and DHI.

6.8.1.1(2)(c) Doors will not swing into corridors, obstruct traffic flow or reduce the minimum required corridor width.

6.8.1.1(2)(d) For the process-oriented Components such as FMO, Energy Centre, Laboratory, Pharmacy, MDR, Biomedical Engineering and Radiation Therapy Service Technology, provide doors as required by the Authority to suit its functional requirements based on the Design.

6.8.1.1(2)(e) Exterior doors and frames:

6.8.1.1.2.(e).1 Exterior doors will meet the requirements of ASHRAE 90.1. All exterior doors will be thermally broken.

6.8.1.1.2.(e).2 Design exterior frame assemblies to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35 deg. C to 35 deg. C.

6.8.1.1.2.(e).3 Exterior doors and frames to be complete with specified heavy galvanized coating and rust inhibiting primer to offer protection against water, de-icing, and similar environmental factors.

6.8.1.1.2.(e).4 Exterior door bottoms to be complete with door bottoms under Finish Hardware Section

to offer protection against water, de-icing, salt and similar environmental factors.

6.8.1.1(2)(f) Provide all fire rated door and frame construction which are labeled and listed to CAN/ULC S104 or NFPA 252. Door and frame assemblies will conform to NFPA 80 for the required fire rated class.

6.8.1.1(3) Quality Assurance

6.8.1.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.1.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.8.1.1(3)(c) Doors, frames and hardware will comply with the standards of the CSDMA and Door and Hardware Institute (DHI) for Hospitals Facilities unless noted otherwise in the Statement of Requirements.

6.8.1.2 Part 2 Products

6.8.1.2(1) Manufacturers

6.8.1.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide hollow metal doors and frames by one of the following:

6.8.1.2.1.(a).1 Daybar Industries Limited.
6.8.1.2.1.(a).2 Fleming-Baron Door Products.
6.8.1.2.1.(a).3 Or alternative as approved by the Authority.

6.8.1.2(2) Materials

6.8.1.2(2)(a) Sheet Steel: Galvanized steel to ASTM A653/A653M, commercial grade (CS), Type B, coating designation Z275 (G90) for exterior and interior wet area doors and frames including factory applied rust inhibiting primer, and coating designation ZF001 (A01) for typical interior doors and frames.

6.8.1.2(2)(b) Door Core Materials

6.8.1.2.2.(b).1 Honeycomb Core (Interior, Non-Rated): Structural small cell, not more than 25 mm (1

inch) kraft paper honeycomb; weight not less than 36.3 kg (80 lb) per ream; density not less than 16 kg/cu.m (1 pcf); sanded to required thickness.

6.8.1.2.2.(b).2 Polyisocyanurate Core (Exterior): CAN/ULC-S704, rigid polyisocyanurate closed cell board, density not less than 32 kg/cu.m (2 pcf), thermal value as required.

6.8.1.2.2.(b).3 Fire Rated (Typical): Mineral fibre insulation to CAN/ULC S702, Type 1A; 24 kg/m3.

6.8.1.2.2.(b).4 Temperature Rise Rated (TRR) Core: Composition to provide fire-protection rating and limit temperature rise on unexposed side of door to 250 degrees C at 30 or 60 minutes, as determined by governing code requirements, core tested as part of a complete door and frame assembly, in accordance with CAN/ULC S104.

6.8.1.2(3) Finishes

6.8.1.2(3)(a) Exterior and interior wet areas: Shop prime with one (1) coat of rust-inhibitive primer. Field painted finish in accordance with MPI requirements as specified in Section 09 91 00.

6.8.1.2(3)(b) Interior, typical: Shop prime with one (1) coat of primer. Field painted finish in accordance with MPI requirements as specified in Section 09 91 00.

6.8.1.2(3)(c) Bituminous Paint: Fibred asphaltic type.

6.8.1.2(4) Fabrication

6.8.1.2(4)(a) Provide metal doors with:

6.8.1.2.4.(a).1 Flush face construction, continuously welded, seamless edge construction using steel sheet;

6.8.1.2.4.(a).2 Provide the following minimum door face gauges:

(a).2.1 16-gauge steel doors for doors over 915 mm wide;

(a).2.2 18-gauge steel doors for doors up to 915 mm wide; and

(a).2.3 Provide thicker gauge as required to suit level of abuse of intended area in conformance with CSDMA requirements.

6.8.1.2.4.(a).3 Fully sealed weather cap on top of door;

6.8.1.2.4.(a).4 Welded edge seams;

6.8.1.2.4.(a).5 Edge seams to correspond with door function and minimize maintenance needed;

6.8.1.2.4.(a).6 Prepared surfaces to receive finishes that resist corrosion from exposure to weather;

6.8.1.2.4.(a).7 All exterior doors that open out will be capped to avoid water collecting in welding channels;

6.8.1.2.4.(a).8 For exterior hollow metal door glazing, use sealed units with warm edge, in thermally-broken frames to prevent heat loss; and

6.8.1.2.4.(a).9 For interior hollow metal door glazing use tempered glass. Provide with safety label where required.

6.8.1.2(4)(b) Provide pressed metal frames with:

6.8.1.2.4.(b).1 Fabricate frames in accordance with CSDMA requirements;

6.8.1.2.4.(b).2 Provide fully welded construction, minimum 1.52 mm (16 gauge, 0.060 inch) thick. Provide high frequency hinge reinforcing to suit heavy weight hinges and full length reinforcing for continuous hinges. Provide 12 gauge welded reinforcing for all surface applied door hardware;

6.8.1.2.4.(b).3 Thermally-broken door frames for exterior door; and

6.8.1.2.4.(b).4 Anchors to each jamb to suit wall type and receive the frame.

6.8.1.2(4)(c) Fire rated doors and frames: Fabricate doors and frames to achieve required fire rating in accordance with ULC.

6.8.1.2(5) Extra Heavy-Duty Doors (Steel Stiffened Construction at Secure Room):

6.8.1.2(5)(a) Face Sheets: 1.7 mm thick (14 ga) minimum steel sheet.

6.8.1.2(5)(b) Coating designation:

6.8.1.2.5.(b).1 Provide galvanneal steel with ZF120 (A40) coating designation in accordance with ASTM A653/A653M.

6.8.1.2(5)(c) Core: Steel stiffened with continuous vertical formed sections, 0.8 mm (0.32") minimum thickness, spaced 150 mm (6") apart, welded to each face sheet at 150 mm (6") on centre. Fill voids

between stiffeners with glass fibre temperature rise rated insulating core.

6.8.1.2(5)(d) Longitudinal edges: Continuously welded and ground smooth with no visible seams.

6.8.1.2(5)(e) Glazing Stops: 1.5 mm thick (16 ga) minimum steel sheet, formed, drilled and countersunk for fastenings.

6.8.1.3 Part 3 Execution

6.8.1.3(1) Not applicable.

6.8.2 Section 08 14 00 – Wood Doors

6.8.2.1 Part 1 General

6.8.2.1(1) References

6.8.2.1(1)(a) ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

6.8.2.1(1)(b) ASTM D5456, Standard Specification for Evaluation of Structural Composite Lumber Products.

6.8.2.1(1)(c) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.8.2.1(1)(d) ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

6.8.2.1(1)(e) ASTM E1333, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

6.8.2.1(1)(f) ANSI A208.1, Particleboard.

6.8.2.1(1)(g) AWI/AWMAC, Architectural Woodwork Institute, Architectural Woodwork Manufacturers Association of Canada.

6.8.2.1(1)(h) NAAWS, North American Architectural Woodwork Standards.

6.8.2.1(1)(i) NEMA LD 3, High-Pressure Decorative Laminates.

6.8.2.1(1)(j) NFPA 80, Standard for fire Doors and other Opening Protectives.

6.8.2.1(1)(k) NFPA 252, Standard Methods of Fire Tests of Doors Assemblies.

6.8.2.1(1)(l) CAN/ULC S104, Standard Method for Fire Tests of Door Assemblies.

6.8.2.1(1)(m) WDMA, Window & Door Manufacturers Association.

6.8.2.1(2) Performance Requirements

6.8.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.2.1(2)(b) Perform work in accordance with requirements of NAAWS Quality Standards.

6.8.2.1(2)(c) Wood doors will not be used for service or Staff Back-of-House entrances to Component due to high traffic of transfers and equipment/supply movements.

6.8.2.1(2)(d) Wood doors to have hardware and finishes that suit the intended function and aesthetics of the Facility. All wood door edges will be sealed.

6.8.2.1(2)(e) Wood doors are not permitted in areas and service rooms (e.g., mechanical, electrical, communications, exit stairs, etc.).

6.8.2.1(3) Quality Assurance

6.8.2.1(3)(a) Perform work in accordance with requirements of NAAWS Quality Standards for Architectural Woodwork, Premium Grade, for materials and installation unless noted otherwise. Perform work in accordance with the definition of Good Workmanship as defined in the NAAWS Quality Standards.

6.8.2.1(3)(b) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.2.1(3)(c) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar

size and nature and that is approved by manufacturer.

6.8.2.1(3)(d) Ensure fire rated doors have been tested in accordance with CAN/ULC S104 and NFPA 252.

6.8.2.1(3)(e) Ensure fire rated doors comply with NFPA-80 and carry labels acceptable to AHJ; Site applied and stamped fire-labeling is not acceptable.

6.8.2.1(3)(f) Provide flush wood core doors which comply with WDMA I.S 1A, Section C-13, Flush Wood Door Minimum Performance Standards, Duty Level: Extra Heavy Duty.

6.8.2.2 Part 2 Products

6.8.2.2(1) Manufacturers

6.8.2.2(1)(a) Acceptable Manufacturers with local representation, subject to conformance with requirements of this Section, provide wood doors by one of the following:

6.8.2.2.1.(a).1 Masonite/Baillargeon.
6.8.2.2.1.(a).2 Lambton Doors.
6.8.2.2.1.(a).3 Lynden Door Inc.
6.8.2.2.1.(a).4 Or alternative as approved by the Authority.

6.8.2.2(2) Wood Door Facing

6.8.2.2(2)(a) Facing (FRL): Fibre reinforced laminate for all wood doors, 1.9 mm (0.075 inches) thick, monolithic panel with 20% continuous glass fibres; with the following properties:

6.8.2.2.2.(a).1 Barcol Hardness: ASTM D2583, 35 typical.
6.8.2.2.2.(a).2 Wear Resistance: NEMA LD 3, 13: Minimum 3,500.
6.8.2.2.2.(a).3 Surface Burning: ASTM E84, Class A. .1 Flame Spread: 25 or less.
6.8.2.2.2.(a).4 Smoke Developed: 30 or less.
6.8.2.2.2.(a).5 Acceptable Products:
(a).5.1 Panolam FRL by Panolam Surface Systems.
(a).5.2 Or alternative as approved by the Authority.

6.8.2.2(3) Standard Duty Non-Rated Flush Wood Doors

6.8.2.2(3)(a) Core: Particle Board: ANSI A208.1; 449 kg/m3 – 513 kg/m3 (28 lb/ft3 – 32 lb/ft3) density solid

particle core, mat-formed sanded both sides, thickness as recommended by AWI/AWMAC for specified NAAWS requirements. Ensure items are classified M2 in accordance with ASTM E1333.

6.8.2.2(3)(b) Stiles: Minimum 11 mm thick (7/16”) thick hardwood laminated to 25 mm (1”) thick structural composite lumber or laminated veneer lumber bonded to core with matching sealed hardwood edge strips. Total Thickness: Manufacturer’s standard thickness required to meet performance requirements specified herein.

6.8.2.2(3)(c) Rails: Minimum 30 mm thick (1-3/16”) thick hardwood, structural composite lumber or laminated veneer lumber bonded to core.

6.8.2.2(4) Heavy Duty Non-Rated Flush Wood Doors

6.8.2.2(4)(a) Core: ASTM D5456 or ANSI/WDMA I.S.4, structural composite lumber or laminated veneer lumber laminated using hot pressing process with Type 1 adhesive as specified herein. Floating cores are not acceptable.

6.8.2.2(4)(b) Stiles: Minimum 11 mm (7/16”) thick, hardwood, structural composite lumber or laminated veneer lumber bonded to core with matching sealed hardwood edge strips.

6.8.2.2(4)(c) Rails: Integrated.

6.8.2.2(5) Fire Rated Flush Wood Doors

6.8.2.2(5)(a) Core: Incombustible mineral core to meet fire-resistance rating requirements specified herein.

6.8.2.2(5)(b) Stiles: Manufacturer’s standard stiles as required for fire rating.

6.8.2.2(5)(c) Rails: Manufacturer’s standard rails as required for fire rating.

6.8.2.2(5)(d) Interior Blocking: Approved fire-retardant reinforcement minimum 120 mm (4-3/4") high at top, bottom rails and at mid height of doors as required to secure surface applied hardware with screw meeting WDMA Extra Heavy-Duty Performance. Provide minimum 11 mm (7/16") hardwood blocking in accordance with WDMA

standards. On doors over 900 mm (36") wide, provide additional approved fire-retardant reinforcement to hinge stile of door.

6.8.2.2(5)(e) Vision Framing: ULC labeled, Prime painted metal framing or fire rated wooden molding kit to match door faces.

6.8.2.2(6) Sound Retardant Wood Doors

6.8.2.2(6)(a) Core: Acoustical sound attenuating core with proprietary sound attenuating material to achieve minimum STC ratings specified in Acoustic, Vibration, and Noise Control Measures when tested in accordance with ASTM E90.

6.8.2.2(6)(b) Stiles: Manufacturer’s standard stiles as required for sound attenuation rating.

6.8.2.2(6)(c) Rails: Manufacturer’s standard rails as required for sound attenuation rating.

6.8.2.2(6)(d) Crossbands: Provide high-density composite crossbands in manufacturer’s standard thicknesses required to meet performance requirements. Ensure crossbands extend full width of door.

6.8.2.2(6)(e) Sound Traps and Seals: as required for sound attenuation rating.

6.8.2.2(7) Fabrication

6.8.2.2(7)(a) Fabricate flush wood core doors 45 mm (1-3/4") thick, unless noted otherwise.

6.8.2.2(7)(b) Factory machine doors for finish hardware in accordance with hardware requirements and dimensions.

6.8.2.2(7)(c) Fabricate flush wood core doors with following edge clearances:

6.8.2.2.7.(c).1 3 mm (1/8") clearance at top and sides;

6.8.2.2.7.(c).2 6 mm (1/4") clearance at bottom to top of floor finish and thresholds.

6.8.2.2(7)(d) Apply fibre reinforced laminate on door edges before front faces.

6.8.2.2(7)(e) Fabricate fire rated doors to comply with NFPA 80. Cut and trim openings through doors to comply with NFPA 80 requirements.

6.8.2.3 Part 3 Execution

6.8.2.3(1) Not applicable.

6.8.3 Section 08 31 00 – Access Doors and Panels

6.8.3.1 Part 1 General

6.8.3.1(1) Quality Assurance

6.8.3.1(1)(a) Installers qualifications: Perform work of this Section by a company that has a minimum of five (5) years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.8.3.2 Part 2 Products

6.8.3.2(1) Access Doors, General

6.8.3.2(1)(a) All access doors within the Facility to be of a common key to conform to Authority's key management system.

6.8.3.2(1)(b) Provide access doors in GB ceilings where rooms are to have a gang box stubbed to cable tray, refer to Appendix 1N [Electrical and Communications Matrix].

6.8.3.2(1)(c) Refer to Section 7.8.10.5(4) for additional requirements.

6.8.3.2(2) Flush Non-Rated Access Doors and Frames (AD1)

6.8.3.2(2)(a) Door: Minimum 1.5 mm (0.060") sheet metal, set flush with exposed face flange of frame.

6.8.3.2(2)(b) Frame: Minimum 1.5-mm (0.060") thick sheet metal with 25-mm (1") wide, surface mounted trim.

6.8.3.2(2)(c) Hinges: Spring-loaded, concealed-pin type or Continuous piano as required.

6.8.3.2(2)(d) Latch: Cylinder lock and common key to conform to key management system.

6.8.3.2(2)(e) Size: Minimum 610 mm x 610 mm (24" x 24").

6.8.3.2(2)(f) Provide product with flanges for taping into gypsum board system.

6.8.3.2(3) Fire Rated Access Doors and Frames (AD-FR)

6.8.3.2(3)(a) Fire-Resistance Rating: Not less than that of adjacent construction.

6.8.3.2(3)(b) Temperature Rise Rating: As required by AHJ but not less than 139 deg C (250 deg F) at the end of 30 minutes.

6.8.3.2(3)(c) Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.9 mm (0.036”).

6.8.3.2(3)(d) Frame: Minimum 1.5 mm (0.060”) thick sheet metal with 25 mm (1”) wide, surface mounted trim.

6.8.3.2(3)(e) Hinges: Continuous piano type.

6.8.3.2(3)(f) Automatic Closer: Spring type.

6.8.3.2(3)(g) Latch: Self-latching device operated by common key to conform to key management system with interior release.

6.8.3.2(4) High Security Fire Rated Access Doors and Frames (AD-FR-S)

6.8.3.2(4)(a) Door: Minimum 2.78 mm (12 ga - 0.1094”) sheet metal for non-rated applications. Minimum 1.9 mm (0.0747”) for fire rated applications.

6.8.3.2(4)(b) Frame: Minimum 2.78 mm (12 ga - 0.1094”) thick sheet metal for non-rated applications. Minimum 1.5 mm (0.0598”) for fire rated applications. Provide units with 25 mm (1”) perimeter flange.

6.8.3.2(4)(c) Hinges: 165o, concealed continuous piano hinge with Tamper Resistant type slot catch flush to surface.

6.8.3.2(4)(d) Latch: Detention grade cylinder lock and common key to conform to key management system. Provide four additional countersunk allen head cam latches with security pin at corners and midpoint of doors to prevent prying.

6.8.3.2(4)(e) Fire-Resistance Rating (where required): Not less than that of adjacent construction.

6.8.3.2.4.(e).1 Automatic closure device: Integral automatic spring closure device for each door.

6.8.3.2.4.(e).2 Interior latch release: Mechanism to allow for panel to open from interior side.

6.8.3.3 Part 3 Execution

6.8.3.3(1) Not applicable.

6.8.4 Section 08 33 13 – Coiling Counter Doors

6.8.4.1 Part 1 General

6.8.4.1(1) References

6.8.4.1(1)(a) ASTM A568/A568M, Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements.

6.8.4.1(1)(b) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.8.4.1(1)(c) ASTM B209/B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.8.4.1(1)(d) ASTM B211/B211M, Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

6.8.4.1(2) Performance Requirements

6.8.4.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.4.1(2)(b) Provide overhead rolling counter shutters at all reception desks, transaction counters and Serveries.

6.8.4.1(2)(c) Provide shutter curtains fabricated with extruded aluminum, or galvanized steel interlocking flat slats, complete with guides of similar materials.

6.8.4.1(2)(d) Provide motorized operation for overhead shutters with manual override and locking capability.

6.8.4.1(2)(e) Provide monitored electric or photoelectric sensors for entrapment protection.

6.8.4.1(3) Quality Assurance

6.8.4.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.4.2 Part 2 Products

6.8.4.2(1) Manufacturers

6.8.4.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide coiling counter doors by one of the following:

6.8.4.2.1.(a).1 Cookson.

6.8.4.2.1.(a).2 Cornell.

6.8.4.2.1.(a).3 Overhead Door Corporation.

6.8.4.2.1.(a).4 Wayne Dalton.

6.8.4.2.1.(a).5 Or alternative as approved by the Authority.

6.8.4.2(2) Materials

6.8.4.2(2)(a) Steel: ASTM A568/A568M, Class 1; Commercial grade steel, hot dip galvanized to ASTM A653/A653M, ZF075 satin coat finish.

6.8.4.2(2)(b) Aluminum:

6.8.4.2.2.(b).1 Aluminum extrusions: ASTM B211; Aluminum Association alloy AA6063-T5

6.8.4.2.2.(b).2 Aluminum sheet: ASTM B209; plain finish utility sheet.

6.8.4.2(3) Coiling Counter Doors, Non-Rated

6.8.4.2(3)(a) Curtain will consist of interlocking, 32 mm wide flat slats of 22 ga. prime painted galvanized steel or aluminum, fitted with endlocks to hold curtain in alignment.

6.8.4.2(3)(b) Bottom of curtain will be fitted with a bottom bar of single primed angle or aluminum provided with a lift handle and master-keyed cylinder(s) on one or both sides. Bottom bar to have continuous foam astragal bumper to seal against counter top.

6.8.4.2(3)(c) Frame will be prime painted galvanized steel or extruded aluminum to suit wall thickness, consisting of 10 ga. jambs, head and fascia. Provide grooves formed into sides of frame for retaining curtain.

6.8.4.2(3)(d) Hood will be galvanized painted steel or aluminum equipped with intermediate support where required.

6.8.4.2(3)(e) Operation will be by electric motor and monitored electric or photoelectric sensors for entrapment protection.

6.8.4.2(3)(f) Finishes:

6.8.4.2.3.(f).1 Galvanized steel: All galvanized steel will have minimum 0.2 mils thick baked on prime paint finish and minimum 0.6 mils thick baked on polyester paint finish.

6.8.4.2.3.(f).2 Aluminum: All aluminum to be clear anodized.

6.8.4.2(4) Coiling Counter Doors, Fire Rated

6.8.4.2(4)(a) Curtain will consist of interlocking, 32 mm wide flat slats of 25 ga. prime painted galvanized steel, fitted with endlocks to hold curtain in alignment.

6.8.4.2(4)(b) Bottom of curtain will be fitted with a bottom bar of single primed angle provided with a lift handle and master-keyed cylinder(s) on one or both sides. Bottom bar to have continuous foam astragal bumper to seal against counter top.

6.8.4.2(4)(c) Frame will be prime painted galvanized steel to suit wall thickness, consisting of 16 ga. jambs, head and fascia and 14 ga. sill. Provide grooves formed into sides of frame for retaining curtain.

6.8.4.2(4)(d) Hood will be galvanized painted steel equipped with thermally controlled, internal flame baffle. Additional support will be provided for openings over 4115 mm.

6.8.4.2(4)(e) Operation will be by ULC listed electric motor and monitored electric or photoelectric sensors for entrapment protection, with automatic closure by means of fusible link and governor meeting NFPA 80.

6.8.4.2(4)(f) Finish: All galvanized steel will have minimum 0.2 mils thick baked on prime paint finish and minimum 0.6 mils thick baked on polyester paint finish.

6.8.4.3 Part 3 Execution

6.8.4.3(1) Not applicable.

6.8.5 Section 08 33 23 – Overhead Coiling Doors

6.8.5.1 Part 1 General

6.8.5.1(1) References

6.8.5.1(1)(a) ASTM A480, General Requirements for Flat-Rolled Stainless Heat-Resisting Steel Plate, Sheet, and Strip.

6.8.5.1(1)(b) ASTM A653/A653M, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.8.5.1(1)(c) CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations.

6.8.5.1(1)(d) CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

6.8.5.1(1)(e) CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

6.8.5.1(1)(f) NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

6.8.5.1(1)(g) NEMA ICS 2, Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

6.8.5.1(1)(h) NEMA MG1, Motors and Generators.

6.8.5.1(1)(i) UL 325, Standard for Safety: Door, Drape, Gate, Louver and Window Operators and Systems.

6.8.5.1(2) Performance Requirements

6.8.5.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.5.1(2)(b) Exterior coiling doors:

6.8.5.1.2.(b).1 Provide a thermally broken insulated coiling overhead door, electrically operated complete with safety edge.

6.8.5.1.2.(b).2 Design overhead rolling service doors with a minimum insulation value of RSI-1.4 (R-8) and provide weather stripping / seals.

6.8.5.1.2.(b).3 Design door assembly to withstand wind loads in closed position of 1.38 kPa. Maximum deflection under full design load to be 1/240 of opening width.

6.8.5.1(2)(c) Provide ULC listed heavy-duty, high-starting torque electric motor operation, complete with manual override for times of power outage or motor failure, and inertia brakes, located on the drive shaft, to prevent curtain free fall.

6.8.5.1(2)(d) Calculate properties of steel sections and allowable stresses used in determination of structural performance in accordance with CSA S136.1-M.

6.8.5.1(2)(e) Design door assembly to withstand minimum 20,000 cycles per annum, and 20 years total Life Cycle.

6.8.5.1(2)(f) Design for means of fully reversing downward descent of door, if door comes down on an obstruction. Door to cycle closed until obstruction is removed.

6.8.5.1(3) Quality Assurance

6.8.5.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.5.2 Part 2 Products

6.8.5.2(1) Manufacturers

6.8.5.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide non-rated overhead coiling doors by one of the following:

6.8.5.2.1.(a).1 Cookson.
6.8.5.2.1.(a).2 Cornell.
6.8.5.2.1.(a).3 Overhead Door Corporation.
6.8.5.2.1.(a).4 Wayne Dalton.
6.8.5.2.1.(a).5 Or alternative as approved by the Authority.

6.8.5.2(2) Materials

6.8.5.2(2)(a) Curtain: Conforming to the following:

6.8.5.2.2.(a).1 Slats: Interlocking, of ASTM A653/A653M steel, galvanized; single thickness slat for interior applications, sandwich slat construction with insulated core for exterior applications
6.8.5.2.2.(a).2 Slat Ends: Fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
6.8.5.2.2.(a).3 Curtain Bottom: Fitted with angles to provide reinforcement and positive contact with floor or counter in closed position.

6.8.5.2(2)(b) Guides: Galvanized steel conforming to ASTM A653/A653M, or stainless steel conforming to

ASTM A480 Type 304 rollable temper of continuous angles, of profile to retain door/shutter in place, mounting brackets of same metal.

6.8.5.2(2)(c) Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension.

6.8.5.2(2)(d) Hood Enclosure and Fascia: Galvanized steel; internally reinforced to maintain rigidity and shape.

6.8.5.2(2)(e) Hardware:

- 6.8.5.2.2.(e).1 Cylinders.
- 6.8.5.2.2.(e).2 Handle: Inside mounted, adjustable keeper, spring activated latch bar with feature to keep in locked or retracted position; interior handle.
- 6.8.5.2.2.(e).3 Weather-stripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure.

6.8.5.2(2)(f) Electric Operator:

- 6.8.5.2.2.(f).1 Description: UL 325.
- 6.8.5.2.2.(f).2 Motor Enclosure: NEMA MG1 Type 1.
- 6.8.5.2.2.(f).3 Motor Rating: Continuous duty, sized as required for application.
- 6.8.5.2.2.(f).4 Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
- 6.8.5.2.2.(f).5 Controller Enclosure: NEMA 250 Type 1.
- 6.8.5.2.2.(f).6 Brake: Adjustable friction clutch type, activated by motor controller.

6.8.5.2(2)(g) Chain operator (emergency back-up): Provide for chain hoist operator with cast iron gears or roller chain sprocket.

6.8.5.2(2)(h) Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.

6.8.5.2(2)(i) Safety Edge: Located at door bottom, full width, electro-mechanical sensitized type, wired to reverse door upon striking object, weather seal.

6.8.5.2(3) Finishes

6.8.5.2(3)(a) Steel sheet finish: All galvanized steel will have 0.2 mil thick baked-on prime paint finish and 0.6 mil baked-on polyester paint.

6.8.5.2(3)(b) Steel: Hot dip galvanized in accordance with CAN/CSA G164-M.

6.8.5.2(3)(c) Stainless steel: No. 4 finish.

6.8.5.3 Part 3 Execution

6.8.5.3(1) Not applicable.

6.8.6 Section 08 33 24 – High-Speed Service Doors

6.8.6.1 Part 1 General

6.8.6.1(1) References

6.8.6.1(1)(a) NEMA 4X, Enclosures and Boxes.

6.8.6.1(2) Performance Requirements

6.8.6.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.6.1(2)(b) Door to opens at speed of 1500 mm per second and closes at 600 mm per second.

6.8.6.1(2)(c) Rolling door curtain and assembly, in the down position, to withstand windloads of 127 mph (20 psf).

6.8.6.1(2)(d) Door to be equipped for exterior mounting including hoods and header.

6.8.6.1(3) Quality Assurance

6.8.6.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.6.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.8.6.2 Part 2 Products

6.8.6.2(1) Manufacturers

6.8.6.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide high-speed doors by one of the following:

6.8.6.2.1.(a).1 Rytec Corporation.

6.8.6.2.1.(a).2 Or alternative as approved by the Authority.

6.8.6.2(2) High-Speed Service Doors

6.8.6.2(2)(a) Door panel:

6.8.6.2.2.(a).1 Double-walled, aluminum slats, 150 mm high by 30 mm thick, with integral rubber weatherseal between each panel.

6.8.6.2.2.(a).2 Door slats are connected by hinge system to provide additional rigidity and security to door panel.

6.8.6.2(2)(b) Side frames:

6.8.6.2.2.(b).1 Prefinished steel side frames with full height weather seal on both sides to seal against door panel.

6.8.6.2.2.(b).2 Doors using an external coil cord will not be accepted.

6.8.6.2(2)(c) Bottom bar: Extruded aluminum bottom bar with electric, reversing edge that reverses the door upon contacting an object.

6.8.6.2(2)(d) Counterbalance:

6.8.6.2.2.(d).1 Up to six extension springs in each side column, depending on size of door.

6.8.6.2.2.(d).2 Springs assist motor in opening door.

6.8.6.2.2.(d).3 Mechanical release lever on side column allows door to be easily opened in event of a power failure.

6.8.6.2.2.(d).4 Doors using torsion springs for counterbalance or doors with springs located within a barrel will not be accepted.

6.8.6.2(2)(e) Provide heavy-duty three-phase, variable-speed AC drive provides soft acceleration and deceleration with independent opening and closing speeds, with manual override in case of power failure. Motor and electrical components will be factory wired to junction boxes in the head assembly. Motors using clutch or brake to start or stop door movement is not accepted.

6.8.6.2(3) Electrical Components

6.8.6.2(3)(a) All electronic controls will be housed in a cUL listed, NEMA 4X-rated enclosure.

6.8.6.2(3)(b) Provide control panel at floor level with self-diagnostic display for informational message for installation, control adjustments and error reporting. Control panel will log all time and date stamped errors for at least 2 years, downloadable to a USB flash drive.

6.8.6.2(3)(c) Provide programmable inputs and outputs to accommodate special control applications without the need for additional electrical components.

6.8.6.2(4) Finish

6.8.6.2(4)(a) Manufacturer's standard, UV stable, powder coat finish, resistant to rust, corrosion and fingerprints.

6.8.6.3 Part 3 Execution

6.8.6.3(1) Not applicable.

6.8.7 Section 08 33 26 – Overhead Coiling Grilles

6.8.7.1 Part 1 General

6.8.7.1(1) References

6.8.7.1(1)(a) AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

6.8.7.1(1)(b) ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

6.8.7.1(1)(c) ASTM A336/A336M, Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts.

6.8.7.1(1)(d) ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.8.7.1(1)(e) ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.8.7.1(1)(f) ASTM B221M, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

6.8.7.1(1)(g) ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

6.8.7.1(1)(h) CAN/CGSB-1.40M, Primer, Structural Steel, Oil Alkyd Type.

6.8.7.1(1)(i) CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

6.8.7.1(1)(j) CSA W59, Welded Steel Construction (Metal Arc Welding).

6.8.7.1(1)(k) CSA W59.2, Welded Aluminum Construction.

6.8.7.1(2) Performance Requirements

6.8.7.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.7.1(2)(b) Provide grilles that allow visual access to secure areas including Retail - Food and Retail - Pharmacy.

6.8.7.1(2)(c) Provide aluminum or steel guides that are: fabricated to withstand vertical and lateral loads; counterbalanced by helical torsion springs; and sound-deadened.

6.8.7.1(2)(d) For manually operated closures, provide inside lift handle and locking bar or chain hoist. Provide motor operation on grilles requiring constant usage. Provide chain operation by means of reduction gears and heavy chrome plated hand chain.

6.8.7.1(2)(e) Provide motor operation for any overhead doors to be operated by clinical Staff.

6.8.7.1(2)(f) Provide motor operation for gates within the underground parking area of the Facility. For parking areas, gate will have card access control, timer control function and embed sensors for egress. Provide an adjacent man door with card access control at each gate.

6.8.7.1(2)(g) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.8.7.1(3) Quality Assurance

6.8.7.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.7.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.8.7.2 Part 2 Products

6.8.7.2(1) Materials

6.8.7.2(1)(a) Aluminum extrusions: ASTM B221 and ANSI H35.1 AA6063 alloy, T5 temper.

6.8.7.2(1)(b) Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 3.0 mm thick.

6.8.7.2(1)(c) Aluminum Plate and Tubes: AA1100-H14 alloy, anodizing quality, conforms to ASTM B209.

6.8.7.2(1)(d) Aluminum Welding Materials: Conforms to CSA W59.2.

6.8.7.2(1)(e) Fasteners: ASTM F738M; Stainless Steel Type 304.

6.8.7.2(1)(f) Steel: Conforms to CAN/CSA-G40.20/G40.21, Grade 300W.

6.8.7.2(1)(g) Sheet Steel (Commercial Quality): ASTM A336/A336M, stretcher levelled or temper rolled.

6.8.7.2(1)(h) Galvanized Sheet Steel (Structural Quality): Galvanizing as specified, ASTM A653/A653M, plain commercial galvanized stretcher levelled or temper rolled. Will be specially treated by a phosphate conversion process or similar prepaint process if steel is to be exposed and finish painted.

6.8.7.2(1)(i) Galvanizing: All steel specified to be galvanized will be galvanized after fabrication by the hot dip process according to CAN/CSA-G164M, with minimum coating of 2 oz./sq. ft. Galvanize after all welding complete. No welding of galvanized products allowed.

6.8.7.2(1)(j) Steel Welding Materials: Conforms to CSA W59.

6.8.7.2(1)(k) Primer: Oil alkyd type primer conforming to CAN/CGSB-1.40M.

6.8.7.2(1)(l) Isolation material: Bitumastic isolation coating, acid and alkali resistant material or neoprene isolation material.

6.8.7.2(2) Fabrication

6.8.7.2(2)(a) Links: 3 mm x 16 mm x 92 mm at 229 mm centres attached to and forming a rolling connection with 8 mm aluminum rod bars. Horizontal members will be spaced at no greater than 38 mm. Every double link centre rod will have a cover sleeve.

6.8.7.2(2)(b) Side Guides: Side guides will be fabricated from extruded aluminum. Equip side guides with vinyl stripping to ensure quiet operation.

6.8.7.2(2)(c) Bottom Bars: Bottom bars will be fabricated from heavy duty aluminum with cylinders located as directed by the Authority.

6.8.7.2(2)(d) Locking Mechanisms: Central locking mechanism in bottom bar will be 2 point deadlock which engages 10 mm steel lock bars at each end.

6.8.7.2(2)(e) Shafts: Shaft to which the curtain is fastened is to be standard pipe of adequate diameter to prevent deflection exceeding 0.76 mm per foot of grille width.

6.8.7.2(2)(f) Counterbalance: Shaft will enclose oil tempered, helical torsion springs of a design to ensure proper counterbalancing action and 25% overload factor. Springs will be mounted on shaped anchors mounted on a single solid torsion rod. Spring tension adjustment will be by means of an adjusting wheel and pin on the outside of the end plates.

6.8.7.2(2)(g) End Plates: End plates will be fabricated of 5 mm, minimum, steel plate. End plates will support the grille shaft and form an end closure for the hood. Ends of the grille shaft are to be supported by sealed ball bearings of sufficient capacity for shaft and curtain loading. End plates will be supplied with clips to which the hoods are to be fastened.

6.8.7.2(2)(h) Hoods: Provide aluminum hood to completely cover barrel and mechanisms.

6.8.7.2(2)(i) Provide manual hand-crank operation when area of grille exceeds 120 sq.ft.

6.8.7.2(2)(j) Grille Support Framing:

6.8.7.2.2.(j).1 Provide and install steel support framing complete with all bracing required for lateral stability, for anchorage of security grille tracks. Framing will be designed to provide a rigid trouble free support. Weld all connections unless noted otherwise.

6.8.7.2.2.(j).2 Coordinate installation with work of other Sections.

6.8.7.2.2.(j).3 Installation to meet approval of AHJ thereover.

6.8.7.2.2.(j).4 Finish: Prime paint.

6.8.7.2(3) Finishes

6.8.7.2(3)(a) Clear Anodizing Class II: All aluminum exposed in the finished work will have clear anodic coating, minimum 0.4 mils thickness, and conforms to AAMA 611. Aluminum Finish Designation AA-M12C22A31, Architectural Class II.

6.8.7.2(3)(b) Steel: Finish for all steel surfaces is to be one shop coat of primer, except on galvanized surfaces and bearings, etc.

6.8.7.3 Part 3 Execution

6.8.7.3(1) Not applicable.

6.8.8 Section 08 33 36 – Side Folding Grilles

6.8.8.1 Part 1 General

6.8.8.1(1) References

6.8.8.1(1)(a) AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

6.8.8.1(1)(b) ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).

6.8.8.1(1)(c) ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.8.8.1(1)(d) ASTM B221M, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

6.8.8.1(1)(e) ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

6.8.8.1(2) Performance Requirements

6.8.8.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.8.1(2)(b) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.8.8.1(3) Quality Assurance

6.8.8.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.8.2 Part 2 Products

6.8.8.2(1) Manufacturers

6.8.8.2(1)(a) Acceptable Products: ESC-31 by Cornell or alternative as approved by the Authority.

6.8.8.2(2) Materials

6.8.8.2(2)(a) Aluminum extrusions: ASTM B221 and ANSI H35.1 AA6063 alloy, T5 temper.

6.8.8.2(2)(b) Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 3.0 mm thick.

6.8.8.2(2)(c) Fasteners: ASTM F738M, Stainless Steel Type 304.

6.8.8.2(2)(d) Isolation material: Bitumastic isolation coating, acid and alkali resistant material or neoprene isolation material.

6.8.8.2(2)(e) Finish: Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A41.

6.8.8.2(3) Fabrication

6.8.8.2(3)(a) Ensure exposed surfaces of aluminum are free of die marks, scratches, blisters, leave off marks, or other blemishes, whether left unfinished or finished.

6.8.8.2(3)(b) Curtain: 184 mm wide with 102 mm high bottom and 133 mm high top plates of truss like aluminum and glazed with 3 mm fire-resistant polycarbonate with a 100 percent viewable area of 121 mm wide. Connect panels with two-piece vertical aluminum tubular hinges.

6.8.8.2(3)(c) Tracks: Extruded aluminum type with continuous extruded profile seamed together by alignment bars and track pins. Track to accept nylon trolleys and carry weight of complete curtain.

6.8.8.2(3)(d) Top plate: to be complete with adjustable height hardware to allow up to 25 mm upward or downward height correction without removal of curtain from installed position.

6.8.8.2(3)(e) Connect panels with one-piece vertical tubular hinges.

6.8.8.2(3)(f) Connect vertical members at curtain edges to extruded vertical members with fixed end members fastened to wall. Provide trailing end of curtain with a floating end-member where stacking pockets are used.

6.8.8.3 Part 3 Execution

6.8.8.3(1) Not applicable.

6.8.9 Section 08 33 44 – Overhead Coiling Fire Doors

6.8.9.1 Part 1 General

6.8.9.1(1) References

6.8.9.1(1)(a) ASTM A36/A36M, Standard Specification for Carbon Structural Steel.

6.8.9.1(1)(b) ASTM A1018/A1018M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

6.8.9.1(1)(c) ASTM B29, Standard Specification for Refined Lead.

6.8.9.1(1)(d) ASTM A653/A653M, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.8.9.1(1)(e) CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

6.8.9.1(1)(f) NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

6.8.9.1(1)(g) NEMA ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.

6.8.9.1(1)(h) NEMA MG1, Motors and Generators.

6.8.9.1(1)(i) UL, Fire Resistance Directory.

6.8.9.1(1)(j) UL 325, Door, Drapery, Gate, Louvre, and Window Operators and Systems.

6.8.9.1(2) Performance Requirements

6.8.9.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.9.1(2)(b) Design fire shutter to suit fire rating required by design.

6.8.9.1(2)(c) Door to be raised and lowered normally by pushbutton stations. Under fire alarm conditions, door to be lowered without releasing fusible link.

6.8.9.1(2)(d) In case of localized fire a fusible link set at 160 deg. F will disengage the electric operator and release the automatic closing mechanism, causing the door to close. Control closing speed by a governor. Fusible link to close flame baffle in hood.

6.8.9.1(2)(e) Tie electric operator into fire alarm system to automatically close door, without breaking the fusible link should fire alarm be activated. Provide audible alarm at door when door is closing in a fire situation whether caused by fusible link or fire alarm signal.

6.8.9.1(2)(f) Design for means of fully reversing downward descent of door if door comes down on an obstruction. Door to cycle closed until obstruction is removed.

6.8.9.1(2)(g) Automatic closing mechanism will in no way affect the normal operation of door in general service. Resetting of door to be affected by clearing the fire alarm and pushing 'open' on push button station.

6.8.9.1(3) Quality Assurance

6.8.9.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.9.2 Part 2 Products

6.8.9.2(1) Manufacturers

6.8.9.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide fire rated overhead coiling doors by one of the following:

6.8.9.2.1.(a).1 Cookson.
6.8.9.2.1.(a).2 Cornell.
6.8.9.2.1.(a).3 Overhead Door Corporation.
6.8.9.2.1.(a).4 Wayne Dalton.
6.8.9.2.1.(a).5 Or alternative as approved by the Authority.

6.8.9.2(2) Shutter

6.8.9.2(2)(a) Slats: Interlocking, of ASTM A653/A653M steel, galvanized; single thickness slat for interior applications, sandwich slat construction with insulated core for exterior applications

6.8.9.2(2)(b) Slat Ends: Fitted with end locks to act as wearing surface in guides and to prevent lateral movement.

6.8.9.2(2)(c) Curtain Bottom: Fitted with angles to provide reinforcement and positive contact with floor or counter in closed position.

6.8.9.2(2)(d) Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension.

6.8.9.2(2)(e) Fire Alarm Release Mechanism: Electric operated from fire alarm system.

6.8.9.2(2)(f) Fusible link as recommended by door manufacturer.

6.8.9.2(2)(g) Hood Enclosure and Fascia: Galvanized steel; internally reinforced to maintain rigidity and shape.

6.8.9.2(3) Electrical

6.8.9.2(3)(a) Electric Operator:

6.8.9.2.3.(a).1 Description: UL 325.

6.8.9.2.3.(a).2 Motor Enclosure: NEMA MG1 Type 1.

6.8.9.2.3.(a).3 Motor Rating: Continuous duty, sized as required for application.

6.8.9.2.3.(a).4 Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.

6.8.9.2.3.(a).5 Controller Enclosure: NEMA 250 Type 1.

6.8.9.2.3.(a).6 Brake: Adjustable friction clutch type, activated by motor controller.

6.8.9.2(3)(b) Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.

6.8.9.2(3)(c) Safety Edge: Located at door bottom, full width, electro-mechanical sensitized type, wired to reverse door upon striking object, weather seal.

6.8.9.2(4) Finishes

6.8.9.2(4)(a) Steel sheet finish: All galvanized steel will have 0.2 mil thick baked-on prime paint finish and 0.6 mil baked-on polyester paint finish.

6.8.9.2(4)(b) Steel: Hot dip galvanized in accordance with CAN/CSA G164-M.

6.8.9.3 Part 3 Execution

6.8.9.3(1) Not applicable.

6.8.10 Section 08 34 49 – Neutron Shielding Doors and Frames

6.8.10.1 Part 1 General

6.8.10.1(1) References

6.8.10.1(1)(a) ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.8.10.1(1)(b) ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

6.8.10.1(1)(c) CNSC, Canadian Nuclear Safety Commission.

6.8.10.1(1)(d) CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

6.8.10.1(1)(e) NEMA 1, Enclosures.

6.8.10.1(2) Performance Requirements

6.8.10.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.10.1(2)(b) Provide neutron shielding door and frames that conform to CNSC requirements, WSBC, and applicable Health Canada Safety Code (e.g. 35 and 36).

6.8.10.1(2)(c) Provide door and frame materials and workmanship that maintain continuity of neutron shielding at intended door application.

6.8.10.1(3) Quality Assurance

6.8.10.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design structural framing of neutron shielded doors and frames and verify that the following will comply with the requirements of the BCBC:

6.8.10.1.3.(a).1 Obtain neutron shielding door and frame materials produced as standard products from single manufacturer regularly engaged in production of neutron shielding doors and frames;

6.8.10.1.3.(a).2 Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience;

6.8.10.1.3.(a).3 Installer qualifications: Company specializing in installing the products specified in this section with minimum five years documented experience; and

6.8.10.1.3.(a).4 The Design-Builder will provide a full quality control, inspection, and testing program for all installations and provide verification reports assuring compliance to all requirements.

6.8.10.2 Part 2 Products

6.8.10.2(1) Manufacturers

6.8.10.2(1)(a) Acceptable Products (Neutron Shielded Door, Frame and Operator): Sliding or Swinging Neutron Shielded Door and Frame by Nelco Worldwide with door operators by Brookfield Industries Inc. or alternative as approved by the Authority.

6.8.10.2(2) Materials

6.8.10.2(2)(a) Steel: Structural steel shapes and plates, conforming to ASTM A36/A36M or CSA G40.20/G40.21, Grade 300W.

6.8.10.2(2)(b) Aluminum:

6.8.10.2.2.(b).1 Aluminum extrusions: ASTM B221 extruded aluminum alloy AA-6063- T5 or T6.

6.8.10.2.2.(b).2 Aluminum plate and sheet: ASTM B209/B209M; of type and characteristics to match finished extrusions.

6.8.10.2(2)(c) Lead sheet/brick: ASTM B29, defect free.

6.8.10.2(2)(d) Borated polyethylene: High density polyethylene consisting of polyethylene and 5 percent boric oxide.

6.8.10.2(2)(e) Rigid polyethylene sheet: Rigid high density polyethylene (HDPE).

6.8.10.2(2)(f) Concrete: As required for door unit.

6.8.10.2(3) Neutron-Shielded Door, Frames and Operators

6.8.10.2(3)(a) General:

6.8.10.2.3.(a).1 Provide sliding or swinging neutron shielding doors complete with internal reinforcing and features as specified herein.

6.8.10.2.3.(a).2 Swinging neutron shielding doors may be acceptable to Authority if sufficient space is available.

6.8.10.2(3)(b) Sliding Neutron Shielded Door, Frame and Operator:

6.8.10.2.3.(b).1 Structural steel supports: Structural steel beams and rectangular tubing complying with CAN/CSA G40.20/G40.21. Engineer structural support system based upon the length, width, thickness, and weight of door.

(b).1.1 Maximum allowable deflection of overhead support beam under full loading: 0.38 mm over length of beam.

6.8.10.2.3.(b).2 Linear motion system: Block type linear motion system, upper side mounted dual rail system with minimum of four slide units (blocks).

6.8.10.2.3.(b).3 Door operators:

(b).3.1 Automatic door operator, including press wall and kill switches as necessary for use with power cut-off when radiation machines are in use.

(b).3.2 CSA/ULC listed, self contained, surface mounted electro-mechanical device mounted to transom bar. Includes all required controls.

(b).3.3 NEMA 1 vented enclosure/control box.

(b).3.4 Peak operating force (maximum): 3115 kg (700 lbs).

(b).3.5 Continuous operating force (maximum): 2225 kg (500 lbs).

(b).3.6 Travel (maximum in one direction): 1500 mm.

(b).3.7 Rated linear speed (maximum): 114 mm/sec. (4.5” per sec.).

(b).3.8 Rated door weight (maximum): 13,620 kg (30, 000 lbs.).

(b).3.9 Minimum rated cycles (openings and closings): 500,000.

6.8.10.2.3.(b).4 Operation:

(b).4.1 Doors will be automatically activated on each side by a press wall switch.

(b).4.2 Operator to function as a manual door closer in the event of any power loss. Manual operation is provided by disconnecting operator from door by operation of emergency hand crank.

6.8.10.2.3.(b).5 Electric sensing edges: Provide reversing edges or photocell reversing strips.

6.8.10.2.3.(b).6 Mounting channel: Extruded aluminum.

6.8.10.2.3.(b).7 Housing cover: Low-profile type with end closure covers.

6.8.10.2.3.(b).8 Presence detection system: Active infrared presence sensor providing infrared curtains (one on each side of door) that will detect stationary humans or objects within the sensing pattern.

6.8.10.2.3.(b).9 Emergency power supply: Provide battery backup system for operator to allow for emergency opening of door during loss of power supply.

6.8.10.2.3.(b).10 Battery backup: Two batteries with float chargers and test switch will be assembled in a grounded and vented NEMA 1 control box.

6.8.10.2(3)(c) Swinging Neutron Shielded Door, Frame and Operator:

6.8.10.2.3.(c).1 Hinges: Heavy-duty precision pre-engineered high capacity full surface vertically adjustable hinges fabricated from cold rolled steel complying with ASTM A1018/A1018M with a thrust capacity accommodating the required door weight and radial loading.

6.8.10.2.3.(c).2 Door operators:

(c).2.1 Automatic door operator, including press wall and kill switches as necessary for use with power cut-off when radiation machines are in use.

(c).2.2 CSA/ULC listed, self contained, surface mounted electro-mechanical device mounted to transom bar. Includes all required controls.

(c).2.3 NEMA 1 vented enclosure/control box.

(c).2.4 Rated operating torque (maximum): 113N-m (1000 pound-inches).

(c).2.5 Rated door weight (maximum): 2043 kg (4500 lbs.).

(c).2.6 Rated door width (maximum): 1.68 m (66”).

(c).2.7 Minimum rated cycles (openings and closings): 500,000.

6.8.10.2.3.(c).3 Operation:

(c).3.1 Doors will be automatically activated on each side by a press wall switch.

(c).3.2 Operator to function as a manual door closer in the event of any power loss. Manual operation is provided by disconnecting operator from door by operation of emergency hand crank.

6.8.10.2.3.(c).4 Presence detection system: Door mounted active infrared presence sensor that will detect stationary humans or objects within the sensing pattern.

6.8.10.2.3.(c).5 Emergency power supply: Provide battery backup system for operator to allow for emergency opening of door during loss of power supply.

6.8.10.2.3.(c).6 Battery backup: Battery with float chargers and test switch will be assembled in a grounded and vented NEMA 1 control box.

6.8.10.2.3.(c).7 Thresholds: 6 mm thick bent plate fabricated to 38 mm thick by width and depth to match frame. 6 mm thick lead bonded to thresholds.

6.8.10.2.3.(c).8 Frame components:

(c).8.1 Materials for frames, reinforcement, anchors, anchor clips, and related items: Structural steel to ASTM A36.

(c).8.2 Hinges: 12.7 mm thick bar stock, width to suit frame dimension.

6.8.10.2(3)(d) Plate reinforcing for frame anchors: 12.7 mm thick steel plate, width and length to suit frame dimension.

6.8.10.2(4) Fabrication

6.8.10.2(4)(a) Sliding neutron shielded doors and frames:

6.8.10.2.4.(a).1 All welded construction, full flush type doors, fabricated from perimeter frames of flat steel bar or plate.

6.8.10.2.4.(a).2 Door faces: Minimum 9.5 mm thick steel plate.

6.8.10.2.4.(a).3 Stiles: Minimum 19 mm thick flat steel bar or plate.

6.8.10.2.4.(a).4 Rails: Minimum 25 mm thick flat steel bar or plate.

6.8.10.2.4.(a).5 Core construction: Manufacturer's standard lead sheet/brick, borated polyethylene and concrete core.

6.8.10.2.4.(a).6 Fabricate exposed faces of door panels, concealed stiffeners and reinforcement from cold or hot-rolled steel.

6.8.10.2.4.(a).7 Fabricate doors with hardware reinforcement welded in place.

6.8.10.2.4.(a).8 Maximum variation for doors: Maximum diagonal distortion 6 mm measured with straight edge, corner to corner.

6.8.10.2(4)(b) Swinging neutron shielded doors and frames:

6.8.10.2.4.(b).1 All welded construction, full flush type doors, fabricated from perimeter frames of flat steel bar or plate.

6.8.10.2.4.(b).2 Door faces: Minimum 9.5 mm thick steel plate.

6.8.10.2.4.(b).3 Core construction: Manufacturer's standard lead sheet/brick and borated polyethylene core.

6.8.10.2.4.(b).4 Fabricate exposed faces of door panels, concealed stiffeners and reinforcement from cold or hot-rolled steel.

6.8.10.2.4.(b).5 Fabricate doors with hardware reinforcement welded in place.

6.8.10.2.4.(b).6 Maximum variation for doors: Maximum diagonal distortion 6 mm measured with straight edge, corner to corner.

6.8.10.2.4.(b).7 Frames:

(b).7.1 Frame type: Shop welded frames with mitered joints arc-welded, reinforced and ground smooth.

(b).7.2 Reinforcements, stiffeners: Welded to interior surfaces of frames to provide a stable base and so as to not interfere with installation of hardware.

6.8.10.3 Part 3 Execution

6.8.10.3(1) Not applicable.

6.8.11 Section 08 34 50 – Cleanroom Doors and Frames

6.8.11.1 Part 1 General

6.8.11.1(1) References

6.8.11.1(1)(a) ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.8.11.1(1)(b) ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

6.8.11.1(1)(c) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.8.11.1(2) Performance Requirements

6.8.11.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.11.1(3) Quality Assurance

6.8.11.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this

section with minimum three years documented experience.

6.8.11.1(3)(b) Installer qualifications: Company specializing in installing the products specified in this section with minimum five years documented experience.

6.8.11.2 Part 2 Products

6.8.11.2(1) Materials

6.8.11.2(1)(a) High pressure laminate: Manufacturer's standard high pressure laminate door facing.

6.8.11.2(1)(b) Insulation: Manufacturer's standard polystyrene core.

6.8.11.2(1)(c) Aluminum:

6.8.11.2.1.(c).1 Aluminum extrusions: ASTM B221 extruded aluminum alloy AA-6063- T5 or T6.

6.8.11.2.1.(c).2 Aluminum plate and sheet: ASTM B209/B209M; of type and characteristics to match finished extrusions.

6.8.11.2(2) Cleanroom Doors and Frames

6.8.11.2(2)(a) Cleanroom Door and Frame:

6.8.11.2.2.(a).1 Provide plastic laminate faced cleanroom door and frame in locations as required.

6.8.11.2.2.(a).2 Cleanroom door:

(a).2.1 45 mm thick, Class A rated to ASTM E84; cleanroom door consisting of expanded polystyrene insulation core with density of 35 kg/m3, internal framework of welded rectangular extruded aluminum profiles and high pressure laminate door facing.

(a).2.2 Door to be complete with manufacturer's standard silicone sealed double glazed window unit sized at 500x 750 mm, consisting of 6 mm thick toughened glass panes and micro-perforation profile with integral silica gel moisture absorption system to eliminate fogging.

6.8.11.2.2.(a).3 Frames to be extruded rounded anodized or powder coated aluminum frames complete with airtight dual gaskets.

6.8.11.2.2.(a).4 Fasteners for hinges and latches to be recessed into door frame.

6.8.11.2.2.(a).5 Door assembly to e complete with stainless steel shroud at top of unit.

6.8.11.2.2.(a).6 Acceptable Products: Hipharma Doors Nicomac or alternative as approved by the Authority.

6.8.11.2(2)(b) Door operators: Automatic door operators in accordance with Section 6.8.21.

6.8.11.3 Part 3 Execution

6.8.11.3(1) Not applicable.

6.8.12 Section 08 36 13 – Sectional Overhead Doors

6.8.12.1 Part 1 General

6.8.12.1(1) References

6.8.12.1(1)(a) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.8.12.1(1)(b) CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

6.8.12.1(1)(c) CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

6.8.12.1(1)(d) CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

6.8.12.1(2) Performance Requirements

6.8.12.1(2)(a) Perform work in accordance with AHJ and as outlined herein. Provide thermally broken insulated flush sectional overhead door, electrically operated complete with safety edge.

6.8.12.1(2)(b) Design door assembly to withstand wind loads in closed position of 1 kPa positive 0.6 kPa negative, with operators to function against 0.4 kPa wind load. Maximum deflection under full design load to be 1/240 of opening width.

6.8.12.1(2)(c) Calculate properties of steel sections and allowable stresses used in determination of structural performance in accordance with CSA S136.1-M.

6.8.12.1(2)(d) Design door assembly to withstand minimum 100,000 cycles per annum, and 20 years total Life Cycle. Design door panel assemblies with thermal insulation factor minimum 2.32 RSI.

6.8.12.1(3) Quality Assurance

6.8.12.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.12.2 Part 2 Products

6.8.12.2(1) Manufacturers

6.8.12.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide sectional overhead doors by one of the following:

6.8.12.2.1.(a).1 Overhead Door Corporation.
6.8.12.2.1.(a).2 Richards Wilcox.
6.8.12.2.1.(a).3 Wayne Dalton.
6.8.12.2.1.(a).4 Or alternative as approved by the Authority.

6.8.12.2(2) Materials

6.8.12.2(2)(a) Steel angles, shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W.

6.8.12.2(2)(b) Galvanized steel sheet: commercial quality to ASTM A653/A653M with Z275 zinc coating. Minimum sheet thickness to be 0.5 mm.

6.8.12.2(2)(c) Insulation: Rigid polyurethane to meet design requirements.

6.8.12.2(2)(d) Vision panels: 305 mm x 610 mm dual acrylic thermal glazing set in moulded gasket.

6.8.12.2(3) Hardware

6.8.12.2(3)(a) Track: standard lift hardware, galvanized steel track.

6.8.12.2(3)(b) Spring counter balance: heavy duty oil tempered torsion spring with manufacturers standard brackets.

6.8.12.2(3)(c) Hinges: standard duty industrial galvanized steel.

6.8.12.2(3)(d) Cable: minimum 4 mm diameter multi-strand galvanized steel aircraft cable with a safety factor of 8:1.

6.8.12.2(3)(e) Chain Operator Unit: Hand-chain actuated unit of type appropriate for the track type used. Furnish endless chain of sufficient length and furnish a wall mounted keeper. Design gear reduction unit to reduce pull required on the hand chain to 35 pounds maximum.

6.8.12.2(4) Electrical

6.8.12.2(4)(a) Electrical jack shaft side mounted type operator. Operator to include motors, speed reducers with all gears running in oil, sheaves, racks, levers, cables and brake, disconnect switches, reversing starters, controls, and all conduit and wiring to make all connections required to complete the work.

6.8.12.2(4)(b) Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA approval with CSA enclosure type 1.

6.8.12.2(4)(c) Motor: Minimum 0.375 kW to maximum 0.560 kW to suit design.

6.8.12.2(4)(d) Operation: Remote pushbutton stations, surface mounted, in location shown, with "OPEN-STOP-CLOSE" designations on pushbuttons in English.

6.8.12.2(4)(e) Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.

6.8.12.2(5) Finishes

6.8.12.2(5)(a) Prefinish sheet steel: 2 coat factory applied silicone modified polyester. Coating thickness: Not less than 25 micrometres.

6.8.12.2(5)(b) Steel: Hot dip galvanized in accordance with CAN/CSA G164-M.

6.8.12.3 Part 3 Execution

6.8.12.3(1) Not applicable.

6.8.13 Section 08 38 16 – Overhead Fabric Rolling Door

6.8.13.1 Part 1 General

6.8.13.1(1) References

6.8.13.1(1)(a) NEMA 4X, Enclosures and Boxes.

6.8.13.1(2) Performance Requirements

6.8.13.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.13.1(2)(b) Door panel speed will be adjustable, but factory set to open at 1.27 m/sec.

6.8.13.1(2)(c) Provide absolute rotary encoder to regulate door travel limits. Limits are adjustable at the control panel, without the use of tools. The use of mechanical limit switches, or limit adjustments at the door operator are not accepted.

6.8.13.1(2)(d) Ensure control devices are securely installed in a manner that prevents doors from being tampered with or manipulated after hours.

6.8.13.1(3) Quality Assurance

6.8.13.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.13.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.8.13.2 Part 2 Products

6.8.13.2(1) Manufacturers

6.8.13.2(1)(a) Acceptable Products: Fast-Seal FS1000 by Rytec Corporation or alternative as approved by the Authority.

6.8.13.2(2) Materials

6.8.13.2(2)(a) Door panel: 3-ply, 2.54 mm thick fabric with vinyl loop seal on bottom bar. Material will be multi-

layered, woven, dimensionally stable, puncture resistant, polymer impregnated, multifilament polyester fabric. Fabrics that are flexible both vertically and laterally are not accepted.

6.8.13.2(2)(b) Side frames: Reinforced with front and rear wind bar guides and front and rear full-height weather seals to seal against the panel material. Two sets of factory-installed thru-beam safety photo eyes to be included.

6.8.13.2(2)(c) Bottom bar: To be capable of breaking away when hit from either direction without damaging or bending bottom bar, safety astragal, or side covers and reassembled without tools. Breakaway and reversing signal is carried to the door controller via radio frequency. Use of coil cord to transmit signal to door controller is not accepted.

6.8.13.2(2)(d) Bottom safety edge: To allow door to reverse to its full open limit when coming into contact with an obstruction above floor line during downward travel.

6.8.13.2(2)(e) Include “kill” switch to automatically shut off motor when door is impacted.

6.8.13.2(2)(f) Provide separate counterbalance and fabric tensioning. Guided counterweights to be custom-sized for proper balancing of door. Independent tensioning system maintains constant panel tension. System to include polyester belting and UHMW spools. Use of springs or separate counterbalance and tensioning system is not accepted.

6.8.13.2(2)(g) Provide heavy-duty three-phase, variable-speed AC drive provides soft acceleration and deceleration with independent opening and closing speeds, with manual override in case of power failure. Motor and electrical components will be factory wired to junction boxes in the head assembly. Motors using clutch or brake to start or stop door movement is not accepted.

6.8.13.2(3) Electrical Components

6.8.13.2(3)(a) All electronic controls will be housed in a ULC listed, NEMA 4X-rated enclosure.

6.8.13.2(3)(b) Provide control panel at floor level with self-diagnostic display for informational message for installation, control adjustments and error reporting. Control panel will log all time and date stamped errors for at least 2 years, downloadable to a USB flash drive.

6.8.13.2(3)(c) Provide programmable inputs and outputs to accommodate special control applications without the need for additional electrical components.

6.8.13.2(3)(d) Provide wireless opening/closing capability and multi-button remotes for ambulance and Control-Security use, compatible with existing wireless remotes used by the BC Ambulance Service.

6.8.13.3 Part 3 Execution

6.8.13.3(1) Not applicable.

6.8.14 Section 08 42 29 – Automatic Sliding Entrances

6.8.14.1 Part 1 General

6.8.14.1(1) Summary

6.8.14.1(1)(a) Furnish complete automatic sliding entrance door systems,

6.8.14.1(2) References

6.8.14.1(2)(a) AAADM American Association of Automatic Door Manufacturers.

6.8.14.1(2)(b) AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.

6.8.14.1(2)(c) AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

6.8.14.1(2)(d) ANSI/BHMA A156.38 Low Energy Power Operated Sliding and Folding Doors.

6.8.14.1(2)(e) ANSI Z97.1 Safety Glazing Materials used in Buildings – Method of Test.

6.8.14.1(2)(f) ASTM B221 Standard Specification for Aluminum and Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

6.8.14.1(2)(g) ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.8.14.1(2)(h) CAN/CGSB 12.1 Safety Glazing.

6.8.14.1(2)(i) CAN/CGSB 12.8 Insulating Glass Units.

6.8.14.1(3) Performance Requirements

6.8.14.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.14.1(3)(b) Provide automatic sliding doors complete with break-away capability for exiting. Exterior entrance vestibules will be designed such that both sets of doors will not be open at the same time.

6.8.14.1(3)(c) Design door equipment to accommodate medium to heavy pedestrian traffic and up to the following weights for active leaf doors: 100 kg for bi-part doors and 200 kg for single slide doors.

6.8.14.1(3)(d) Provide door operators, including the motion and presence detection system that are capable of operating within anticipated temperature ranges at the Facility and ancillary buildings and unaffected by ambient light or ultrasonic interference.

6.8.14.1(3)(e) Provide energy-saving devices to reduce conditioned air or heat loss.

6.8.14.1(3)(f) Provide bumper stop or cushioned stop on all automatic sliding doors.

6.8.14.1(3)(g) Design sliding door system to accommodate all modes of operation, day time, night time, security response and fire alarm response and similar criteria.

6.8.14.1(3)(h) Where automatic sliding doors have access control, the Design-Builder will provide an interface between the automatic door opener and the access control system such that when the door is secured by access control, the secure side input devices are inactive unless there is a valid card-swipe.

6.8.14.1(4) Quality Assurance

6.8.14.1(4)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this

section with minimum three years documented experience.

6.8.14.1(4)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.8.14.1(4)(c) Obtain AAADM inspection compliance form completed and signed by certified AAADM inspector prior to doors being placed in operation as proof of compliance with ANSI A156.38

6.8.14.2 Part 2 Products

6.8.14.2(1) Manufacturers

6.8.14.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide automatic sliding doors by one of the following:

6.8.14.2.1.(a).1 Assa Abloy.
6.8.14.2.1.(a).2 Horton Automatics.
6.8.14.2.1.(a).3 Record-USA Inc.
6.8.14.2.1.(a).4 Stanley Ltd.
6.8.14.2.1.(a).5 Or alternative as approved by the Authority.

6.8.14.2(2) Materials

6.8.14.2(2)(a) Aluminum extrusions: ANSI H35.1 AA6063, T5 temper alloy.

6.8.14.2(2)(b) Aluminum sheet and plate: ASTM B209/B209M.

6.8.14.2(2)(c) Tempered/laminated, safety glass: CAN/CGSB-12.1-M, Type 1, Class B; Laminated glass consisting of two 3 mm thick tempered glass panes laminated together, laminating film thickness: 0.8 mm.

6.8.14.2(2)(d) Insulating glass units: CAN/CGSB-12.8-M; 25 mm overall thickness. Tempered/laminated inside, tempered/laminated outside.

6.8.14.2(2)(e) Permanent warning decal: 150 mm diameter, self adhesive vinyl, red colour decal with white lettering reading CAUTION SLIDING DOOR.

6.8.14.2(3) Sliding Doors

6.8.14.2(3)(a) Doors: Provide manufacturer's standard 44.5 mm thick glazed doors with minimum 3.2 mm thick, extruded tubular stile and rail members. Fabricate corners with mechanically fastened reinforcing brackets or by welding. Incorporate concealed tie-rods that span full length of top and bottom rails.

6.8.14.2(3)(b) Configuration: Single-or Double-sliding door, with one or two operable leaf and sidelights.

6.8.14.2(3)(c) Emergency Breakaway Capability: Door and sidelight break out together as a pivoting unit, providing double the normal entrance opening; flush bolts manually retracted.

6.8.14.2(3)(d) Opening Force: Provide doors that require no more than 22.2 N (5lbf) to stop door movement.

6.8.14.2(4) Hardware

6.8.14.2(4)(a) Back-to-back cylinder cam lock between meeting stiles of sliding doors.

6.8.14.2(4)(b) On - Exit only - Maintenance - Off, four position, key switch located on the door stile of each door, with standard key for automatic doors to conform to key management system.

6.8.14.2(5) Motion/Presence Detector

6.8.14.2(5)(a) K-band microwave, for two-way traffic, motion detectors and active infrared presence sensors, designed to control the opening, hold open, and closing cycles of sliding automatic doors, with fully adjustable detection pattern and sensitivity adjustments, in high impact, weather tight housing.

6.8.14.2(5)(b) Fabricate detectors which are capable of distinguishing false impulse events, including rain, snow, and which are unaffected by temperature changes, ambient light, or excessive traffic flow.

6.8.14.2(6) Finishes

6.8.14.2(6)(a) Anodized:

6.8.14.2.6.(a).1 215-R1 Clear Arch Class 1 clear anodized AA-M12C23A41.

6.8.14.2(6)(b) Resin:

6.8.14.2.6.(b).1 Three-coat fluoropolymer coating system, complying with AAMA 2605, containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both colour coat and clear topcoat, producing a coating thickness of 1.6 mils.

6.8.14.2.6.(b).2 Acceptable Products:

(b).2.1 Duranar XL by PPG Industries Inc.;

(b).2.2 Kynar 500 by Arkema;

(b).2.3 Or alternative approved by the Authority.

6.8.14.3 Part 3 Execution

6.8.14.3(1) Not applicable.

6.8.15 Section 08 42 43 – Manual and Automatic Sliding Door Systems

6.8.15.1 Part 1 General

6.8.15.1(1) Summary

6.8.15.1(1)(a) Provide manual and automatic entrances as set out in this Agreement.

6.8.15.1(1)(b) This Section will be read in conjunction with Appendix 1B [Minimum Room Requirements].

6.8.15.1(2) References

6.8.15.1(2)(a) AAADM American Association of Automatic Door Manufacturers

6.8.15.1(2)(b) AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.

6.8.15.1(2)(c) ASHRAE 170-2013 Ventilation of Healthcare Facilities.

6.8.15.1(2)(d) ANSI/BHMA A156.38 Low Energy Power Operated Sliding and Folding Doors.

6.8.15.1(2)(e) ANSI H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).

6.8.15.1(2)(f) ASTM B221 Standard Specification for Aluminum and Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

6.8.15.1(2)(g) ANSI Z97.1 Safety Glazing Materials used in Buildings – Method of Test.

6.8.15.1(2)(h) CSA Z8000-18 Canadian Healthcare Facilities.

6.8.15.1(2)(i) Facilities Guidelines Institute FGI, Guidelines for Design and Construction of Health Care Facilities 2014.

6.8.15.1(2)(j) Underwriters Laboratories (UL), UL1784 Air Leakage Test of Door.

6.8.15.1(3) Performance Requirements

6.8.15.1(3)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.15.1(3)(b) Provide interior sliding doors with recessed mounted track, sliding and fixed panel(s) single glazed with 6.0 mm clear fully tempered glass with safety glazing labelling.

6.8.15.1(3)(c) Provide interior glass sliding doors without floor track.

6.8.15.1(3)(d) Provide interior sliding doors and interior glass sliding doors with break-out capability, in direction of egress under 90 N factory set.

6.8.15.1(3)(e) Provide visual cues/glazing film in transparent glass panels as appropriate to prevent collisions.

6.8.15.1(3)(f) Entrances will be rated as an effective barrier limiting the passage of smoke.

6.8.15.1(3)(g) Entrances will be leakage rated, designed and tested for use in Airborne Isolation Rooms (AIR).

6.8.15.1(3)(h) Entrances will be certified for use in clean rooms.

6.8.15.1(3)(i) Door edge seals to limit leakage air flow as set out in ASHRAE 170, per FGI and CSA Z8000.

6.8.15.1(4) Quality Assurance

6.8.15.1(4)(a) Manufacturer qualifications: Manufacturer to have minimum (5) five years successful experience in the fabrication of intensive/critical care doors of the type required for this Project. Manufacturer to provide field service representation during installation, approving acceptable installer and approving application method.

6.8.15.1(4)(b) Installers qualifications: Installer experienced to perform work of this section who has specialized in the installation of work similar to that required for this Project and who is acceptable to product manufacturer.

6.8.15.1(4)(c) Obtain AAADM inspection compliance form completed and signed by certified AAADM inspector prior to doors being placed in operation as proof of compliance with ANSI A156.38.

6.8.15.2 Part 2 Products

6.8.15.2(1) Acceptable products and manufacturers for manual single sliding doors, with self closing:

6.8.15.2(1)(a) Procare 8300 and Dura-Care 7500A by Stanley;

6.8.15.2(1)(b) Profiler ICU by Horton Automatics;

6.8.15.2(1)(c) Or alternative as approved by the Authority.

6.8.15.2(2) Acceptable Products and Manufacturers for automatic single sliding doors:

6.8.15.2(2)(a) Profiler Series 2000 IDS-2 by Horton Automatics;

6.8.15.2(2)(b) Procare 8300A Automatic by Stanley;

6.8.15.2(2)(c) Or alternative as approved by the Authority.

6.8.15.2(3) Materials

6.8.15.2(3)(a) Aluminum extrusions: ANSI H35.1 AA6063, T5 temper alloy.

6.8.15.2(3)(b) Glass: CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear, minimum 6 mm thick.

6.8.15.2(3)(c) Hardware: Provide manufacturer's standard hardware as required for operation indicated.

6.8.15.2.3.(c).1 Breakaway arms and bottom pivot assemblies will allow panels to breakout to 90 degrees. Maximum force to breakout slider panel to be 50 lbf (222 N). Gas regulated damper to control movement of breakout panels.

6.8.15.2.3.(c).2 Positive Latch: Mortise type self-latching hookbolt, ANSI/BHMA A156.5, Grade 1, with lever handles on each slide.

6.8.15.2.3.(c).3 Flush Bolts: Manual operated flush bolt to secure sidelight panel(s).

6.8.15.2(3)(d) Recessed pull: Provide manufacturers standard positive latch with lever handle on each side of door.

6.8.15.2(3)(e) Guide Track/Threshold: aluminum guide track. Guide track will allow breakout from any position except when door is latched.

6.8.15.2(4) Operators

6.8.15.2(4)(a) Operator and controller: Electro-mechanical controlled unit utilizing a high-efficiency, energy efficient, DC motor. System will be capable of operating at full performance through brown out and high voltage line conditions (85V - 265V) by sensing changes and adjusting automatically. Operator will allow an adjustable hold open time of 0 to 60 seconds.

6.8.15.2(4)(b) Microprocessor Control Box: Factory-adjusted configuration, with pre-set opening and closing speeds. Selector switch to be interior jamb mounted and will allow "on", "off", and "hold open" functions to be engaged when switch is turned to the appropriate setting. Switch will be a multi- position keyed cylinder, with standard key for automatic doors to conform to key management system.

6.8.15.2(4)(c) Sensor Plate: Touchless, activation senor plates, black polycarbonate with white letters. Microwave technology has an adjustable range of 2 inches to 24 inches.

6.8.15.2(5) Finish

6.8.15.2(5)(a) Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes. AA-M12C23A41.

6.8.15.3 Part 3 Execution

6.8.15.3(1) Not applicable.

6.8.16 Section 08 44 00 – Aluminum Work

6.8.16.1 Part 1 General

6.8.16.1(1) Summary

6.8.16.1(1)(a) Building Envelope Fenestration Framing.

6.8.16.1(1)(b) Framing for Glazed Vestibules, Interior Glazed Partitions and Screens.

6.8.16.1(2) Related Sections

6.8.16.1(2)(a) 08 80 00 Glass & Glazing

6.8.16.1(3) References

6.8.16.1(3)(a) AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.

6.8.16.1(3)(b) AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

6.8.16.1(3)(c) FGIA AAMA CWM-19 Curtain Wall Manual.

6.8.16.1(3)(d) AAMA/WDMA/CSA 101/I.S.2/A440 NAFS North American Fenestration, Standard/Specification for Windows, Doors, and Unit Skylights.

6.8.16.1(3)(e) ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

6.8.16.1(3)(f) ASTM A36/A36M, Specification for Carbon Structural Steel.

6.8.16.1(3)(g) ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

6.8.16.1(3)(h) ASTM E283/E283M, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

6.8.16.1(3)(i) ASTM E330/E330M, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

6.8.16.1(3)(j) ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

6.8.16.1(3)(k) ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

6.8.16.1(3)(l) CAN/CSA-A440.2 Fenestration Energy Performance.

6.8.16.1(3)(m) CAN/CSA-A440.4-18 Window, door and skylight installation.

6.8.16.1(3)(n) CSA S478:19 Durability in Buildings.

6.8.16.1(3)(o) NFRC 100, Procedure for Determining Fenestration Product U-factors.

6.8.16.1(3)(p) NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

6.8.16.1(3)(q) NFRC 500, Fenestration Product Condensation Resistance (computer simulation software).

6.8.16.1(4) Performance Requirements

6.8.16.1(4)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.16.1(4)(b) Design aluminum work with reference to the guidelines of FGIA AAMA CWM-19 and its references to meet the performance and energy efficiency requirements specified herein and as required by AHJ.

6.8.16.1(4)(c) Fenestration framing to have a Design Life as set out in Section 3.8.

6.8.16.1(4)(d) Energy performance requirements:

6.8.16.1.4.(d).1 Design aluminum work and associated glazing materials to comply with the requirements set out in Schedule 5 [Energy Guarantee]. Unless otherwise required, the overall performance U-value including frame will be maximum 0.38 (btu/h ft².°F).

6.8.16.1(4)(e) Design aluminum work to accommodate following without producing detrimental effect:

6.8.16.1.4.(e).1 Cyclic 40 deg. C daily thermal swing of components.

6.8.16.1.4.(e).2 Cyclic, dynamic loading and release of loads such as wind loads.

6.8.16.1.4.(e).3 13 mm vertical deflection in supporting structure and movement of supporting structure due to live, dead load, and creep or

deflections, seismic load, sway displacement and similar items.

6.8.16.1(4)(f) Design aluminum work in accordance with Climatic Design Data contained in the BCBC:

6.8.16.1.4.(f).1 Design temperature: January 1%, July 2 ½%.

6.8.16.1.4.(f).2 Hourly wind pressures: 1 in 50 year occurrence.

6.8.16.1(4)(g) Design to prevent accumulation of condensation on interior side of aluminum work framing under the following service conditions:

6.8.16.1.4.(g).1 Exterior temperature: -17 deg. C.

6.8.16.1.4.(g).2 Interior RH: 30 to 50%.

6.8.16.1.4.(g).3 Interior temperature range: 20 to 22 deg. C.

6.8.16.1(4)(h) Restrict air infiltration/exfiltration, through aluminum work in accordance with ASTM E283/E283M at pressure differential as indicated:

6.8.16.1.4.(h).1 Curtainwalls and entrance assemblies: 0.0003 $m^3/s\ m^2$ at differential of 300 Pa.

6.8.16.1.4.(h).2 Doors (per door): 2.78 m3/h m per linear metre of crack at differential of 75 Pa.

6.8.16.1(4)(i) Design and detail controlled drainage path to actively discharge water, which enters into or forms within aluminum work, to exterior; prevent accumulation or storage of water within aluminum work. Prevent water from entering interior when tested in accordance with ASTM E331.

6.8.16.1(4)(j) Design and detail air barrier, vapour retarder, and Rain Screen products and assemblies into continuous and integrated aluminum work envelope. Optimize aluminum work design to align envelope layers and to minimize thermal bridges.

6.8.16.1(4)(k) Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 and 19 mm maximum for heights under 4115 mm and L/240 and 25 mm maximum for heights over 4115 mm.

6.8.16.1(4)(l) Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies to accommodate construction and installation tolerances.

6.8.16.1(4)(m) Seismic: Design cladding assemblies to prevent damage due to earthquake forces and movement as required by the BCBC. Obtain movement data from Design-Builder structural consultant and reflect limitations in the design.

6.8.16.1(4)(n) Aluminum mullions will have a deflection limit in conformance with ASTM E330/E330M.

6.8.16.1(4)(o) Design aluminum work and connections as required to meet guard and handrail loads in accordance with the BCBC and applicable local regulations.

6.8.16.1(4)(p) Provide frames that are thermally-broken, flush glazed, aluminum sections, to accept insulating glass units.

6.8.16.1(4)(q) Design framing members, mullions, and similar members to accept integral blinds and to have adequate structural strength to support weight of glass and louvers. Frames are to be level, plumb, square, and in plane. Provisions are to be made in frames to receive required hardware and accessories.

6.8.16.1(4)(r) Provide isolation coating or neoprene isolation material as required to prevent galvanic corrosion of dissimilar metals.

6.8.16.1(5) Quality Assurance

6.8.16.1(5)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.16.1(5)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature, with crews certified as Glaziers with the Industry Training Authority (ITA) and approved by manufacturer.

6.8.16.1(5)(c) Coordinate systems to ensure integration with access control system.

6.8.16.2 Part 2 Products

6.8.16.2(1) Manufacturers

6.8.16.2(1)(a) Manufacturers: Subject to conformance to requirements of this Section, provide aluminum work by one of the following:

6.8.16.2.1.(a).1 Alumicor Limited.

6.8.16.2.1.(a).2 Kawneer Co. Canada Ltd.

6.8.16.2.1.(a).3 Or alternative as approved by the Authority.

6.8.16.2(2) Metals

6.8.16.2(2)(a) Aluminum: Extruded aluminum conforming to ASTM B221/B221M temper 6063-T5.

6.8.16.2(2)(b) Steel Sections: ASTM A36/A36M; shaped to suit mullion sections.

6.8.16.2(2)(c) Fasteners: ASTM F738M, corrosion resistant Type 304 stainless steel complete with isolator between dissimilar metals.

6.8.16.2(2)(d) Isolation material: Bitumastic isolation coating, acid and alkali resistant material or neoprene isolation material.

6.8.16.2(3) Curtainwall

6.8.16.2(3)(a) Acceptable Products:

6.8.16.2.3.(a).1 ThermaWall 2600 by Alumicor;

6.8.16.2.3.(a).2 1600 UT System 1 by Kawneer;

6.8.16.2.3.(a).3 Or alternative as approved by the Authority.

6.8.16.2(3)(b) Standard tubular aluminum sections, with self-supporting framing, steel reinforced framing and continuous thermal breaks, fully captured and structural silicone glazed sealed insulating double-glazed vision glass assemblies.

6.8.16.2(3)(c) Provide Architectural Grade.

6.8.16.2(4) Entrances and Storefronts

6.8.16.2(4)(a) Acceptable Products – Thermally Broken

6.8.16.2.4.(a).1 FlushGlaze BF 3400, by Alumicor;

6.8.16.2.4.(a).2 Trifab VG Versaglaze, by Kawneer;

6.8.16.2.4.(a).3 Or alternate approved by Authority.

6.8.16.2(4)(b) Acceptable Products – Interior

6.8.16.2.4.(b).1 FlushGlaze TL 1800, by Alumicor;

6.8.16.2.4.(b).2 Trifab 400 by Kawneer;

6.8.16.2.4.(b).3 Or alternate approved by Authority.

6.8.16.2(4)(c) Aluminum entrances and storefront framing and doors will form part of the exterior envelope of the Facility. Styles and rails will be oversized to avoid the failure of glazing unit and potential twisting and fastener failure of door frame assembly.

6.8.16.2(5) Exterior Windows

6.8.16.2(5)(a) Thermally broken, vertical stick-built glazed aluminum curtain wall system of tubular aluminum sections with supported framing, shop fabricated, factory prefinished, vision glass, insulated metal panel, spandrel infill and column covers; related flashings, anchorage and attachment devices.

6.8.16.2(5)(b) Provide Architectural Grade.

6.8.16.2(5)(c) All exterior windows will conform to ASHRAE 90.1, complete with thermal breaks.

6.8.16.2(5)(d) Unless a larger size of window is required to comply with other applicable requirements in this Schedule, exterior windows in Patient rooms will have a minimum area of 2.5 square metres and a minimum short dimension of 1.2 m. The vertical dimension of the window will be greater than the horizontal.

6.8.16.2(5)(e) Exterior windows in occupied spaces will be no less than 1.2 m x 1.2 m in size or larger as required to meet the provisions in Section 3.11 Quality of Daylight.

6.8.16.2(6) Interior Windows and Glazing

6.8.16.2(6)(a) The height of interior windows and glazing will be approximately 2.1 m AFF such that the window frame aligns with the door frame. The sill height, overall width and mullion spacings will be as determined in consultation with the Authority through the Review Procedure. Refer to Appendix 1B [Minimum Room Requirements] for minimum locations for interior glazing.

6.8.16.2(6)(b) If Multimedia Rooms have interior windows, provide electrically deployed shades. Provide manually deployed shades or privacy film on all other interior windows unless noted otherwise.

6.8.16.2(7) Aluminum Doors

6.8.16.2(7)(a) Provide aluminum swing entrance doors that are heavy-duty commercial or institutional grade, automatically operated, motion-detector controlled.

6.8.16.2(7)(b) Provide a minimum 150 mm wide mid-rail at a height between 900 and 1.1 m AFF.

6.8.16.2(7)(c) Swing doors will be provided with a continuous hinge. Pivot hinges are not acceptable.

6.8.16.2(8) Finishes

6.8.16.2(8)(a) Aluminum finishes:

6.8.16.2.8.(a).1 Anodized Finish to AAMA 611.

6.8.16.3 Part 3 Execution

6.8.16.3(1) Not applicable.

6.8.17 Section 08 56 53 – Security Transaction Windows

6.8.17.1 Part 1 General

6.8.17.1(1) References

6.8.17.1(1)(a) ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.8.17.1(2) Performance Requirements

6.8.17.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.17.1(2)(b) Provide pass-through windows constructed of anodized aluminum frames with stainless steel components as follows:

6.8.17.1.2.(b).1 Manual slide up/down windows;

6.8.17.1.2.(b).2 Continuous set down; and

6.8.17.1.2.(b).3 Width of window frames to be determined in consultation with the Authority through the Review Procedure.

6.8.17.1(2)(c) Unless noted otherwise, provide security transaction windows with glass in accordance with Section 6.8.18.2(5)(b) at locations including, at minimum:

6.8.17.1.2.(c).1 E1.01.06 Package Holding/Staging Area;

6.8.17.1.2.(c).2 F1.06 Data Imaging Centre - Medical Imaging;

6.8.17.1.2.(c).3 J3.02 Dispensing Counter;

6.8.17.1.2.(c).4 R1.02.01 Shipping/Receiving Area;
6.8.17.1.2.(c).5 J4.01.01 Courier Reception & Packaging; and
6.8.17.1.2.(c).6 W4.09 Workroom - FMO.

6.8.17.1(2)(d) All other locations where wickets, transaction windows or similar are described in Appendix 1A [Clinical Specifications and Functional Space Requirements].

6.8.17.1(2)(e) Provide security transaction windows with lockable sliding glass panel(s) and/or a secure speaker hole/opening and backer system. Transaction windows with speaker hole/openings will consist of custom prefabricated panels with secure air passage as required for voice transmission.

6.8.17.1(2)(f) Provide the required size and opening dimensions to meet the Authority's functional requirements including security, speech intelligibility and Line of Sight.

6.8.17.1(2)(g) The area surrounding Security Transaction Windows will be designed to maximize privacy through the use of:

6.8.17.1.2.(g).1 Increased use of sound absorbing finishes;
6.8.17.1.2.(g).2 Layout/orientation;
6.8.17.1.2.(g).3 Barriers; and
6.8.17.1.2.(g).4 Sound masking systems.

6.8.17.1(3) Quality Assurance

6.8.17.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.17.2 Part 2 Products

6.8.17.2(1) Manufacturers

6.8.17.2(1)(a) Manufacturers: Subject to conformance to requirements of this Section, provide security transaction windows by one of the following:

6.8.17.2.1.(a).1 C.R. Laurence Co., Inc.
6.8.17.2.1.(a).2 Or alternative as approved by the Authority.

6.8.17.2(2) Materials

6.8.17.2(2)(a) Stainless steel sheet and plate: ASTM A480/A480M, Type 304, finish: brushed.

6.8.17.2(2)(b) Tempered Laminated Glass in accordance with Section 08 80 00.

6.8.17.3 Part 3 Execution

6.8.17.3(1) Not applicable.

6.8.18 Section 08 80 00 – Glass and Glazing

6.8.18.1 Part 1 General

6.8.18.1(1) Summary

6.8.18.1(1)(a) Exterior Insulating Glazing Units (IGU).

6.8.18.1(1)(b) Interior glass for glazed partitions, sidelights and doors, with and without fire protection ratings,

6.8.18.1(2) Related Sections

6.8.18.1(2)(a) Section 08 44 00 Aluminum Work.

6.8.18.1(2)(b) Section 08 11 00 Metal Doors and Frames.

6.8.18.1(3) References

6.8.18.1(3)(a) ANSI Z97.1, Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

6.8.18.1(3)(b) ASTM C1036, Standard Specification for Flat Glass.

6.8.18.1(3)(c) ASTM C1048, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

6.8.18.1(3)(d) ASTM C1172, Standard Specification for Laminated Architectural Flat Glass.

6.8.18.1(3)(e) ASTM C1376, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

6.8.18.1(3)(f) ASTM C1349, Standard Specification for Architectural Flat Glass Clad Polycarbonate.

6.8.18.1(3)(g) ASTM C1503, Standard Specification for Silvered Flat Glass Mirror.

6.8.18.1(3)(h) ASTM E1300, Standard Practice for Determining Load Resistance of Glass in Buildings.

6.8.18.1(3)(i) ASTM E2141, Standard Test Method for Accelerated Aging of Electrochromic Devices in Sealed Insulating Glass Units.

6.8.18.1(3)(j) ASTM E2190, Standard Specification for Insulating Glass Unit Performance and Evaluation.

6.8.18.1(3)(k) ASTM F1233, Test Method for Security Glazing Materials and Systems.

6.8.18.1(3)(l) CAN/CGSB-12.1 Safety Glazing.

6.8.18.1(3)(m) CAN/CGSB-12.8, Insulating Glass Units.

6.8.18.1(3)(n) FGIA, Fenestration & Glazing Industry Alliance (merger of AAMA & IGMA), AAMA CWM-19.

6.8.18.1(3)(o) CAN/ULC-S104-M, Standard Method for Fire Tests of Door Assemblies.

6.8.18.1(3)(p) IGMAC Insulating Glass Manufacturers Association of Canada.

6.8.18.1(3)(q) (ULC) CAN4-S106-M, Standard Method for Fire Tests of Window and Glass Block Assemblies.

6.8.18.1(3)(r) NFPA 80, Fire Doors and Other Opening Protectives.

6.8.18.1(4) Performance Requirements

6.8.18.1(4)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.18.1(4)(b) Perform work in accordance with FGIA recommendations.

6.8.18.1(4)(c) Design glass using a probability of breakage of 8 lites per 1000 at the first application of design load.

6.8.18.1(4)(d) Design glass to CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

6.8.18.1(4)(e) Perform a thermal stress analysis on each glass unit with Low-E coating and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.

6.8.18.1(4)(f) Perform a thermal stress analysis on each insulating thermal unit and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.

6.8.18.1(4)(g) Where required, design glazing units so as not to allow thermal stress fracture due to heat build-up behind insulating units.

6.8.18.1(4)(h) Glass-clad polycarbonate performance:

- 6.8.18.1.4.(h).1 HP White HPW-TP-0500.02 Forced Entry
- 6.8.18.1.4.(h).2 Level 1 (Report WJE 972491); and
- 6.8.18.1.4.(h).3 HP White HPW-TP-0500.02 Ballistics Level A (Report HPW 7305-09A).

6.8.18.1(4)(i) Roller wave:

- 6.8.18.1.4.(i).1 Heat treated flat glass to be by horizontal (roller hearth) process with inherent roller wave distortion parallel to the bottom edge of the glass as installed.
- 6.8.18.1.4.(i).2 Maximum peak to valley roller wave 0.08 mm in the central area and 0.20 mm within 267 mm of the leading and trailing edge or 100 millidiopter over 95% of the glass surface.
- 6.8.18.1.4.(i).3 Maximum bow and warp 0.79 mm per 300 mm.
- 6.8.18.1.4.(i).4 Roll distortion is to run parallel to the width dimension when installed in the building.

6.8.18.1(4)(j) Project to be designed to resist local seismic conditions as a post-disaster Facility.

6.8.18.1(4)(k) Provide white matte translucent privacy film on window interior glazing and door glazing where required for privacy by the Authority.

6.8.18.1(4)(l) Provide interior glazing and inside panes of exterior glazing of tempered-laminated glass at the following locations as listed below. All other interior glazing and interior panes of exterior glazing to be tempered glazing to meet the requirements of the Building Code and applicable standards as set out in the Agreement.

- 6.8.18.1.4.(l).1 Areas where Patients are deemed high risk by the Authority such as the Emergency Department and Inpatient Units;
- 6.8.18.1.4.(l).2 Areas where there is a high volume of cart, stretcher, bed, or other Equipment traffic that in the opinion of the Authority acting

reasonably would potentially damage the glazing;

6.8.18.1.4.(l).3 Areas where regular maintenance of equipment is preformed such as the Energy Centre plant areas or mechanical floors;

6.8.18.1.4.(l).4 Glazing in exit stair windows;

6.8.18.1.4.(l).5 Glazing below 1100 mm AFF or as otherwise required by Building Code; and

6.8.18.1.4.(l).6 Glazing at exit and egress doors including 2m on either side of exit and egress doors.

6.8.18.1(4)(m) Provide door sidelights at minimum, at the locations described in Appendix 1B [Minimum Room Requirements] and at other locations where required to provide Line of Sight for Patient or Staff safety.

6.8.18.1(4)(n) Provide interior windows and door sidelights consisting of minimum 12 mm thick clear fully tempered-laminated glass with safety glazing labelling in the areas set out in Section 6.8.18.1.4.(l).6. All other interior window and door sidelight glazing to be tempered glazing of minimum thickness to meet the requirements of the Building Code and applicable standards as set out in the Agreement.

6.8.18.1(4)(o) Provide white matte translucent privacy film on door sidelight glazing which balances the extent of observation required and the privacy requirements of the occupants of the room.

6.8.18.1(4)(p) The Design-Builder will provide minimum 460 mm wide door sidelight glazing.

6.8.18.1(4)(q) Provide the lower horizontal mullion of the door sidelight such that it is horizontally aligned with the adjacent handrail height to allow for extension of adjacent handrail.

6.8.18.1(4)(r) Door sidelights will have minimum STC ratings as specified in Appendix 1D [Acoustic, Vibration and Noise Control Measures]. The perimeters will be sealed to prevent sound leakage.

6.8.18.1(4)(s) Refer to Drivers' Visibility Section 4.16.6 for additional door sidelight requirements.

6.8.18.1(4)(t) Provide observations windows in all Alcove – Observation areas as described in Appendix 1A [Clinical Specifications and Functional Space Requirements]. Windows will be provided on all sides of the Alcove – Observation with the exact height, width and placement of the window designed to meet the clinical observation needs of the Authority, refer to Section 6.8.19.1.1.(b).3 for additional requirements.

6.8.18.1(5) Quality Assurance

6.8.18.1(5)(a) Manufacturer of glass qualifications (typical): Company specializing in manufacturing glass products specified in this section with minimum three years documented experience.

6.8.18.1(5)(b) Manufacturer of insulating glazing unit IGU products qualifications: Company specializing in fabricating IGU products specified in this section, certified with IGMAC, and with minimum ten years documented experience.

6.8.18.1(5)(c) Installer qualifications: Refer to Section 08 44 00 Aluminum Work.

6.8.18.2 Part 2 Products

6.8.18.2(1) Acceptable Manufacturers

6.8.18.2(1)(a) Manufacturers of architectural glass:

- 6.8.18.2.1.(a).1 AGC Glass Company North America;
- 6.8.18.2.1.(a).2 Guardian Industries;
- 6.8.18.2.1.(a).3 Vitro Architectural Glass (formerly PPG Industries Ltd.);
- 6.8.18.2.1.(a).4 Or alternative as approved by the Authority.

6.8.18.2(1)(b) Manufacturers of electrochromic glass, subject to conformance to requirements of this Section:

- 6.8.18.2.1.(b).1 Sage Glass, Saint-Gobain;
- 6.8.18.2.1.(b).2 View, Inc.;
- 6.8.18.2.1.(b).3 Or alternative as approved by the Authority.

6.8.18.2(1)(c) Manufacturers of fire and safety rated glass ceramic subject to conformance to requirements of this Section:

- 6.8.18.2.1.(c).1 Technical Glass Products (TGP);
- 6.8.18.2.1.(c).2 Or alternative as approved by the Authority.

6.8.18.2(2) Materials

6.8.18.2(2)(a) Float Glass: CAN/CGSB-12.3 or ASTM C1036.

6.8.18.2(2)(b) Safety Glass: CAN/CGSB-12.1 or ASTM C1048, and ANSI Z97.1, laminated, tempered, laminated and tempered.

6.8.18.2(2)(c) Laminated Float Glass: CAN/CGSB-12.1 or ASTM C1172, two sheets of clear float glass, with a fully-bonded, high-impact, UV-resistant, clear polyvinyl butyral interlayer 0.8 mm minimum thickness.

6.8.18.2(2)(d) Tempered-Laminated Glass: CAN/CGSB-12.1 or ASTM C1172, two sheets of fully tempered clear float glass fully-bonded, high-impact, UV-resistant, clear polyvinyl butyral interlayer 0.8 mm minimum thickness.

6.8.18.2(2)(e) Glass-clad polycarbonate: Conforming to ASTM C1349:

- 6.8.18.2.2.(e).1 HP White HPW-TP-0500.02 Forced Entry
- 6.8.18.2.2.(e).2 Level 1 (Report WJE 972491); and
- 6.8.18.2.2.(e).3 HP White HPW-TP-0500.02 Ballistics Level A (Report HPW 7305-09A).

6.8.18.2(2)(f) Ceramic-Coated (Fritted) Glass: Ceramic bake solid coating to prevent adhesive or substrate being visible through glass. Colours, textures and patterns to suit design.

6.8.18.2(2)(g) One-Way Glass: Creating a visual barrier between subjects and their observers while providing clear and discreet vision to allow for undetected surveillance to achieve privacy. Glass to meet the following:

- 6.8.18.2.2.(g).1 Nominal Glass Thickness: 6 mm;
- 6.8.18.2.2.(g).2 Glass Substrate: Grey;
- 6.8.18.2.2.(g).3 Visible Transmittance (%): 11;
- 6.8.18.2.2.(g).4 Visible Reflectance Glass Side (%): 16.

6.8.18.2(2)(h) Insulating glass units, typical and electrochromic glass units:

- 6.8.18.2.2.(h).1 To CAN/CGSB-12.8-M, ASTM E2190 and IGMA requirements utilizing approved metallic stainless steel warm edge spacer. Dual seal with a PIB primary seal and silicone secondary seal;
- 6.8.18.2.2.(h).2 Double glazed unit: Provide two panes of glass in an insulated unit;

6.8.18.2.2.(h).3 Refer to Section 08 44 00 for additional performance requirements regarding insulating glass units.

6.8.18.2.2.(h).4 Electrochromic glass application:

(h).4.1 Visible transmittance: 44 percent or higher.

(h).4.2 Interior visible reflectance: 13 percent or lower.

(h).4.3 Exterior visible reflectance: 11 percent or higher.

(h).4.4 Correlated colour temperature (CCT): Less than 10% variation from the modelled exterior daylight illuminant.

(h).4.5 Colour fidelity and gamut: Greater than or equal to 90.

6.8.18.2(2)(i) Low E coating:

6.8.18.2.2.(i).1 ASTM C1376, high performance sputtered low-E coating;

6.8.18.2.2.(i).2 Provide insulating glass units with low-E coating edge deletion and low-E coating and on surface pane as required to suit insulating glass unit construction and meet intended performance requirements;

6.8.18.2.2.(i).3 Acceptable Products:

(i).3.1 Low E Coating, Typical (Type 1): Solarban 60 by Vitro Architectural Glass (formerly PPG Industries Ltd.) or alternative as approved by the Authority.

(i).3.2 Low E Coating, Electrochromic Glass (Type 2): Sunguard SuperNeutral SN68 by Guardian Industries or alternative as approved by the Authority.

6.8.18.2(2)(j) Mirror glass:

6.8.18.2.2.(j).1 ASTM C1503, 6 mm thick, laminated safety mirror glass fabricated with electrolytically-applied silver plating and polished plate or float glass;

6.8.18.2.2.(j).2 Mirror backing will be resistant to sulphur and hydrogen sulphide fumes. Polish and round all corners and edges of mirrors;

6.8.18.2.2.(j).3 Grind smooth and polish all exposed mirror edges;

6.8.18.2.2.(j).4 Channel frame mirrors will consist of one piece, stainless steel with a No. 1 quality;

6.8.18.2.2.(j).5 Mirrors will be high quality distortion-free glass.

6.8.18.2(2)(k) Electrochromic glass:

6.8.18.2.2.(k).1 Acceptable Products: View Dynamic Glass Insulating Glass Units by View Inc. or alternative approved by the Authority.

6.8.18.2.2.(k).2 Provide electrochromic glass in sealed exterior insulating glass units; refer to insulating glass unit and low E coating requirements specified in this Section for additional criteria pertaining to electrochromic glass application.

6.8.18.2.2.(k).3 Electrochromic glass to conform to ASTM E2141 and having electrochromic coating and the ability to change from a clear to tinted state when burst of charge is applied via controls.

6.8.18.2.2.(k).4 Clear tempered glass pane with multiple thin layers of metal oxide to form the electrochromic coating on inside of outside light, minimum 6 thick. Unless otherwise indicated, noted outside pane to be in combination with standard clear tempered glass for middle pane and clear tempered/laminated glass at inside panes of double glazed insulating glass units.

6.8.18.2.2.(k).5 Glass tint and performance:

(k).5.1 Glass tint to be variable electrically, edge-to-edge uniform colour at final tint.

(k).5.2 To tint uniformly, without variation in colour or light transmission, to ensure a consistent solar thermal performance, uniform visual appearance and consistent glare control.

(k).5.3 No bus bars, scribe lines or colour gradient in the daylight opening of the insulating glass unit.

(k).5.4 Tinting performance stability: Tinting performance in tinting speed and functionality should not vary with temperature conditions for a specific insulating glass unit. Tinting performance at -6°C (20°F) and 32°C (90°F) should be the same.

6.8.18.2.2.(k).6 Components, controls and accessories:

(k).6.1 Provide components and accessories as necessary for complete installation.

(k).6.2 To be as recommended by the electrochromic glass manufacturer.

(k).6.3 Busbar:

(k).6.3.1 Electrically conductive metal strip to apply voltage across electrochromic surface of insulated glass units.

(k).6.3.2 Busbar location: Along edge of glass.

(k).6.4 Smart window connector:

(k).6.4.1 Wire extending from individual special function insulating glass units.

(k).6.4.2 Length: Approximately 350-430 mm.

(k).6.4.3 Termination: IP67 rated, environmentally sealed, 8 mm circular connector.

6.8.18.2(2)(l) Decorative plastic film: Vision strip/privacy type.

6.8.18.2(2)(m) Security film: ASTM F1233; 6 mil micro-layered polyester film.

6.8.18.2(3) Exterior Glazing

6.8.18.2(3)(a) The thermal performance of the overall glazing assemblies will be as required to meet Schedule 5 [Energy Guarantee].

6.8.18.2(3)(b) Refer to Section 08 44 00 for targeted performance and energy requirements for overall framing system and glass units.

6.8.18.2(3)(c) Exterior glazing to consist of sealed double glazed units consisting of the below glazing types as required to meet performance requirements of the Project:

6.8.18.2.3.(c).1 Standard vision glass.

6.8.18.2.3.(c).2 Ceramic frit glass.

6.8.18.2.3.(c).3 Electrochromic glass.

6.8.18.2(4) Exterior glazing in Secure Room:

6.8.18.2(4)(a) Size of the Secure Room window as determined in consultation wit the Authority and in accordance with the Provincial Quality, Health and Safety

Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act;

6.8.18.2(4)(b) Exterior: 6 mm clear tempered low ‘E’ glass;

6.8.18.2(4)(c) Cavity: 12.7 mm (1/2”) hermetically sealed argon filled airspace;

6.8.18.2(4)(d) Interior: 9 mm (7/16") Glass Clad Polycarbonate:

6.8.18.2(4)(e) Security film on #6 surface;

6.8.18.2(4)(f) Low ‘E’ on the #2 surface; and

6.8.18.2(4)(g) Adjust the cavity size to suit the integral blind system.

6.8.18.2(5) Interior Glazing Types

6.8.18.2(5)(a) Unless noted otherwise, for interior windows, sidelights and door glazing provide the following minimum requirements, provide the following minimum requirements:

6.8.18.2.5.(a).1 12 mm clear tempered laminated glass:

(a).1.1 6 mm Clear Tempered;
(a).1.2 0.8 mm PVB interlayer; and
(a).1.3 6 mm Clear Tempered.

6.8.18.2(5)(b) For interior windows, sidelights and door glazing in higher risk areas such as Consult Room - ED and security transaction windows, provide the following minimum requirements, provide the following minimum requirements:

6.8.18.2.5.(b).1 14 mm clear tempered laminated glass:

(b).1.1 3 mm Clear Tempered;
(b).1.2 0.8 mm PVB interlayer;
(b).1.3 6 mm Polycarbonate Lexan;
(b).1.4 0.8 mm PVB interlayer; and
(b).1.5 3 mm Clear Tempered.

6.8.18.2(5)(c) Fire rated ceramic glass: type to suit application, for use in fire rated partitions, screens and doors.

6.8.18.2.5.(c).1 Fire Rated Glass Ceramic Fire-Rating 20-90 minutes ‘FireLite’, by TGP, 5 -25 mm thick as required for rating, clear polished glass.

6.8.18.2.5.(c).2 Fire Rated, Safety-Rated Glass Ceramic Fire-Rating: 20-180 minutes ‘FireLite Plus’ by TGP.

6.8.18.2.5.(c).3 Fire Rated, Safety-Rated Transparent Panel Fire Rating 45-120 Minutes, Heat Barrier 'Pilkington Pyrostop' distributed by TGP, for fire separation and closures with temperature rise limit.

6.8.18.2(5)(d) Mirrors:

6.8.18.2.5.(d).1 Provide mirrors of minimum 610 mm W x 460 mm D x 1.78 m H with two (2) swivel castors in all rehabilitation areas.

6.8.18.2.5.(d).2 Provide wall-mounted mirrors in all remaining areas.

6.8.18.2.5.(d).3 Grind smooth and polish all exposed mirror edges.

6.8.18.2.5.(d).4 Channel frame mirrors will consist of one-piece, stainless steel frame.

6.8.18.2(5)(e) Interior glazing for Secure Room:

6.8.18.2.5.(e).1 12 mm clear tempered laminated glass:

(e).1.1 3 mm Clear Tempered;

(e).1.2 6 mm Polycarbonate Lexan; and

(e).1.3 3 mm Clear Tempered.

6.8.18.2.5.(e).2 Cavity to suit the system.

6.8.18.2.5.(e).3 12 mm clear tempered laminated glass:

(e).3.1 3 mm Clear Tempered;

(e).3.2 6 mm Polycarbonate Lexan; and

(e).3.3 3 mm Clear Tempered.

6.8.18.2.5.(e).4 Minimum Forced Entry Resistance:

(e).4.1 ASTM F1915 – Grade 4

(e).4.2 HPW-TP-0500.02 – Level I.

6.8.18.3 Part 3 Execution

6.8.18.3(1) Not applicable.

6.8.19 Section 08 88 00 – Integral Blinds within Glazed Unit

6.8.19.1 Part 1 General

6.8.19.1(1) Performance Requirements

6.8.19.1(1)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.19.1(1)(b) Provide integral blinds for use within glazing units at the following locations:

6.8.19.1.1.(b).1 In door glazing, refer to Appendix 1B [Minimum Room Requirements];

6.8.19.1.1.(b).2 In Secure Room exterior window;

6.8.19.1.1.(b).3 In all Alcove – Observation areas that have observation windows into associated Patient Rooms; and

6.8.19.1.1.(b).4 In Operating Rooms and other spaces where lasers are used and require use of laser blocking blinds; refer to Appendix 1H [Equipment and Furniture].

6.8.19.1(1)(c) Provide laser blocking blinds for all locations where laser Equipment will be used. Blinds will provide all required filter or barriers to reduce any transmitted laser radiation to levels below the applicable MPE (maximum permissible exposure) level.

6.8.19.1(1)(d) Design integral blinds so as to not allow air movement from any room to adjacent rooms. Openings in the glazing plane are not acceptable.

6.8.19.1(2) Quality Assurance

6.8.19.1(2)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.8.19.2 Part 2 Products

6.8.19.2(1) Materials

6.8.19.2(1)(a) Integral blind glazing units will be a hermetically sealed consisting of glass panes on both sides of an airspace, fitted with integral interlocking louver blades.

6.8.19.2(1)(b) Provide integral blinds with the widest blades available.

6.8.19.2(1)(c) Integral blind will consist of tempered aluminum alloy slats resistant to UV degradation uniformly spaced and 100% interlaced between cross-ladders on at least one tape.

6.8.19.2(1)(d) Tapes will not require special end rails to attach suspension members from window opening to blind.

6.8.19.2(2) Control of Integral Blinds

6.8.19.2(2)(a) Provide an operator specially constructed with a permanent magnet capable of moving the blind

assembly from a closed position in one direction to a closed position in the opposite direction.

6.8.19.2(2)(b) Provide fully adjustable positioning allowing 180 degree rotation in a continuous cycle, allowing a full range of privacy position options.

6.8.19.2(2)(c) Chain, pull down cords or rod type controls will not be permitted.

6.8.19.2(2)(d) Operating Room controls will be located both within the room and in the corridor outside the room.

6.8.19.2(2)(e) Controls for integral blinds providing views into Patient rooms will be located on the corridor side.

6.8.19.2(2)(f) All other control locations will be determined in consultation with the Authority to suit functional requirements based on the Design.

6.8.19.3 Part 3 Execution

6.8.19.3(1) Not applicable.

6.8.20 Section 08 91 00 – Louvres

6.8.20.1 Part 1 General

6.8.20.1(1) References

6.8.20.1(1)(a) AAMA 2605, High Performance Organic Coatings on Architectural Extrusions and Panels.

6.8.20.1(1)(b) ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.8.20.1(1)(c) ASTM B221M, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

6.8.20.1(2) Performance Requirements

6.8.20.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.8.20.1(2)(b) Aerodynamic performance: 46% free area minimum.

6.8.20.1(2)(c) Limit deflection of louver members to not more than 1/180 of span between supports when subjected to

wind load of 1 Kpa applied horizontally to louvre face.

6.8.20.1(2)(d) Design louvers to accommodate expansion and contraction of components due to temperature changes.

6.8.20.1(3) Quality Assurance

6.8.20.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.8.20.2 Part 2 Products

6.8.20.2(1) Manufacturers

6.8.20.2(1)(a) Manufacturers: Subject to conformance to requirements of this Section, provide louvres by Construction Specialties or alternative as approved by the Authority.

6.8.20.2(2) Louvres

6.8.20.2(2)(a) Fixed, High Performance Drainable, Continuous Line, Storm-Resistant Horizontal Blade Aluminum Louver Assembly and Equipment Enclosure.

6.8.20.2(2)(b) Frames and Blades: Aluminum, ASTM B221M, 6063-T6 alloy and temper; extruded shapes, storm-resistant design, blades sloped at 45 degrees.

6.8.20.2(3) Accessories

6.8.20.2(3)(a) Flashings and Closures: ASTM B209M, alloy and temper to suit application, sheet; 1.27 mm minimum thickness. Provide head and sill flashings to required shape, single length in one piece per location.

6.8.20.2(3)(b) Bird Screen: Manufacturer's standard flattened aluminum mesh.

6.8.20.2(3)(c) Welded construction. Include concealed vertical stiffeners spaced to meet required loads.

6.8.20.2(3)(d) Blank-Out Sheeting on Interior of Louvre: Same material as louver and frame. Where indicated provide insulated sandwich panel construction with rigid polyurethane core having thermal resistance

value compatible with performance of wall construction.

6.8.20.2(4) Finish

6.8.20.2(4)(a) Fluoropolymer finish:

6.8.20.2.4.(a).1 Three-coat fluoropolymer coating system, complying with AAMA 2605 Voluntary Specification for High Performance Organic Coatings, containing not less than 70 percent PVDF resin by weight in both colour coat and clear topcoat, producing a coating thickness of 1.6 mils.

6.8.20.2.4.(a).2 Acceptable Products: Duranar XL by PPG Industries, Inc. or alternative approved by the Authority.

6.8.20.3 Part 3 Execution

6.8.20.3(1) Not applicable.

6.8.21 Section 08 71 00 – Door Hardware

6.8.21.1 Basic Requirements

6.8.21.1(1) The Authority’s goal is to limit the use of keys through door hardware technology. Location of card readers and other technologies are described in Section 7.9.4.

6.8.21.1(2) Refer to Appendix 1B [Minimum Room Requirements] for door hardware groups for each space listed in Appendix 1A [Clinical Specifications and Functional Space Requirements]. Doors, door hardware and controls will meet the Authority’s functional requirements based on the Design.

6.8.21.1(3) For all exterior entrances not otherwise noted in Appendix 1B [Minimum Room Requirements] and not listed in Appendix 1A [Clinical Specifications and Functional Space Requirements], provide door hardware to achieve the functionality described in door hardware groups; AO-10 and AO-11 below.

6.8.21.1(4) Provide a permanent, non-toxic antimicrobial finish such as silver based "MicroShield" or "AG+" products on all locksets, panic hardware and push/pulls.

6.8.21.1(5) All Component entrance doors that are closed due to BCBC requirements and/or controlled access requirements will be on automatic operators.

6.8.21.1(6) Provide automatic operators on doors in all corridors and service areas to facilitate the movement of materials, carts and equipment. Both leaves are to open allowing for maximum corridor width. Automatic opening hardware will be touch-free actuator type in all areas. The touch-free actuator type in all Staff and Patient areas will be a touchless switch, wave-to-open type sensor, designed for health care applications. Provide push button actuators as required at locations as determined in consultation with the Authority.

6.8.21.1(7) Provide card reader, key override, door contact, request to exit device, audio-video door intercom, audio intercom and remote release requirements as set out in:

6.8.21.1(7)(a) Section 7.9 Electronic Safety and Security (Division 28);

6.8.21.1(7)(b) Appendix 1O [Security Operation Matrix] and Section 7.9.4 Access Control, and

6.8.21.1(7)(c) Appendix 1A [Clinical Specifications and Functional Space Requirements],

6.8.21.1(7)(d) whereby the more stringent requirements applicable in each case will govern.

6.8.21.1(8) All doors throughout the Facility require a door hardware Evacuation Room Verification System including hinges and evacuation indicators that are highly visible in low light and smoke-filled environments to signal if the room is vacant or in-use. The Evacuation Room Verification System will indicate the status of the room during emergency conditions. The system will be activated when occupants have vacated the room and indicate if someone has re-entered the room. The system will enable the Fire Department to quickly assess the status of a room; if the device is in closed position then the room has been accessed and will be verified. If the door to a room is opened by more than one inch, the spring hinge will revert the system automatically to the closed position. The unit will not be reset from inside the room.

6.8.21.1(9) The Design-Builder will retain an Architectural Hardware Consultant (AHC) to assist with the preparation of the door schedule, prepare the door hardware schedule in coordination with the Access Control System provider and the electrical designer, attend in person all door hardware meetings, prepare a detailed Cx Plan for doors and sequence of operations, assist with review of door and hardware installations, and assist with Commissioning of the same.

6.8.21.1(10) For all Anti-Barricade doors, provide kerfed-in seal with a pile insert for the door header and jamb, and a pile sweep at the door bottom, in compliance with door acoustic requirements.

6.8.21.1(11) Card reader access control is not required on Staff Washroom/Shower room doors if they are only accessible from within secure Staff locker rooms in which case provide a mortise privacy set with occupied indicator and ability to lock door when out of service.

6.8.21.1(12) Provide a minimum of 2.135 m high door or door leaf, unless specifically required for access to services or other purposes where height is restricted.

6.8.21.1(13) Ensure required opening height is maintained where door hardware projects into the door opening. Use low profile or concealed hardware to maintain opening height where required.

6.8.21.1(14) Provide Patient room, Patient washrooms, laundry facility, and consult/interview rooms with hardware that allows the doors to stay in an open position and facilitates casual observance of Patients by the Staff.

6.8.21.1(15) For doors into or between major departments or activity areas through which cart and wheel chair traffic is anticipated on a routine basis, provide automatic activation by an electronic device or manual push button, located to allow emergency access without the necessity to stop movement. For all other doors through which cart, or frequent Patient or Staff traffic is anticipated on a routine basis, provide appropriate hardware or automatic activation that allows the doors to stay in an open position.

6.8.21.1(16) Provide concealed bearing swing clear hinges to provide greater access and protect the hinge edge of door wherever mobile Equipment will be moved in and out of the room. For other doors in the Facility, provide concealed bearing conventional door hinges. Provide door closer arms, automatic operator arms and power transfers designed for use with swing clear hinges.

6.8.21.1(17) Doors will not swing into ensuite washrooms.

6.8.21.1(18) Finish doors and frames with a suitable finish that prevents dirt and fingerprint accumulation and will be easily cleaned and disinfected.

6.8.21.1(19) Provide glazing in doors to allow Patient observation and operational safety of the spaces they serve, at minimum, as follows:

6.8.21.1(19)(a) as indicated in Appendix 1B [Minimum Room Requirements]; and

6.8.21.1(19)(b) in service room doors, except for mechanical, electrical, and Communications Rooms. The vision panel in these rooms will have a minimum size of 150 mm x 300 mm, or as permitted by code.

6.8.21.1(20) Provide blackout blinds and perimeter seals in doors where window treatment also requires blackout functionality as described in this Schedule; refer to Section 5.15.7.8.

6.8.21.1(21) Provide doors and door frames with the capability to withstand the varying and high levels of humidity and impact that occur typically within hospitals, and in specific rooms within these facilities, and maintain their inherent aesthetic and functional capacities.

6.8.21.1(22) Design doors at mechanical, electrical, plumbing and Communications Rooms to swing out, unless required otherwise by code, and be lockable through access control system.

6.8.21.1(23) Wicket and “door within a door” types of doors are not acceptable.

6.8.21.1(24) Provide doors into stairwells with glass vision panel (exit stairs and convenience stairs), as permitted by BCBC.

6.8.21.1(25) For the following rooms, provide all doors with door sweeps:

6.8.21.1(25)(a) Workshop - Main

6.8.21.1(25)(b) Workshop - Carpentry

6.8.21.1(25)(c) Workshop - Metal/Welding/Plumbing

6.8.21.1(26) All Doors are to be identified by a door number and a QR code in the BIM file, to be used for construction, and for maintenance during the design service life of the building. All doors are to be identified with a laser etched stainless steel sheet metal label with the QR code and door number, riveted to the inside of the door frames and suitably affixed to edges of the door panels. The Design-Builder will update the BIM file with design and as-built construction information of all doors, and the Architectural Hardware Consultant (AHC) will review the door information entries.

6.8.21.2 Performance Requirements

6.8.21.2(1) Finish hardware will be heavy duty suitable for institutional use.

6.8.21.2(2) Hinges: ANSI Grade 1, warranted for the life of the Facility. Size hinges according to manufacturer's recommendations. Provide hinges with concealed maintenance free Teflon or plastic bearings and non-removable pins.

6.8.21.2(3) Continuous hinges: ANSI Grade 1, geared aluminum type. Provide removable serviceable power transfers where required.

6.8.21.2(4) Swing Clear Hinges: ANSI Grade 1, Stainless Steel pin and barrel hinge with full length edge guard and "Adjusta-Screw" fasteners.

6.8.21.2(5) Wherever Ligature Resistant hardware is specified in the door hardware group, provide hospital tip hinges.

6.8.21.2(6) Locksets and latch sets: ANSI A156.13, fully mortised grade 1 type, lever handles will be solid material and provide a full return to the door. Provide lever handle locksets are with break-away/free-wheeling levers. Where doors are monitored for access control, provide request to exit switches in the lockset. Provide locksets from one of the following manufacturers:

6.8.21.2(6)(a) Schlage

6.8.21.2(6)(b) Sargent

6.8.21.2(6)(c) Best

6.8.21.2(7) Integrated Locksets: ANSI A156.13, fully mortised grade 1 type, lever handles will be solid material and provide a full return to the door. Provide lever handle locksets are with break-away/free-wheeling levers. Provide with an integrated card reader, door position switch, request to exit and manual key override. Locks are to be hard-wired for power and communication. Wireless locks will not be permitted. Provide locksets from one of the following manufacturers:

6.8.21.2(7)(a) Sargent Harmony

6.8.21.2(7)(b) Schlage AD series

6.8.21.2(7)(c) Best IDH Max

6.8.21.2(8) Deadbolts: ANSI A156.13, fully mortised grade 1 type. Provide Deadbolts from one of the following manufacturers:

6.8.21.2(8)(a) Schlage

6.8.21.2(8)(b) Sargent

6.8.21.2(8)(c) Best

6.8.21.2(9) Door closers: ANSI A156.4, Grade 1 type. Provide concealed door closers in areas where Patients are receiving care or treatment. Size all door closers to suit Facility conditions and with regards to accessibility for Persons with Disabilities. Provide delayed action closers at all locations. Do not locate door closers on the corridor side of openings. Provide through-bolt mounting for closers. Selectable hold open arms and spring-loaded stops are to be provided where applicable as determined in consultation with the Authority. Do not provide friction type hold open arms. Main arm and forearm are to be solid forged steel. Provide Door Closers from one of the following manufacturers:

6.8.21.2(9)(a) LCN

6.8.21.2(9)(b) Sargent

6.8.21.2(9)(c) Norton

6.8.21.2(10) Exit devices: ANSI 156.3 Grade 1 type. All exit devices will be listed for accident hazard and fire exit. Latch retraction devices will require an inrush of 1amp or less, have a manual key override and will not require proprietary power supplies. Vertical rod exit devices are to be concealed, less bottom rod type. Where doors are monitored for access control, provide request to exit switches in the exit device. Provide Exit Devices from one of the following manufacturers:

6.8.21.2(10)(a) VonDuprin

6.8.21.2(10)(b) Sargent

6.8.21.2(10)(c) Corbin

6.8.21.2(11) Door stops: Provide heavy duty wall stops.

6.8.21.2(12) Where doors are monitored for access control, provide request to exit switches in the exit device. Provide Exit Devices from one of the following manufacturers:

6.8.21.2(12)(a) VonDuprin

6.8.21.2(12)(b) Sargent

6.8.21.2(12)(c) Corbin

6.8.21.2(13) Floor stops are not permitted for safety and cleanliness reasons. Provide solid backing for wall stops.

6.8.21.2(14) Coordinators: Provide bar type coordinators for pairs of fire rated doors with astragals. Prepare for vertical rod strikes and provide mounting brackets for stop mounted hardware.

6.8.21.2(15) Magnetic Door Holders: Provide heavy duty wall mounted door holders where doors need to be held open and released on fire alarm. Provide solid backing for wall holders.

6.8.21.2(16) Astragals: Provide full length astragals for all exterior and parkade doors. For lead lined doors, refer to Section 6.13 Special Construction (Division 13). Proved short lip strike plates where they conflict with astragals. The astragal is not to be cut to accommodate strike plates.

6.8.21.2(17) Flush bolts: Provide heavy duty automatic latching top bolts. Mounting height of top flush bolts will not exceed 1800 mm. Provide heavy duty manual bottom bolts with dust proof strikes, except in areas where Patients are receiving care or treatment.

6.8.21.2(18) Manual sliding door hardware: Provide heavy duty tracks and hangers with a load capacity suitable for the door weight. Surface mounted track and hangers are to be concealed with facia and end caps. Provide all manual sliding doors with soft open/close hardware.

6.8.21.2(19) Perimeter seals: Provide seals with replaceable gaskets. Provide semi-recessed door bottoms that can be serviced without removal of the door. Mortised/concealed door bottoms that require the door to be removed for servicing are not permitted. In areas where Ligature Resistant hardware is required, provide seals designed to break into segments. Refer to Appendix 1D [Acoustic, Vibration, and Noise Control Measures] for acoustic requirements and provide seals as follows:

6.8.21.2(19)(a) D0 – Basic

6.8.21.2.19.(a).1 No Seals.

6.8.21.2(19)(b) D1 – Standard

6.8.21.2.19.(b).1 Full perimeter seals and an automatic door bottom.

6.8.21.2(19)(c) D2 – Acoustic Rated Door

6.8.21.2.19.(c).1 Full perimeter seals and an automatic door bottom.

6.8.21.2(19)(d) D3 – Acoustic Rated Door Assembly

6.8.21.2.19.(d).1 All seals provided by the door and frame manufacturer.

6.8.21.2(19)(e) D4 – Acoustic Rated Door Assembly

6.8.21.2.19.(e).1 All seals provided by the door and frame manufacturer.

6.8.21.2(20) Power transfers: Mortise power transfers into the edges of the door and frame. All power transfers are to be serviceable without removal of the door.

6.8.21.2(21) Magnetic Locks: ANSI A156.23 Grade 1 type. All magnetic locks are to be provided with a magnetic bond sensor.

6.8.21.2(22) Power supplies: Provide power supplies with relay boards that completely isolate hardware power from the access control system and individually fused outputs for each hardware device. Provide a minimum of 25% room for expansion and 5Ah battery backup. Locate power supplies in Communications Room.

6.8.21.2(23) Request to exit devices: Locate request to exit devices in the door hardware wherever the hardware allows.

6.8.21.2(24) Door position switches: Provide double throw double pole door position switches.

6.8.21.2(25) Automatic swing door operators: Provide Record-USA series 8100 Electromechanical Automatic Operators or alternative as approved by the Authority. Provide operators with on-board timing sequencers, power close mode, dynamic stack pressure compensation and opening assist. Upon loss of power, manual opening force will not exceed 15 lbf. Provide door mounted safety sensors on both sides of doors with automatic operation. Provide through-bolt mounting for operator arms. Provide a key switch located on the secure side to toggle function Auto/Open/Close. Key switches are to be keyed to the building masterkey system. Touch-free actuators are to be provided at two heights on both sides of the opening in accordance with BCBC. Where the opening can be approached in more than one direction from the same side of the opening, provide additional actuators.

6.8.21.2(26) Automatic sliding door operators: Provide Record-USA series 5100 Electromechanical Automatic Operators or alternative as approved by the Authority. Provide with electromechanical locking device and door leaf surveillance. Provide with request to exit device to release integrated lock. Provide safety sensors including sidelight protection sensors.

6.8.21.2(27) Delayed egress hardware: Except where required by BCBC or otherwise required by this Schedule, delayed egress hardware will not be used.

6.8.21.3 Door Hardware Corridor, Stairs and Outbreak Control Zone Requirements

6.8.21.3(1) For the rooms and spaces listed in Appendix 1A [Clinical Specifications and Functional Space Requirements], provide door

hardware as described in Appendix 1B [Minimum Room Requirements].

6.8.21.3(2) Provide the following door hardware in other areas of the Facility:

6.8.21.3(2)(a) Secure Room Doors:

6.8.21.3.2.(a).1 Ligature Resistant /Anti-Barricade;
6.8.21.3.2.(a).2 Swing out of the Secure Room;
6.8.21.3.2.(a).3 Continuous hinge;
6.8.21.3.2.(a).4 Magnetic lock;
6.8.21.3.2.(a).5 3-point locking mortise lock (key lockable), 1 strike into head and two into the jamb – middle and lower;
6.8.21.3.2.(a).6 No door closers;
6.8.21.3.2.(a).7 Wall-mounted door stop; and
6.8.21.3.2.(a).8 Be designed and constructed to comply with the requirements of the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

6.8.21.3(2)(b) Cross-corridor doors on inpatient area floors (Secure Double Egress). These doors are normally locked and can be released (scheduled, card reader, or in an emergency). Connected into the Patient Wandering System:

6.8.21.3.2.(b).1 Provide Type B2 as described in the Appendix 1B [Minimum Room Requirements];
6.8.21.3.2.(b).2 Hinges;
6.8.21.3.2.(b).3 Concealed power transfer;
6.8.21.3.2.(b).4 Exit hardware (request to exit provided in the door hardware);
6.8.21.3.2.(b).5 Magnetic locks;
6.8.21.3.2.(b).6 Door closers;
6.8.21.3.2.(b).7 Door stops;
6.8.21.3.2.(b).8 Perimeter seals (for acoustics and/or pressurization);
6.8.21.3.2.(b).9 Thresholds (where required);
6.8.21.3.2.(b).10 At secure vestibules provide the ability to interlock inner and outer doors; and
6.8.21.3.2.(b).11 Card reader.

6.8.21.3(2)(c) Cross-corridor doors (fire separation). These doors are normally held open and are released on fire alarm:

6.8.21.3.2.(c).1 Provide Type B2 as described in the Appendix 1B [Minimum Room Requirements];
6.8.21.3.2.(c).2 Hinges;

6.8.21.3.2.(c).3 Exit hardware;
6.8.21.3.2.(c).4 Door closers;
6.8.21.3.2.(c).5 Door stops;
6.8.21.3.2.(c).6 Magnetic wall holders; and
6.8.21.3.2.(c).7 Perimeter seals (for smoke).

6.8.21.3(2)(d) Exit stairs from inpatient areas floors. These doors are normally locked and can be released (card reader or in 2nd stage fire alarm). Connected into the Patient Wandering System; refer to Section 7.9.10. Delayed egress with remote notification at Care Team Station. Always locked from the stair side:

6.8.21.3.2.(d).1 Hinges;
6.8.21.3.2.(d).2 Concealed power transfer;
6.8.21.3.2.(d).3 Exit hardware;
6.8.21.3.2.(d).4 Delayed egress;
6.8.21.3.2.(d).5 Door closers;
6.8.21.3.2.(d).6 Door stops;
6.8.21.3.2.(d).7 Perimeter seals (for acoustics and/or pressurization);
6.8.21.3.2.(d).8 Thresholds (where required); and
6.8.21.3.2.(d).9 Card reader.

6.8.21.3(2)(e) For Outbreak Control Zone corridor doors, provide interior automatic pairs with card reader and hold open with the following features:

6.8.21.3.2.(e).1 Provide Type B2 as described in the Appendix 1B [Minimum Room Requirements];
6.8.21.3.2.(e).2 Consist of inner and outer doors to create an anteroom. Sequenced so both doors cannot be open at the same time in an outbreak scenario;
6.8.21.3.2.(e).3 Presence/safety sensors;
6.8.21.3.2.(e).4 Actuated by card reader;
6.8.21.3.2.(e).5 Remote key switch to deactivate;
6.8.21.3.2.(e).6 Ability to be held open; and
6.8.21.3.2.(e).7 Perimeter seals.

6.8.21.3(2)(f) Single Exterior Entry Vestibules:

6.8.21.3.2.(f).1 Consist of inner and outer doors to create a vestibule;
6.8.21.3.2.(f).2 Hinges;
6.8.21.3.2.(f).3 Lockset (outer door) and push/pull (inner door);
6.8.21.3.2.(f).4 Closers;
6.8.21.3.2.(f).5 Door Stops;
6.8.21.3.2.(f).6 Perimeter seals (for weather);

6.8.21.3.2.(f).7 Thresholds;
6.8.21.3.2.(f).8 Astragal (outer door);
6.8.21.3.2.(f).9 Door position switch (outer door); and
6.8.21.3.2.(f).10 Card Reader (outer door).

6.8.21.3(2)(g) Department Entry in public areas. Door with automatic operator and card reader. Doors are normally unlocked from the corridor side (latches retracted) and can be locked on schedule, fire alarm or in an emergency. Exiting is always free:

6.8.21.3.2.(g).1 Provide Type B2 as described in the Appendix 1B [Minimum Room Requirements];
6.8.21.3.2.(g).2 Hinges;
6.8.21.3.2.(g).3 Concealed power transfer;
6.8.21.3.2.(g).4 Exit Hardware (Latch retraction and request to exit provided in the door hardware);
6.8.21.3.2.(g).5 Automatic operator;
6.8.21.3.2.(g).6 Actuators;
6.8.21.3.2.(g).7 Remote key switch to deactivate;
6.8.21.3.2.(g).8 Ability to be held open;
6.8.21.3.2.(g).9 Perimeter seals; and
6.8.21.3.2.(g).10 Card reader.

6.8.21.3(2)(h) Department Entry in Staff areas. Door with automatic operator and card reader. Doors are normally locked from the corridor side. Exiting is always free:

6.8.21.3.2.(h).1 Provide Type B2 as described in the Appendix 1B [Minimum Room Requirements];
6.8.21.3.2.(h).2 Hinges;
6.8.21.3.2.(h).3 Concealed power transfer;
6.8.21.3.2.(h).4 Exit Hardware (Latch retraction and request to exit provided in the door hardware);
6.8.21.3.2.(h).5 Automatic operator;
6.8.21.3.2.(h).6 Actuators;
6.8.21.3.2.(h).7 Remote key switch to deactivate;
6.8.21.3.2.(h).8 Ability to be held open;
6.8.21.3.2.(h).9 Perimeter seals; and
6.8.21.3.2.(h).10 Card reader.

6.8.21.3(2)(i) Exterior exit doors (stair exits). No operable hardware outside. Doors are always locked from the outside. Exiting is always free:

6.8.21.3.2.(i).1 Provide Type A as described in the Appendix 1B [Minimum Room Requirements] unless otherwise required by the Authority and determined through the Review Procedure;
6.8.21.3.2.(i).2 Hinges;

6.8.21.3.2.(i).3 Concealed power transfer;
6.8.21.3.2.(i).4 Exit Hardware (Request to exit provided in the door hardware);
6.8.21.3.2.(i).5 Door closer;
6.8.21.3.2.(i).6 Perimeter seals;
6.8.21.3.2.(i).7 Threshold; and
6.8.21.3.2.(i).8 Astragal.

6.8.21.3(2)(j) Exterior service doors. Access to service rooms from exterior and from underground parking. Doors are always locked from the outside. Exiting is always free:

6.8.21.3.2.(j).1 Provide Type A2 p as described in the Appendix 1B [Minimum Room Requirements] providing a minimum opening size of approximately 1830 x 2400 unless otherwise required by the Authority and determined through the Review Procedure;
6.8.21.3.2.(j).2 Hinges;
6.8.21.3.2.(j).3 Concealed power transfer;
6.8.21.3.2.(j).4 Lockset (Electronic release, Request to exit provided in the door hardware);
6.8.21.3.2.(j).5 Door closer;
6.8.21.3.2.(j).6 Perimeter seals;
6.8.21.3.2.(j).7 Threshold;
6.8.21.3.2.(j).8 Astragal; and
6.8.21.3.2.(j).9 Card reader.

6.8.21.3(2)(k) Exterior courier or Staff entry doors. These will consist of an inner and outer door to form a vestibule. Provide automatic operator and card reader. Doors are normally locked from the outside. Exiting is always free. Provide a video intercom and remote release at a location determined in consultation with the Authority:

6.8.21.3.2.(k).1 Hinges;
6.8.21.3.2.(k).2 Concealed power transfer;
6.8.21.3.2.(k).3 Exit Hardware (Latch retraction and request to exit provided in the door hardware);
6.8.21.3.2.(k).4 Automatic operator;
6.8.21.3.2.(k).5 Actuators;
6.8.21.3.2.(k).6 Remote key switch to deactivate;
6.8.21.3.2.(k).7 Ability to be held open;
6.8.21.3.2.(k).8 Perimeter seals; and
6.8.21.3.2.(k).9 Card reader.

6.8.21.4 Keying

6.8.21.4(1) Provide factory master keyed cylinders with Schlage numbered keyway. Cylinders are to be construction keyed. Permanent keys will be given directly to the Authority by the manufacturer. Four (4) keys will be supplied for each lock cylinder. Install permanent cylinders prior to Substantial Completion.

6.8.21.4(2) Supply and install geographically exclusive, patent protected cylinders, patent to be to the minimum year 2029, 6 pin (factory recorded, factory pinned).

6.8.21.4(3) Implement a 4-level system.

6.8.21.4(4) Supply four (4) keys for each lock cylinder.

6.8.21.4(5) Keying groups will be assigned by the Authority.

6.8.21.4(6) New key bittings will be provided to and controlled by Authority.

6.8.21.4(7) The Design-Builder will remove construction cores and install permanent cores under the direction of the Authority.

6.8.21.4(8) See Section 7.9 Electronic Safety and Security (Division 28) for additional requirements.

6.8.21.5 Electronic Key Management Systems

6.8.21.5(1) Provide a key management system to meet the following requirements:

6.8.21.5(1)(a) 175 mm (7") capacitive touch screen;

6.8.21.5(1)(b) Full audit trail of all users and key transactions;

6.8.21.5(1)(c) Secure storage and management for up to sixty (60) keys;

6.8.21.5(1)(d) Access by authorized users only via card reader and biometric fingerprint reader;

6.8.21.5(1)(e) Provide battery backup;

6.8.21.5(1)(f) Provide soft close-down with no data loss in the event of long-term power failure;

6.8.21.5(1)(g) Cabinet material: Zintec steel;

6.8.21.5(1)(h) Users per system: 40,000; and

6.8.21.5(1)(i) Comply with the following certifications: CE, FCC, CSA, ROHS

6.8.21.5(2) Provide power, data and network integration/connectivity as required for a complete installation and in accordance with the requirements as set out in this Schedule.

6.8.21.5(3) Provide key management systems in the following locations:

6.8.21.5(3)(a) W4.09 Workroom – FMO; and

6.8.21.5(3)(b) W4.01 Workshop - Main

6.8.21.5(4) Acceptable products:

6.8.21.5(4)(a) Traka S-Touch Series or alternative as approved by the Authority.

6.8.21.6 Digital Device Lockers

6.8.21.6(1) Acceptable Products: Traka Intelligent Tablet and Laptop Lockers by Assa Abloy or alternative as approved by the Authority.

6.8.21.6(2) Digital device lockers to include the following features:

6.8.21.6(2)(a) Centrally managed and controlled by user friendly software, capable of allocating devices to specific users at specific times;

6.8.21.6(2)(b) Equipped with RTLS technology allowing each Asset to be individually tagged and complete audit trail is stored within system enabling full visibility of usage, such as monitoring of withdrawal, current use, previous use and return;

6.8.21.6(2)(c) Has capability of sending system alert notifications to a device if not returned by a designated time;

6.8.21.6(2)(d) Equipped with charging facilities within locker system;

6.8.21.6(2)(e) Equipped with fault logging and automatic reporting feature to lock items in place and not be dispensed until fault has been fixed;

6.8.21.6(2)(f) Capable of being integrated with databases or existing access control systems;

6.8.21.6(2)(g) Steel sheet and components;

6.8.21.6(2)(h) ASTM A653/A653M; steel sheet and members, surfaces finished with manufacturer’s standard powder coating; and

6.8.21.6(2)(i) Door complete with pattern of ventilation holes.

6.8.21.6(3) Hardware: Manufacturer's standard Vandal Resistant nuts, bolts, lock washers, nut covers, angle clips and fastenings as required for complete installation.

6.8.21.6(4) Lockers will include provision for touchscreen technology for access and locking of locker unit.

6.8.21.6(5) Device lockers to be complete with number plates.

6.8.21.6(6) Device locker size and configuration will be determined in consultation with the Authority through the Review Procedure and will accommodate a minimum of ten (10) laptops, ten (10) tablets, ten (10) scanners and ten (10) radios.

6.8.21.6(7) Provide power, data and network integration/connectivity as required for a complete installation and in accordance with the requirements as set out in this Schedule.

6.8.21.6(8) Provide a minimum one (1) device locker in each of the following locations:

6.8.21.6(8)(a) Workshop – Main;

6.8.21.6(8)(b) Workroom – FMO;

6.8.21.6(8)(c) Workstation - Virtual Health; and

6.8.21.6(8)(d) Workroom – Diet.

6.8.21.6(9) Part 3 Execution

6.8.21.6(9)(a) Not applicable.

6.9 Finishes (Division 9)

6.9.1 Section 09 21 16 – Gypsum Board Assemblies

6.9.1.1 Part 1 General

6.9.1.1(1) References

6.9.1.1(1)(a) ASTM A653/A653-M, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.9.1.1(1)(b) ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

6.9.1.1(1)(c)	ASTM C475/C475M, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
6.9.1.1(1)(d)	ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.
6.9.1.1(1)(e)	ASTM C665, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
6.9.1.1(1)(f)	ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board.
6.9.1.1(1)(g)	ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
6.9.1.1(1)(h)	ASTM C1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
6.9.1.1(1)(i)	ASTM C1178, Specification for Glass Mat Water-Resistant Gypsum Backing Board.
6.9.1.1(1)(j)	ASTM C1278, Specification for Fiber-Reinforced Gypsum Panel.
6.9.1.1(1)(k)	ASTM C1325, Standard Specification for Non Asbestos Fiber Mat Reinforced Cementitious Backer Units.
6.9.1.1(1)(l)	ASTM C1396, Specification for Gypsum Board.
6.9.1.1(1)(m)	ASTM C1629/C1629M, Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
6.9.1.1(1)(n)	ASTM C1658/C1658M, Standard Specification for Glass Mat Gypsum Panels.
6.9.1.1(1)(o)	ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
6.9.1.1(1)(p)	ASTM E413, Classification for Rating Sound Insulation.

6.9.1.1(1)(q) ASTM F1267, Standard Specification for Metal, Expanded, Steel. AWCC, Association of Wall & Ceiling Contractors.

6.9.1.1(1)(r) CSSBI, Canadian Sheet Steel Building Institute.

6.9.1.1(1)(s) CSA S832, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

6.9.1.2 Performance Requirements

6.9.1.2(1) Perform work in accordance with AHJ and as outlined herein.

6.9.1.2(2) Seismic Performance: Provide materials to withstand the effects of earthquake motions determined according to BCBC and CSA S832 requirements.

6.9.1.2(3) Design ceiling suspension system in accordance with manufacturer's printed directions and ASTM C754.

6.9.1.2(4) Design ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

6.9.1.2(5) Design hanger anchor and entire suspension system to conform to post disaster requirements.

6.9.1.2(6) Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

6.9.1.2(7) Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.

6.9.1.2(8) Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.

6.9.1.2(9) Levels of Gypsum Wall board Finish:

6.9.1.2(9)(a) Level 0: Temporary construction only.

6.9.1.2(9)(b) Level 1: Plenum areas and above ceilings. Where a fire-resistance rating is required finishing to be in accordance with reports of fire tests of assemblies that have met the requirements of the fire rating imposed.

6.9.1.2(9)(c) Level 2: Areas of water resistant gypsum backing board under tile, exposed areas where appearance is not critical.

6.9.1.2(9)(d) Level 3: Service corridors and areas to receive heavy or medium textured coatings or heavy-duty wallcoverings.

6.9.1.2(9)(e) Level 4: Areas to receive light textured coatings or lightweight wallcoverings.

6.9.1.2(9)(f) Level 5: Areas to receive gloss, semi-gloss or flat sheen paints and critical lighting conditions.

6.9.1.2(10) Interior wall framing will comply with all applicable standards listed in the BCBC, including Canadian Sheet Steel Building Institute Standards (CSSBI) and Association of Wall and Ceiling Contractors of BC (AWCC) Wall & Ceiling Specification Standards Manual for materials and workmanship for interior walls, including steel studs and furring and gypsum board ceiling suspension systems.

6.9.1.2(11) Partition design will accommodate all applicable loads including the following loadings with deflection not exceeding L/240 in any direction:

6.9.1.2(11)(a) Minimum lateral load for partitions: 0.24 kPA (5 psf);

6.9.1.2(11)(b) Minimum lateral load for firewalls and fire separations: 0.51 kPA (10 psf); and

6.9.1.2(11)(c) Minimum lateral load for shaft walls: 0.73 kPA (15 psf)

6.9.1.2(12) Fire-resistance

6.9.1.2(12)(a) Design fire rated construction to provide an acceptable level of fire safety in accordance with BCBC, to approve ULC or cUL design requirements;

6.9.1.2(12)(b) Provide materials and construction identical to those tested in assembly indicated according to standards referenced above, by an independent testing agency.

6.9.1.2(13) Fire-Resistance Rated Shaftwall Gypsum Board Assemblies: Provide materials and construction identical to those tested in

assembly indicated according to applicable Underwriter's Laboratories of Canada (ULC) shaftwall design assemblies.

6.9.1.2(14) Non-Ferrous Materials: In locations where non-ferrous metals are required such as MRI rooms, provide non-ferrous framing. Ensure all components or materials including fastenings, anchors and accessories, used for the Work are nonferrous and certified by the Equipment manufacturer as non-detrimental to the proper operation of the equipment.

6.9.1.2(15) Aluminum Studs: ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Type 6063-T6) specialty aluminum channels complete with necessary fittings and nuts for complete installation.

6.9.1.2(16) Acoustical Rated Gypsum Board Assemblies:

6.9.1.2(16)(a) For acoustical rated gypsum board assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

6.9.1.2(16)(b) For acoustical rated gypsum board ceiling assemblies, provide acoustical suspension isolators as required.

6.9.1.2(17) Quality Assurance

6.9.1.2(17)(a) Source Limitations: Obtain gypsum board assemblies from single source from single manufacturer.

6.9.1.2(17)(b) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.1.3 Part 2 Products

6.9.1.3(1) Manufacturers

6.9.1.3(1)(a) Manufacturers (gypsum board): Subject to conformance to requirements of this Section, provide gypsum board materials by one of the following:

6.9.1.3.1.(a).1 Canadian Gypsum Company (CGC) Inc.;
6.9.1.3.1.(a).2 CertainTeed Gypsum Canada Inc.;
6.9.1.3.1.(a).3 Georgia-Pacific Canada Inc.;

6.9.1.3.1.(a).4 Or alternative as approved by the Authority.

6.9.1.3(1)(b) Manufacturers (cement board): Subject to conformance to requirements of this Section, provide cement board by PermaBase Building Products or alternative as approved by the Authority.

6.9.1.3(1)(c) Manufacturers (steel framing): Subject to conformance to requirements of this Section, provide non-structural interior metal framing by one of the following:

6.9.1.3.1.(c).1 Bailey Metal Products Limited;
6.9.1.3.1.(c).2 CEMCO;
6.9.1.3.1.(c).3 Clark Dietrich Building Systems;
6.9.1.3.1.(c).4 Or alternative as approved by the Authority.

6.9.1.3(2) Framing

6.9.1.3(2)(a) Wall Framing:

6.9.1.3.2.(a).1 Studs and tracks: ASTM C645; Galvanized steel studs and runners, formed from galvanized steel sheet.
6.9.1.3.2.(a).2 Steel framing: ASTM C754; ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.

6.9.1.3(2)(b) Ceiling framing:

6.9.1.3.2.(b).1 Main carrying channels: ASTM C645; Formed from galvanized steel sheet, channels.
6.9.1.3.2.(b).2 Resilient channel: ASTM C645; 0.5 mm thick galvanized metal.
6.9.1.3.2.(b).3 Furring channels: ASTM C645; Formed from galvanized steel sheet, winged flange type, cold rolled.
6.9.1.3.2.(b).4 Furring channels (hat type): ASTM C645; 0.5 mm base steel thickness, galvanized, hat shaped channel.
6.9.1.3.2.(b).5 Heavy duty furring channels: ASTM C645; 0.9 mm steel thickness, galvanized hat shaped channel with a wider and deeper size as required by manufacturers.
6.9.1.3.2.(b).6 Suspension system grid:
(b).6.1 Pre-engineered drywall suspension grid system.
(b).6.2 Acceptable Products: Drywall Grid System by Armstrong World Industries or alternative as approved by the Authority.

6.9.1.3(2)(c) Suspended Ceiling Components: Provide traditional framed suspension system components consisting of tie wires, hangers, anchorages channels and attachments or at locations acceptable to the Authority provide manufactured direct-hung grid suspension system.

6.9.1.3(2)(d) Shaft wall framing:

6.9.1.3.2.(d).1 Steel J-Runner: ASTM C645; Rolled formed sheet steel, 25 gauge.

6.9.1.3.2.(d).2 C-H stud: hot-dipped galvanized.

6.9.1.3(3) Gypsum and Cement Boards

6.9.1.3(3)(a) Gypsum board (GB, non-rated): ASTM C1396; gypsum board 15.9 mm (5/8”) thick.

6.9.1.3(3)(b) Fire rated gypsum board (GB, fire rated): ASTM C1396; gypsum board 15.9 mm (5/8”) thick, Type X Board.

6.9.1.3(3)(c) Ceiling board: Sag resistant, meeting requirements of ASTM C1396, 15.9 mm (5/8”) thick.

6.9.1.3(3)(d) Abuse-resistant Gypsum Board (ARGB): ASTM C1658/C1658M and ASTM C1396; 15.9 mm (5/8") thick Type X board smooth paintable surface consisting of fibre-reinforced gypsum core with fibre-reinforced gypsum perlite interlayers and embedded fibreglass with moisture treated core.

6.9.1.3(3)(e) Impact Resistant Gypsum Board (IRGB): ASTM C1658M and ASTM C1396M; 15.9 mm (5/8") thick Type X board smooth paintable surface consisting of fibre-reinforced gypsum core with fibre-reinforced gypsum perlite interlayers and embedded fibreglass with moisture treated core.

6.9.1.3(3)(f) Interior Cementitious Board: ASTM C1325, high strength portland cement building panel with self adhesive glass tape; provide board with heavier mesh reinforcement for suspended applications.

6.9.1.3(3)(g) Exterior Cementitious Board: High strength portland cement building panel with self adhesive glass tape, with heavier mesh reinforcement for suspended applications.

6.9.1.3(3)(h) Mold and Moisture Resistant Gypsum Board (MMRGB): ASTM C1658M and ASTM C1396M,

15.9 mm (5/8") thick glass mat reinforced board with moisture treated core. Comply with ASTM C1629 Level 2 for Hard Body Impact.

6.9.1.3(3)(i) Tile Backer: Water resistant tile backer board, glass mat, meeting ASTM C1178 or ASTM C1278.

6.9.1.3(3)(j) Shaft Liner Panel: ASTM C1658; Gypsum wallboard panel, Thicknesses: 15.9 mm (5/8”) face panel and 25.4 mm (1”) liner panel.

6.9.1.3(3)(k) Exterior sheathing: ASTM C1177; Type X glass mat reinforced, weather and sag resistant exterior gypsum panel, 15.9 mm (5/8”) thick.

6.9.1.3(4) Accessories

6.9.1.3(4)(a) Acoustic/Fire insulation: ASTM C665, Paperless, semi-rigid, mineral wool batts.

6.9.1.3(4)(b) Acoustical sealant: ASTM C919, Single component, non-skinning synthetic rubber sealant.

6.9.1.3(4)(c) Corner Beads: Galvanized steel sheet conforming to ASTM A653, minimum 0.0179" (25 gauge).

6.9.1.3(4)(d) Casing Beads: Galvanized steel sheet conforming to ASTM A653, minimum 30 gauge, U-shaped designed for finishing with joint compound.

6.9.1.3(4)(e) Control Joints: Galvanized sheet steel conforming to ASTM A653, minimum 0.0179" (25 gauge), or roll-formed zinc-alloy to resist corrosion, with expansion joint material perforated flanges.

6.9.1.3(4)(f) Reveals: Galvanized sheet steel conforming to ASTM A653, minimum 0.0179" (25 gauge)

6.9.1.3(4)(g) Joint Compound for Interior Gypsum Board: Conforming to ASTM C475 and as recommended by gypsum board manufacturers.

6.9.1.3(4)(h) Joint Compound for Tile Backing Panels: Use setting type taping and setting type, sandable topping compounds.

6.9.1.3(4)(i) Joint Compound for Exterior Sheathing Boards: Fibreglass mesh tape.

6.9.1.3(4)(j) Security Accessories:

6.9.1.3.4.(j).1 Mesh: ASTM F1267, Type 2, Class 1; 3 mm thick galvanized, flattened, expanded steel diamond mesh, nominal diamond size 25 x 50 mm.

6.9.1.3.4.(j).2 Strap/Clips: Galvanized steel strap or clip.

6.9.1.4 Part 3 Execution

6.9.1.4(1) Not applicable.

6.9.2 Section 09 51 23 – Suspended Acoustic Ceiling Tiles

6.9.2.1 Part 1 General

6.9.2.1(1) References

6.9.2.1(1)(a) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.9.2.1(1)(b) ASTM B209/B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.9.2.1(1)(c) ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

6.9.2.1(1)(d) ASTM C635, Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

6.9.2.1(1)(e) ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

6.9.2.1(1)(f) ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.

6.9.2.1(1)(g) ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

6.9.2.1(1)(h) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.9.2.1(1)(i) ASTM E580/E580M, Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions.

6.9.2.1(1)(j) ASTM E1264, Classification of Acoustical Ceiling Products.

6.9.2.1(1)(k) AWCC, Association of Wall and Ceiling Contractors.

6.9.2.1(1)(l) CSA Z8000, Canadian Health Care Facilities.

6.9.2.1(2) Performance Requirements

6.9.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.2.1(2)(b) Ceiling finish for infection control purposes will comply with CSA Z8000, including the requirements as defined for semi-restricted and restricted areas.

6.9.2.1(2)(c) Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.

6.9.2.1(2)(d) Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

6.9.2.1.2.(d).1 Flame-Spread Index: Comply with ASTM E1264 for Class A materials.

6.9.2.1.2.(d).2 Smoke-Developed Index: 50 or less.

6.9.2.1(2)(e) Design hanger anchor and entire suspension system to conform to post disaster requirements.

6.9.2.1(2)(f) Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

6.9.2.1(2)(g) Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.

6.9.2.1(2)(h) Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

6.9.2.1(2)(i) Acoustical Ceiling Seismic Suspension Assemblies:

6.9.2.1.2.(i).1 Design suspended ceiling systems to comply with seismic resistance as required by BCBC.

6.9.2.1.2.(i).2 Acoustical ceiling suspension assemblies will be designed to resist seismic loads for the geographical location of the project site in accordance with ASTM E580/E580M.

6.9.2.1(2)(j) Design suspension system components in MRI areas to incorporate non-ferrous materials.

6.9.2.1(2)(k) Refer to Appendix 1H [Equipment and Furniture] for coordination of acoustical ceiling systems with clinical equipment list as required for special imaging equipment requirements.

6.9.2.1(2)(l) Provide acoustical ceiling system to provide reverberation control (NRC rating) and sound isolation (CAC rating) as required to suit the intended function of the room. The minimum NRC rating and CAC will be 0.70 and 35, respectively, except for in the following conditions:

6.9.2.1.2.(l).1 Where washable tiles are required to meet infection control requirements, provide minimum NRC 0.50; and

6.9.2.1.2.(l).2 For Multimedia Rooms provide minimum NRC 0.70 (CAC not applicable).

6.9.2.1(2)(m) Where required in restricted or semi restricted areas use system that is monolithic, gasketed and clipped down. Perforated or highly textured tiles will not be used in these areas.

6.9.2.1(3) Quality Assurance

6.9.2.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.2.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.9.2.1(3)(c) Work of this Section will comply to the Specification Standards Manual as published by the Association of Wall and Ceiling Contractors of BC (AWCC).

6.9.2.2 Part 2 Products

6.9.2.2(1) Manufacturers

6.9.2.2(1)(a) Manufacturers: Subject to conformance to requirements of this Section, provide acoustical ceiling systems by one of the following:

6.9.2.2.1.(a).1 Armstrong World Industries.

6.9.2.2.1.(a).2 Canadian Gypsum Company (CGC) Inc.

6.9.2.2.1.(a).3 Or alternative as approved by the Authority.

6.9.2.2(2) Materials

6.9.2.2(2)(a) Galvanized steel: ASTM A653/A653M, Z275; cold rolled, galvanized steel.

6.9.2.2(2)(b) Aluminum:

6.9.2.2.2.(b).1 Aluminum extrusions: ASTM B221 extruded aluminum alloy AA-6063- T5 or T6.

6.9.2.2.2.(b).2 Aluminum plate and sheet: ASTM B209/B209M, of type and characteristics to match finished extrusions.

6.9.2.2(3) Suspension System

6.9.2.2(3)(a) General: Provide non-ferrous materials for suspension system components at MRI areas. Provide aluminum exposed ceiling suspension system in MRI areas and locations where ferrous metals are not acceptable complying with ASTM C635, heavy duty structural classification.

6.9.2.2(3)(b) Non-Fire Rated Grid: ASTM C635, intermediate or heavy duty; exposed T; components die cut and interlocking. Allow for 50% tegular bevelled and 50% square lay-in.

6.9.2.2(3)(c) Fire Rated Grid: ASTM C635, intermediate or heavy duty, listed by UL for use in required assemblies, exposed T; components die cut and interlocking.

6.9.2.2(3)(d) Grid Materials:

6.9.2.2.3.(d).1 Typical: Commercial quality cold rolled steel with galvanized coating.

6.9.2.2.3.(d).2 MRI areas: Aluminum grid with non-magnetic properties.

6.9.2.2.3.(d).3 Grid Finish: White.

6.9.2.2(3)(e) Accessories:

6.9.2.2.3.(e).1 Stabilizer bars, clips, splices, perimeter mouldings, and hold down clips, required for suspended grid system.

6.9.2.2.3.(e).2 Perimeter mouldings:

(e).2.1 Typical: Galvanized steel trim.

(e).2.2 MRI areas: Aluminum trim with non-magnetic properties.

(e).2.3 Trim Finish: White.

6.9.2.2(3)(f) Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

6.9.2.2(3)(g) Manufacturer's standard direct hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635 requirements and as supplied by same materials supplier as acoustic panels for intermediate duty, exposed tee bar and as follows:

6.9.2.2.3.(g).1 Tee Bar Grid Face Width: 24 mm

6.9.2.2.3.(g).2 Module: Sized as appropriate to acoustic panel size.

6.9.2.2.3.(g).3 Hangers, Braces and Ties: Nominal 14 ga. diameter steel wire, galvanized.

6.9.2.2.3.(g).4 Exposed Finish: Manufacturers standard satin, white finish.

6.9.2.2.3.(g).5 Corrosion Resistance: Hot-dip galvanized or stainless steel components.

6.9.2.2(4) Acoustical Units

6.9.2.2(4)(a) Suspended Acoustic Ceiling Tile (ACT):

6.9.2.2.4.(a).1 General: Non-directional, fissured pattern, Imperial dimension white ceiling panel, trim edge detail (square) to fit a standard 15/16” T-bar grid panel size. Acoustic ceiling tiles having other textures/finishes may be considered provided they meet acoustic and other requirements.

6.9.2.2.4.(a).2 Special surface-treated ceiling tiles, such as mylar, vinyl-faced or metal-faced tiles, may be used where maintenance and ease of cleaning are priorities as well as the accessibility and subject to acoustic requirements.

6.9.2.2.4.(a).3 Use tiles with scratch-resistant surfaces in any area where lay-in ceiling panels

frequently need to be removed for plenum access.

6.9.2.2.4.(a).4 Acceptable Products:

(a).4.1 Acoustic tile (typical):

(a).4.1.1 ASTM E1264, Type IV, Form 1 & 2, Pattern E, G, Fire Class A, minimum NRC of 0.70, CAC of 38; wet-formed mineral fibre with acoustically transparent water-repellent membrane with factory-applied latex paint, square edge, 19 mm thick, Ultima Health Zone by Armstrong World Industries or USG Mars Healthcare by Canadian Gypsum Company (CGC) Inc.

(a).4.1.2 Or alternative as approved by the Authority.

(a).4.2 Acoustic tile (upgraded/higher NRC):

(a).4.2.1 ASTM E1264, Type IV, Form 2, Pattern E, Fire Class A, NRC of 0.80, CAC of 40; wet-formed mineral fibre with acoustically transparent membrane and polyethylene foam with factory-applied latex paint, tegular edge, 25 mm thick, Calla Health Zone AirAssure by Armstrong World Industries.

(a).4.2.2 Or alternative as approved by the Authority.

(a).4.3 Acoustic tile (ACT-C for ISO Clean Room/Spaces utilizing HEPA filters/USP 797 pharmacies):

(a).4.3.1 ASTM E1264, Type IV, Form 2, Pattern E, Fire Class A, CAC of 40; wet-formed mineral fibre with vinyl-faced membrane, square edge, 16 mm thick, Clean Room VL by Armstrong World Industries. Ceiling tile to be complete with hold down clips as required for installation in integral gasketed clean room ceiling grid.

(a).4.3.2 Or alternative as approved by the Authority.

(a).4.4 Acoustic tile (KLCT for kitchen / food services):

(a).4.4.1 ASTM E1264, Type IX, Form 2, Pattern G, Fire Class A, CAC of 33; wet-formed mineral fibre with factory-applied latex paint, square edge, 16 mm thick, Kitchen Zone by Armstrong World Industries.

(a).4.4.2 Or alternative as approved by the Authority.

6.9.2.2(4)(b) Modular Ceiling Plates:

6.9.2.2.4.(b).1 Provide modular ceiling plates to meet the following requirements:

(b).1.1 Purpose built, dedicated modular ceiling plate panel above each workstation or packaging table as outlined in Section 5.7.7.16;

(b).1.2 Modular ceiling plates will be stainless steel and sized to suit the T-bar grid panel size.

6.9.2.2.4.(b).2 Provide medical gases located in modular ceiling plates, in the quantities described in Appendix 1B [Minimum Room Requirements].

6.9.2.2(5) Accessories

6.9.2.2(5)(a) Gypsum Board: Fire rated type; 15.9 mm thick, ends and edges square, paper faced.

6.9.2.2(5)(b) Acoustic Sealant: ASTM C919 for perimeter mouldings.

6.9.2.2(5)(c) Touch-up Paint: Type and colour to match acoustic and grid units.

6.9.2.3 Part 3 Execution

6.9.2.3(1) Not applicable.

6.9.3 Section 09 54 26 – Architectural Ceilings (AC) – Wood

6.9.3.1 Part 1 General

6.9.3.1(1) References

6.9.3.1(1)(a) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.9.3.1(1)(b) ASTM C635, Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

6.9.3.1(1)(c) ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

6.9.3.1(1)(d) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.9.3.1(1)(e) ASTM E580/E580M, Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions.

6.9.3.1(1)(f) ASTM E1264, Classification of Acoustical Ceiling Products.

6.9.3.1(1)(g) AWCC, Association of Wall and Ceiling Contractors.

6.9.3.1(2) Performance Requirements

6.9.3.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.3.1(2)(b) Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.

6.9.3.1(2)(c) Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

6.9.3.1.2.(c).1 Flame-Spread Index: Comply with ASTM E1264 for Class A materials.

6.9.3.1.2.(c).2 Smoke-Developed Index: 50 or less.

6.9.3.1(2)(d) Design hanger anchor and entire suspension system to conform to post disaster requirements.

6.9.3.1(2)(e) Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

6.9.3.1(2)(f) Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with

adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.

6.9.3.1(2)(g) Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

6.9.3.1(2)(h) Wood Ceiling Seismic Suspension Assemblies:

6.9.3.1.2.(h).1 Design suspended ceiling systems to comply with seismic resistance as required by the BCBC.

6.9.3.1.2.(h).2 Wood ceiling suspension assemblies will be designed to resist seismic loads for the geographical location of the project site in accordance with ASTM E580/E580M.

6.9.3.1(3) Quality Assurance

6.9.3.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.3.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.9.3.1(3)(c) Work of this Section will comply to the Specification Standards Manual as published by the Association of Wall and Ceiling Contractors of BC (AWCC).

6.9.3.2 Part 2 Products

6.9.3.2(1) Manufacturers

6.9.3.2(1)(a) Manufacturers (Wood Panels and Planks): Subject to conformance to requirements of this Section, provide wood panel and plank ceiling systems by one of the following:

6.9.3.2.1.(a).1 9Wood.

6.9.3.2.1.(a).2 Geometrik Manufacturing Inc.

6.9.3.2.1.(a).3 Linea Ceiling & Wall Systems.

6.9.3.2.1.(a).4 Or alternative as approved by the Authority.

6.9.3.2(1)(b) Manufacturers (Suspension Systems): Subject to conformance to requirements of this Section,

provide suspension systems by one of the following:

6.9.3.2.1.(b).1 Armstrong World Industries.

6.9.3.2.1.(b).2 Canadian Gypsum Company (CGC) Inc.

6.9.3.2.1.(b).3 Or alternative as approved by the Authority.

6.9.3.2(2) Suspension System

6.9.3.2(2)(a) Galvanized steel: ASTM A653/A653M; prefinished galvanized steel sheet and galvanized steel components.

6.9.3.2(2)(b) Non-Fire Rated Grid: ASTM C635, intermediate or heavy duty; exposed T; components die cut and interlocking.

6.9.3.2(2)(c) Grid Materials:

6.9.3.2.2.(c).1 Commercial quality cold rolled steel with galvanized coating.

6.9.3.2.2.(c).2 Grid Finish: Black colour with matte finish.

6.9.3.2(2)(d) Accessories: Stabilizer bars, clips, splices, perimeter mouldings, and hold down clips, required for suspended grid system.

6.9.3.2(2)(e) Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

6.9.3.2(2)(f) Wood Panel and Planks (AC, wood): Class 1 (A) Fire Rating.

6.9.3.2.2.(f).1 Acoustic wood panels or planks consisting of fine linear grooves, constructed of fire rated core and wood veneer, prefinished with clear finish.

6.9.3.2.2.(f).2 Wood edges to have square edge profile.

6.9.3.2.2.(f).3 Panels and planks to be complete with manufacturer’s standard acoustic scrim treatment.

6.9.3.2(3) Accessories

6.9.3.2(3)(a) Touch-up Paint: Type and colour to match grid units.

6.9.3.3 Part 3 Execution

6.9.3.3(1) Not applicable.

6.9.4 Section 09 54 23 – Architectural Ceilings (AC) - Metal

6.9.4.1 Part 1 General

6.9.4.1(1) References

6.9.4.1(1)(a) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.9.4.1(1)(b) ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

6.9.4.1(1)(c) ASTM C645, Standard Specification for Nonstructural Steel Framing Members.

6.9.4.1(1)(d) ASTM E1264, Classification of Acoustical Ceiling Products.

6.9.4.1(1)(e) CSA S16.1, Limit States Design of Steel Structures.

6.9.4.1(1)(f) CSA S136, Cold Formed Steel Structural Members.

6.9.4.1(2) Performance Requirements

6.9.4.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.4.1(2)(b) Design hanger anchor and suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

6.9.4.1(2)(c) Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of items.

6.9.4.1(2)(d) Design metal ceiling system to withstand positive and negative wind loads, uplift of piston effect of up to 1.25 kPa. Comply with CAN3-S16.1 and CAN3-S136.

6.9.4.1(2)(e) Design metal ceiling system to be free from rattle and noise.

6.9.4.1(2)(f) Design subframing as necessary to accommodate and prevent conflicts and interferences where ducts or other equipment prevent regular spacing of hangers.

6.9.4.1(3) Quality Assurance

6.9.4.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.4.2 Part 2 Products

6.9.4.2(1) Manufacturers

6.9.4.2(1)(a) Manufacturers: Subject to conformance to requirements of this Section, provide architectural metal ceilings by one of the following:

6.9.4.2.1.(a).1 Armstrong World Industries.
6.9.4.2.1.(a).2 Canadian Gypsum Company (CGC) Inc.
6.9.4.2.1.(a).3 CertainTeed Gypsum Canada Inc.
6.9.4.2.1.(a).4 Or alternative as approved by the Authority.

6.9.4.2(2) Architectural Metal Ceiling Panels (AC, metal)

6.9.4.2(2)(a) Prefinished metal channel system.

6.9.4.2(2)(b) Panel Profile Type: Roll formed electrogalvanized steel with square edges and decorative "wood look" powder coat finish, unless otherwise approved by the Authority.

6.9.4.2(2)(c) Galvanized steel sheet: ASTM A653/A653M; prefinished galvanized steel sheet.

6.9.4.2(2)(d) Metal panel: ASTM E1264, Type XX, Form 2, Pattern G, Class A rated, unperforated metal panel, in panel size as approved by the Authority.

6.9.4.2(2)(e) Panels to be complete with manufacturer's standard acoustic scrim treatment.

6.9.4.2(2)(f) Closure: Flat Recessed Closure, roll-formed galvanized steel hat-shaped closure panel to snap-fit between ceiling panels, for perimeter and column surround applications.

6.9.4.2(2)(g) Panel Splice: Formed galvanized steel insert designed to snap-fit between ends of two panels.

6.9.4.2(3) Suspension System

6.9.4.2(3)(a) Carrier: Universal hat shaped, roll-formed galvanized steel section with hook shaped tabs

spaced to receive ceiling panels. Finish: Factory applied black enamel.

6.9.4.2(3)(b) Hanger Wire: minimum 12 gauge galvanized carbon steel hanger wire.

6.9.4.2(3)(c) Seismic / Wind Uplift Compression Struts.

6.9.4.2(3)(d) Subframing: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation.

6.9.4.3 Part 3 Execution

6.9.4.3(1) Not applicable.

6.9.5 Section 09 57 53 – Security Suspended Acoustic Ceiling Tiles

6.9.5.1 Part 1 General

6.9.5.1(1) References

6.9.5.1(1)(a) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.9.5.1(1)(b) ASTM C635, Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

6.9.5.1(1)(c) ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

6.9.5.1(1)(d) ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

6.9.5.1(1)(e) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.9.5.1(1)(f) ASTM E580/E580M, Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions.

6.9.5.1(1)(g) ASTM E1264, Classification of Acoustical Ceiling Products.

6.9.5.1(1)(h) AWCC, Association of Wall and Ceiling Contractors.

6.9.5.1(2) Performance Requirements

6.9.5.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.5.1(2)(b) Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.

6.9.5.1(2)(c) Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

6.9.5.1.2.(c).1 Flame-Spread Index: Comply with ASTM E1264 for Class A materials.

6.9.5.1.2.(c).2 Smoke-Developed Index: 50 or less.

6.9.5.1(2)(d) Design hanger anchor and entire suspension system to conform to post disaster requirements.

6.9.5.1(2)(e) Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

6.9.5.1(2)(f) Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Security panel system is not designed to carry the weight of mechanical and electrical equipment.

6.9.5.1(2)(g) Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

6.9.5.1(2)(h) Security Ceiling Seismic Suspension Assemblies:

6.9.5.1.2.(h).1 Design suspended ceiling systems to comply with seismic resistance as required by BCBC.

6.9.5.1.2.(h).2 Security ceiling suspension assemblies will be designed to resist seismic loads for the geographical location of the project site in accordance with ASTM E580/E580M.

6.9.5.1(2)(i) Where required in restricted or semi restricted areas use system that is monolithic, gasketed and

clipped down. Perforated or highly textured tiles will not be used in these areas.

6.9.5.1(3) Quality Assurance

6.9.5.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.5.1(3)(b) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.9.5.1(3)(c) Work of this Section will comply to the Specification Standards Manual as published by the Association of Wall and Ceiling Contractors of BC (AWCC).

6.9.5.2 Part 2 Products

6.9.5.2(1) Manufacturers

6.9.5.2(1)(a) Manufacturers: Subject to conformance to requirements of this Section, provide security acoustical ceiling systems by one of the following:

6.9.5.2.1.(a).1 Armstrong World Industries.

6.9.5.2.1.(a).2 Or alternative as approved by the Authority.

6.9.5.2(2) Suspension System

6.9.5.2(2)(a) Galvanized steel: ASTM A653/A653M; prefinished galvanized steel sheet and galvanized steel components.

6.9.5.2(2)(b) Non-Fire Rated Grid: ASTM C635, intermediate or heavy duty; exposed T; components die cut and interlocking.

6.9.5.2(2)(c) Grid Materials:

6.9.5.2.2.(c).1 Commercial quality cold rolled steel with galvanized coating.

6.9.5.2.2.(c).2 Grid Finish: White.

6.9.5.2(2)(d) Accessories: Stabilizer bars, clips, splices, perimeter mouldings, and hold down clips, required for suspended grid system.

6.9.5.2(2)(e) Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic

requirements, and ceiling system flatness requirement specified.

6.9.5.2(3) Steel Security Ceiling Panels

6.9.5.2(3)(a) Security Suspended Acoustic Ceiling Tile (SACT):

6.9.5.2.3.(a).1 Tamper Resistant;

6.9.5.2.3.(a).2 18-gauge galvanized steel panels;

6.9.5.2.3.(a).3 Point load tested to withstand up to 850 lbs and a minimum of 430 lbs;

6.9.5.2.3.(a).4 Concealed locking;

6.9.5.2.3.(a).5 Durable, washable, scrubbable, soil resistant, impact resistant;

6.9.5.2.3.(a).6 NRC (0.80) with perforated panels and acoustical infill;

6.9.5.2.3.(a).7 Sound Blocking (CAC) up to 38;

6.9.5.2.3.(a).8 Light Reflectance up to 77%;

6.9.5.2.3.(a).9 Fire performance: Class A (FM), Class A (UL);

6.9.5.2.3.(a).10 Installs on heavy-duty suspension system. System capable of withstanding 600 impacts with 200 foot-pound of energy. Screw-in point load plank system tested to withstand 960 - 3,100 lbs of force;

6.9.5.2.3.(a).11 Acceptable Products: MetalWorks SecureLock by Armstrong World Industries or alternative as approved by the Authority.

6.9.5.2(4) Accessories

6.9.5.2(4)(a) Touch-up Paint: Type and colour to match metal panels and grid units.

6.9.5.3 Part 3 Execution

6.9.5.3(1) Not applicable.

6.9.6 Section 09 65 13 – Resilient and Prefabricated Bases

6.9.6.1 Part 1 General

6.9.6.1(1) References

6.9.6.1(1)(a) ASTM F1861, Standard Specification for Resilient Wall Base.

6.9.6.1(2) Quality Assurance

6.9.6.1(2)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this

section with minimum three years documented experience.

6.9.6.2 Part 2 Products

6.9.6.2(1) Manufacturers

6.9.6.2(1)(a) Manufacturers (Resilient Bases): Subject to conformance with requirements of this Section, provide rubber tiles and treads by one of the following:

6.9.6.2.1.(a).1 Roppe Corporation USA;

6.9.6.2.1.(a).2 Tarkett Corporation;

6.9.6.2.1.(a).3 Or alternative as approved by the Authority.

6.9.6.2(2) Resilient Straight Base

6.9.6.2(2)(a) Resilient Base (RB): ASTM F1861, Type TP thermoplastic rubber, colour-integrated; top set coved and toeless; premoulded external corners:

6.9.6.2.2.(a).1 Group: 1 – Homogeneous;

6.9.6.2.2.(a).2 Style: A – Straight;

6.9.6.2.2.(a).3 Height: 150mm;

6.9.6.2.2.(a).4 Thickness: 3 mm thick.

6.9.6.2(2)(b) Base Accessories: Pre-moulded end stops and external corners, of same material, size, and colour as base.

6.9.6.2(3) Flash Cove Base

6.9.6.2(3)(a) Base:

6.9.6.2.3.(a).1 Fabricated from resilient sheet product with formed aluminum reinforced back and stainless steel base cap;

6.9.6.2.3.(a).2 For use in conjunction with vinyl sheet flooring materials (VSF).

6.9.6.2(4) Accessories

6.9.6.2(4)(a) Adhesive: Use adhesive for bases that meets or exceeds the United States Environmental Protection Agency (EPA) Standards for acceptable VOC concentration and emission rates. Use water-soluble, low-odour base adhesive, of types recommended by base manufacturer.

6.9.6.3 Part 3 Execution

6.9.6.3(1) Not applicable.

6.9.7 Section 09 65 16 – Resilient Sheet Flooring

6.9.7.1 Part 1 General

6.9.7.1(1) References

6.9.7.1(1)(a) ANSI/ESD STM7.1, Protection of Electrostatic Discharge Susceptible Items – Floor Materials – Resistive Characterization of Materials.

6.9.7.1(1)(b) ANSI/ESD STM97.2, Floor Materials and Footwear - Voltage Measurement in Combination with A Person.

6.9.7.1(1)(c) ANSI/NFSI B101.3, Test Method for Measuring the Wet DCOF of Hard Surface Walkways.

6.9.7.1(1)(d) ASTM D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

6.9.7.1(1)(e) ASTM E648, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

6.9.7.1(1)(f) ASTM F150, Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring.

6.9.7.1(1)(g) ASTM F510, Standard Test Method for Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method.

6.9.7.1(1)(h) ASTM F925, Standard Test Method for Resistance to Chemicals of Resilient Flooring.

6.9.7.1(1)(i) ASTM F970, Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading.

6.9.7.1(1)(j) ASTM F1303, Standard Specification for Sheet Vinyl Floor Covering with Backing.

6.9.7.1(1)(k) ASTM F1859, Standard Specification for Rubber Sheet Floor Covering Without Backing.

6.9.7.1(1)(l) ASTM F1913, Standard Specification for Vinyl Sheet Floor Covering Without Backing.

6.9.7.1(1)(m) ASTM F2034, Standard Specification for Sheet Linoleum Floor Covering.

6.9.7.1(1)(n) IEC 61340-4-1, Electrostatics - Part 4-1: Standard Test Methods for Specific Applications - Electrical Resistance of Floor Coverings and Installed Floors.

6.9.7.1(1)(o) NFCA, National Floor Covering Association Standards Manual.

6.9.7.1(1)(p) NFPA 253, Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

6.9.7.1(1)(q) UL 410, Standard for Slip Resistance of Floor Surface Materials.

6.9.7.1(2) Performance Requirements

6.9.7.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.7.1(2)(b) Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

6.9.7.1(2)(c) Anti-bacterial properties: to prevent entry of gram-positive and gram-negative micro-organisms.

6.9.7.1(2)(d) Provide slip-resistant flooring with a minimum DCOF AcuTest of 0.42 on level surfaces and 0.8 on ramps complying with ANSI/NFSI B101.3, unless otherwise indicated to have more stringent requirements within the Section.

6.9.7.1(2)(e) Provide flooring that has a minimum thickness of 2.0 mm (0.080”), unless greater required thickness is specified, meets requirements of ASTM F510 and additional requirements as specified for each flooring material.

6.9.7.1(2)(f) Bases and butterfly corners, typical:

6.9.7.1.2.(f).1 Provide field flash cove bases and butterfly external mitre corners typically for resilient sheet flooring materials.

6.9.7.1.2.(f).2 Butterfly corners: Strictly adhere to manufacturer’s written instructions for forming of butterfly corners, which will include the following procedures:

(f).2.1 Installing required caps strips;

(f).2.2 Cutting of butterfly piece;

(f).2.3 Folding, warming, cooling and installing butterfly fill piece;

(f).2.4 Installing field material over butterfly fill piece with required relief cuts;

(f).2.5 Warm, cutting and trimming field material to fit net perimeter of butterfly corner fill; and

(f).2.6 Groove and heat weld to complete butterfly corner.

6.9.7.1.2.(f).3 Provide resilient bases used in conjunction with intended resilient sheet flooring material as indicated in Appendix 1B [Minimum Room Requirements].

6.9.7.1(2)(g) Within a room or defined area, resilient sheet flooring will be uniform in colour, texture and pattern when viewed under normal lighting conditions. Any visible variation between dye lots is not acceptable. Resilient sheet flooring not meeting this acceptable and required condition will be repaired to the satisfaction of the Authority.

6.9.7.1(2)(h) Ensure all floor base material are lapped with adjoining wet wall panels and coverings under Section 09 72 17 to create a seamless transition.

6.9.7.1(2)(i) Transition of dissimilar flooring materials:

6.9.7.1.2.(i).1 Workmanship and application procedures are to match that which is established and approved by the Authority during On-Site test and mock-up.

6.9.7.1.2.(i).2 Refer to Section 01 10 10 for additional requirements regarding testing to be completed at transitions of dissimilar flooring materials, such as vinyl sheet flooring and rubber sheet flooring.

6.9.7.1(3) Quality Assurance

6.9.7.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this Section with a quality management system, and minimum five (5) years documented experience.

6.9.7.1(3)(b) Source Limitations: Obtain resilient flooring and accessories from single source manufacturer for each specific product type.

6.9.7.1(3)(c) All preparation, materials, and workmanship will be in strict accordance with NFCA requirements as detailed in the latest (online edition of the NFCA

Floor Covering Reference Manual of Canada, (www.floorcoveringreferencemanual.com) and material manufacturer's written recommendations for conditions of work and guarantee / warranty periods as set out in Appendix 1X [Warranty Requirements].

6.9.7.1(3)(d) Companies specializing in performing work of this Section will have a minimum five (5) years documented experience and detail requirements for conditions of work that apply and comply with the NFCA Specification Standards Manual.

6.9.7.1(3)(e) The cost of the Quality Assurance Program (QAP) will be included in the cost of the floor covering work. Contact NFCA (ww.nfca.ca) for clarifications prior to submitting a bid.

6.9.7.1(3)(f) The cost of a 100%, two-year, Maintenance Bond is to be carried under the project by the floor covering contractor.

6.9.7.1(3)(g) All Work described in this Section is included under the Quality Assurance Program (QAP) of NFCA (National Floor Covering Association), as detailed in the latest (online) edition of the Floor Covering Reference Manual of Canada (www.floorcoveringreferencemanual.com) and will be reviewed in accordance with QAP requirements therein by an Inspection Agency assigned by the National Floor Covering Association (NFCA).

6.9.7.1(3)(h) Any preparation, materials, and workmanship that do not meet NFCA requirements will be replaced in accordance with Quality Assurance requirements without any additional cost to the Owner.

6.9.7.1(3)(i) On award of contract, contact NFCA and request a QA Review Form and submit prior to ordering materials.

6.9.7.1(3)(j) Qualification of installers performing all work will meet the requirements detailed in Part A05 Trade Qualifications in the latest edition of the NFCA Floor covering Reference Manual.

6.9.7.1(3)(k) Installer Qualifications – The floor covering contractor at the time of and throughout the performance of the Work will be a member in good

standing of the National Floor Covering Association (NFCA) and referenced on the NFCA website (www.nfca.ca).

6.9.7.2 Part 2 Products

6.9.7.2(1) Anti-Static Sheet Linoleum Flooring

6.9.7.2(1)(a) Conforming to ASTM F2034 and the following:

6.9.7.2.1.(a).1 Type: II - Static Dissipative Linoleum Sheet with Backing;

6.9.7.2.1.(a).2 Thickness: nominal 2.5 mm;

6.9.7.2.1.(a).3 Electrical resistance: 1 x 106-108 ohms to ground, complying to ASTM F150 and ANSI/ESD STM7.1.

6.9.7.2.1.(a).4 Provide with a homogenous conductive flooring with core of primarily natural materials, consisting of linseed oil, wood flour, and resin binders mixed and calendared onto a natural jute backing, complete with UV cured dirt repellent finish.

6.9.7.2.1.(a).5 Anti-static linoleum sheet flooring will be used in intended Communication Rooms.

6.9.7.2.1.(a).6 Acceptable Products:

(a).6.1 Marmoleum Ohmex by Forbo Flooring Systems;

(a).6.2 Or alternative as approved by the Authority.

6.9.7.2(2) Vinyl Sheet Flooring (VSF)

6.9.7.2(2)(a) Heterogeneous:

6.9.7.2.2.(a).1 ASTM F1303, Type 1, Grade 1, Class C, with a DCOF of 0.70 wet to ANSI/NFSI B101.3 and static load limit of 1000 psi to ASTM F970, 2.4 mm thick;

6.9.7.2.2.(a).2 Acceptable Products:

(a).2.1 Cantata by Altro Canada Inc.;

(a).2.2 Or alternative as approved by the Authority.

6.9.7.2(2)(b) PVC-free:

6.9.7.2.2.(b).1 ASTM F1913, homogeneous PVC-free flooring with a static load limit of 2000 psi to ASTM F970, 2.0 mm thick;

(b).1.1 Flooring material is complete with cultured diamond infused coating for scratch, stain, scuff and slip resistance;

6.9.7.2.2.(b).2 Acceptable Products:

(b).2.1 MedinPure with Diamond 10 Technology Coating by Armstrong Flooring, Inc.;

(b).2.2 Or alternative as approved by the Authority.

6.9.7.2(2)(c) Homogeneous:

6.9.7.2.2.(c).1 ASTM F1913, slip resistant, homogeneous resilient sheet flooring with static load limit conforming to ASTM F970 and SCOF of 0.6 to ASTM D2047, 2.0 mm thick;

6.9.7.2.2.(c).2 Acceptable Products:

(c).2.1 Sphera by Forbo Flooring Systems;

(c).2.2 iQ Optima by Tarkett Corporation;

(c).2.3 Or alternative as approved by the Authority.

6.9.7.2(3) Static Dissipative Vinyl Sheet Flooring (SDVF):

6.9.7.2(3)(a) ASTM F1913, static dissipative, single layered, homogeneous, pressed, bacteria, chemical and slip resistant, vinyl sheet flooring, 2.0 mm thick.

6.9.7.2.3.(a).1 Static electrical charge: <2 kV.

6.9.7.2.3.(a).2 Electrical resistance: IEC 61340-4-1, 100V: $<10^8$ Ohms.

6.9.7.2(3)(b) Acceptable Products:

6.9.7.2.3.(b).1 iQ Granit SD by Tarkett Corporation;

6.9.7.2.3.(b).2 Or alternative as approved by the Authority.

6.9.7.2(4) Wetroom Safety Vinyl Sheet Flooring (WSVF):

6.9.7.2(4)(a) References

6.9.7.2.4.(a).1 ASTM F1303

6.9.7.2.4.(a).2 ASTM F1913

6.9.7.2(4)(b) Performance Requirements

6.9.7.2.4.(b).1 Durable, impervious, easily cleanable , sheet vinyl floor covering with slip resistance when wet. Types for areas noted under acceptable products.

6.9.7.2(4)(c) Materials

6.9.7.2.4.(c).1 Homogeneous or heterogeneous sheet vinyl, with or without backing, seams heat welded, and with flash cove bases.

6.9.7.2.4.(c).2 Minimum 2.0 mm thick, and minimum 2.5 mm thick for heavy traffic areas.

6.9.7.2(4)(d) Acceptable products for barefoot areas: showers and ensuites.

6.9.7.2.4.(d).1 Eternal Step Aqua by Forbo Flooring Systems;

6.9.7.2.4.(d).2 Altro Aquarius by Altro Canada;

6.9.7.2.4.(d).3 Or alternative as approved by Authority.

6.9.7.2(4)(e) Acceptable products for light shoe traffic areas: single user washrooms and change rooms

6.9.7.2.4.(e).1 Eternal Surestep Safety Vinyl Sheet by Forbo Flooring Systems;

6.9.7.2.4.(e).2 Or alternative as approved by Authority.

6.9.7.2(4)(f) Acceptable products for heavy shoe traffic areas: public washrooms and MDR Rooms

6.9.7.2.4.(f).1 Altro Reliance by Altro Canada;

6.9.7.2.4.(f).2 Granit Multisafe by Tarkett;

6.9.7.2.4.(f).3 Or alternative as approved by the Authority.

6.9.7.2(5) Rubber Sheet Flooring (RSF)

6.9.7.2(5)(a) Minimum 3 mm thick, non-skid, slip resistant homogeneous, single layered, prefabricated resilient rubber flooring, calendared and vulcanized with a base of synthetic rubber, stabilizing agents and pigmentation.

6.9.7.2(5)(b) Slip resistance: ASTM D2047; approximately 0.8 (dry), 1.0 (wet).

6.9.7.2(5)(c) Manufacturers: Subject to conformance with requirements of this Section:

6.9.7.2.5.(c).1 Mondo Contract Flooring;

6.9.7.2.5.(c).2 Nora Systems Inc.;

6.9.7.2.5.(c).3 Roppe Corporation USA;

6.9.7.2.5.(c).4 Or alternative as approved by the Authority.

6.9.7.2(6) Static-Dissipative Rubber Sheet Flooring (SDRF):

6.9.7.2(6)(a) Minimum 3 mm thick, non-skid, slip resistant homogeneous, single layered, prefabricated resilient rubber flooring, calendared and vulcanized with a base of synthetic rubber, stabilizing agents and pigmentation.

6.9.7.2(6)(b) Slip resistance: ASTM D2047; approximately 0.8 (dry), 1.0 (wet).

6.9.7.2(6)(c) Manufacturers/Products: Subject to conformance with requirements of this Section

6.9.7.2.6.(c).1 Mondo Contract Flooring, Granito ESD;
6.9.7.2.6.(c).2 Nora Systems Inc, Noraplan Signa ED;
6.9.7.2.6.(c).3 Or alternative as approved by the Authority.

6.9.7.2(7) Bases

6.9.7.2(7)(a) Field flash cove base: Formed in field, using specified resilient sheet flooring material.

6.9.7.2(7)(b) Prefabricated base: Aluminum reinforced prefabricated base in accordance with Section 09 65 13.

6.9.7.2(7)(c) Resilient base: In accordance with Section 09 65 13.

6.9.7.2(8) Accessories

6.9.7.2(8)(a) Heat Welding Bead: Solid strand product recommended by flooring manufacturer for heat welding seams. Colour and Pattern to match colour and pattern of resilient flooring.

6.9.7.2(8)(b) Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

6.9.7.2(8)(c) Primers: Waterproof; types recommended by flooring manufacturer.

6.9.7.2(8)(d) Adhesives:

6.9.7.2.8.(d).1 Typical: Use adhesive for resilient flooring that meets or exceeds the United States Environmental Protection Agency (EPA) Standards for acceptable VOC concentration and emission rates. Use water-soluble, low-odour flooring adhesive, of types recommended by flooring manufacturer.

6.9.7.2.8.(d).2 Static dissipative flooring adhesive: Provide conductive adhesive as required for static dissipative flooring applications. Type as recommended by flooring manufacturer and meeting general criteria as specified for typical adhesives.

6.9.7.2.8.(d).3 Copper strips: Provide copper strips as required for static dissipative flooring applications and as recommended by flooring manufacturer.

6.9.7.2(8)(e) Tape: Contact tape for butterfly fill piece; type as recommended by flooring manufacturer for installation of butterfly corners.

6.9.7.2(8)(f) Fillet Strip: Plastic.

6.9.7.3 Part 3 Execution

6.9.7.3(1) Not applicable.

6.9.8 Section 09 65 19 – Resilient Tile Flooring and Accessories

6.9.8.1 Part 1 General

6.9.8.1(1) References

6.9.8.1(1)(a) ASTM E648, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

6.9.8.1(1)(b) ASTM F1344, Standard Specification for Rubber Floor Tile.

6.9.8.1(1)(c) ASTM F1861, Standard Specification for Resilient Wall Base.

6.9.8.1(1)(d) ASTM F2169, Standard Specification for Resilient Stair Treads.

6.9.8.1(1)(e) NFPA 253, Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

6.9.8.1(2) Performance Requirements

6.9.8.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.8.1(2)(b) Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

6.9.8.1(2)(c) Within a room or defined area, resilient tile flooring will be uniform in colour, texture and pattern when viewed under normal lighting conditions. Any visible variation between dye lots is not acceptable. Resilient tile flooring not meeting this acceptable and required condition will be repaired to the satisfaction of the Authority.

6.9.8.1(3) Quality Assurance

6.9.8.1(3)(a) Source Limitations: Obtain resilient flooring and accessories from single source from single manufacturer.

6.9.8.1(3)(b) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.8.2 Part 2 Products

6.9.8.2(1) Manufacturers

6.9.8.2(1)(a) Manufacturers (Rubber Tiles, Tactile Warning Surface Tiles): Subject to conformance with requirements of this Section, provide rubber tiles and treads by one of the following:

6.9.8.2.1.(a).1 Nora Systems Inc.
6.9.8.2.1.(a).2 Roppe Corporation USA.
6.9.8.2.1.(a).3 Tarkett Corporation.
6.9.8.2.1.(a).4 Or alternative as approved by the Authority.

6.9.8.2(2) Rubber Floor Tiles (Landings)

6.9.8.2(2)(a) Provide rubber floor tiles for landings of exit stairs to match stair treads and to consist of the following minimum requirements:

6.9.8.2.2.(a).1 Conform to ASTMF1344, rubber composition with slip resistant pattern to match stair treads, minimum 3 mm thick.
6.9.8.2.2.(a).2 Textures: Slip resistant texture as approved by the Authority.

6.9.8.2(3) Stair Covering

6.9.8.2(3)(a) One-piece stair treads and sheet risers with colour contrasting carborundum strip at leading edge, conforming to ASTM F2169.

6.9.8.2(3)(b) Colour and texture: Colour and slip resistant texture as approved by the Authority.

6.9.8.2(4) Tactile Warning Surface Indicator Tile

6.9.8.2(4)(a) Provide resilient tactile warning surface indicator tiles at top of stairs and conforming to the BCBC.

6.9.8.2.4.(a).1 Conform to ASTMF1344, rubber composition with tactile indicator texture or pattern, minimum 3 mm thick.

6.9.8.2(4)(b) Colour and texture or pattern: Colour and tactile surface texture or pattern as approved by the Authority.

6.9.8.2(5) Accessories

6.9.8.2(5)(a) Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

6.9.8.2(5)(b) Primers: Waterproof; types recommended by flooring manufacturer.

6.9.8.2(5)(c) Adhesive: Use adhesive for resilient flooring that meets or exceeds the United States Environmental Protection Agency (EPA) Standards for acceptable VOC concentration and emission rates. Use water-soluble, low-odour flooring adhesive, of types recommended by flooring manufacturer.

6.9.8.3 Part 3 Execution

6.9.8.3(1) Not applicable.

6.9.9 Section 09 65 66 – Sports Flooring

6.9.9.1 Part 1 General

6.9.9.1(1) References

6.9.9.1(1)(a) ASTM D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces.

6.9.9.1(2) Performance Requirements

6.9.9.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.9.1(2)(b) Exceed coefficient of friction standards for athletic performance. Provide a coefficient of friction (COF) no less than 0.6 for level surfaces and 0.8 for incline surfaces in accordance with ASTM D2047.

6.9.9.1(2)(c) Within a room or defined area, resilient athletic flooring will be uniform in colour, texture and pattern when viewed under normal lighting conditions. Any visible variation between dye lots is not acceptable. Resilient athletic flooring not meeting this acceptable and required condition will be repaired to the satisfaction of the Authority.

6.9.9.1(3) Quality Assurance

6.9.9.1(4) Refer to 6.9.7 Section 09 65 16 Resilient Sheet Flooring, 6.9.7.1(3) Quality Assurance.

6.9.9.2 Part 2 Products

6.9.9.2(1) Rubber Athletic Flooring

6.9.9.2(1)(a) Rubber Athletic Flooring (RAF): Rubber athletic flooring constructed from vulcanization process, with a base of natural and synthetic rubbers, stabilizing agents and pigmentation. Factory lamination is not accepted.

6.9.9.2.1.(a).1 Thickness: 8 mm;
6.9.9.2.1.(a).2 2 mm homogeneous wear layer;
6.9.9.2.1.(a).3 Surface texture: smooth;
6.9.9.2.1.(a).4 Greenguard Gold certified;
6.9.9.2.1.(a).5 Excellent fungal, bacterial and microbial resistance; and
6.9.9.2.1.(a).6 Easily maintained and cleaned as per manufacturer’s specifications.

6.9.9.2(1)(b) Provide underlayment for increased thermal insulation and sound absorption and to decrease potential moisture problems as required.

6.9.9.2(1)(c) Acceptable Products:

6.9.9.2.1.(c).1 Mondo Advanced by Mondo U.S.A. Inc.;
6.9.9.2.1.(c).2 Or alternative as approved by the Authority.

6.9.9.3 Part 3 Execution

6.9.9.3(1) Not applicable.

6.9.10 Section 09 67 23 – Fluid Applied Resinous Flooring

6.9.10.1 Part 1 General

6.9.10.1(1) References

6.9.10.1(1)(a) ASTM C307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.

6.9.10.1(1)(b) ASTM C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

6.9.10.1(1)(c) ASTM C580, Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

6.9.10.1(1)(d) ASTM D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces.

6.9.10.1(1)(e) ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

6.9.10.1(2) Performance Requirements

6.9.10.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.10.1(2)(b) Provide a coefficient of friction (COF) no less than 0.6 for level surfaces and 0.8 for incline surfaces in accordance with ASTM D2047.

6.9.10.1(3) Quality Assurance

6.9.10.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with a quality management system and satisfactory documented experience.

6.9.10.1(3)(b) Source Limitation: Obtain resinous flooring material from single source for each specific product type.

6.9.10.1(3)(c) Installer Qualifications: Firm with a crew trained and certified by the manufacturer to install the resinous flooring product and has reference documentation that the installer has completed five or more similar jobs.

6.9.10.1(3)(d) Mock-up

6.9.10.1.3.(d).1 Apply full thickness mock-up for 1.2 m x 1.2 m area selected by the Authority.

6.9.10.1.3.(d).2 Approved mock-up may become part of the completed Work if undisturbed at time of installation to finish the Work.

6.9.10.2 Part 2 Products

6.9.10.2(1) Manufacturers

6.9.10.2(1)(a) Manufacturers (typical): Subject to conformance with requirements of this Section, provide resinous

flooring by Sika Canada Inc. or alternative as approved by the Authority.

6.9.10.2(2) Epoxy Flooring

6.9.10.2(2)(a) Trowelled Epoxy Flooring and Base: (EFC):

6.9.10.2.2.(a).1 6 mm thick, trowelled and sealed epoxy floor, composed of multicoloured quartz aggregates finished with transparent top coats and meeting the following minimum criteria:

(a).1.1 Compressive strength: ASTM C579, 91 MPa (13 198psi);

(a).1.2 Tensile strength: ASTM C307, 6 MPa (870 psi);

(a).1.3 Elongation: 1.9%;

(a).1.4 Bond strength: ASTM D4541, > 2 MPa (290 psi);

(a).1.5 Flexural strength: ASTM C580, 28 MPa (4061 psi).

6.9.10.2.2.(a).2 System will provide durable, impermeable finish with superior mechanical and chemical resistance.

6.9.10.2.2.(a).3 Base: Coved base at room perimeter and at built-in fitment locations. Form cove with 25 mm radius. Coved height will be in accordance with CSA Z8000 unless otherwise approved by the Authority.

6.9.10.2.2.(a).4 Waterproofing membrane: Provide waterproofing membrane on suspended slabs where epoxy flooring is used in wet areas and flooring might be subjected to spills.

6.9.10.2.2.(a).5 Finish/texture: Slip resistant texture to be selected by the Authority.

6.9.10.2.2.(a).6 Acceptable Products: Sikafloor Morritex by Sika Canada Inc. or alternative as approved by the Authority.

6.9.10.2(3) Resinous Floor Coatings

6.9.10.2(3)(a) Polyurethane Floor Enamel Coating (PFC):

6.9.10.2.3.(a).1 100% acrylic, water-based polyurethane paint coating with resistance to scuffing, scraping, flaking, chalking, fading and yellowing.

6.9.10.2.3.(a).2 Acceptable Products: Polyurethane Floor Enamel by Dulux (PPG Architectural Coatings) or alternative as approved by the Authority.

6.9.10.2(3)(b) Acrylic Floor Coating:

6.9.10.2.3.(b).1 For use in underground parking level corridors and utility rooms.

6.9.10.2.3.(b).2 One-component, 100% acrylic, low odour, slip and abrasion resistant waterborne floor coating.

6.9.10.2.3.(b).3 Acceptable Products: Armorseal Tread-Plex by Sherwin Williams or alternative as approved by the Authority.

6.9.10.2(4) Seamless Cushioned Flooring (SCF)

6.9.10.2(4)(a) Ergonomic, sound dampening, low emission flooring abrasion-, impact- and chemical-resistant, aggregate-filled, resin-based, monolithic floor surfacing designed to produce a seamless floor with following characteristics:

6.9.10.2(4)(b) System Description:

6.9.10.2.4.(b).1 Adhesive: two component solvent free polyurethane adhesive.

6.9.10.2.4.(b).2 Acceptable Products; “Sikafloor Comfort Adhesive” by Sika Canada Inc. or approved equivalent.

6.9.10.2.4.(b).3 Shock Pad: prefabricated rubber shock pad produced by bonding rubber crumb with polyurethane compound.

6.9.10.2.4.(b).4 Acceptable Products: “Sikafloor Comfort Regupol 6015H” by Sika Canada Inc. or approved equivalent.

6.9.10.2.4.(b).5 Pore Sealer: two part, 100% solid, low VOC, polyurethane.

6.9.10.2.4.(b).6 Acceptable Products: “Sikafloor Comfort Porefiller” by Sika Canada Inc. or approved equivalent.

6.9.10.2.4.(b).7 Body Coat: elastic, two-part, solvent free, self-leveling polyurethane resin system.

6.9.10.2.4.(b).8 Acceptable Products: “Sikafloor 330” by Sika Canada Inc. or approved equivalent.

6.9.10.2.4.(b).9 Top Coat / Colour Sealer: two part water based, low VOC, polyurethane, pigmented matte topcoat for use with flexible membrane systems.

6.9.10.2.4.(b).10 Acceptable Products: “Sikafloor 305W” by Sika Canada Inc. or approved equivalent.

6.9.10.2.4.(b).11 Cove base: Epoxy mortar cove based.

6.9.10.3 Part 3 Execution

6.9.10.3(1) Not applicable.

6.9.11 Section 09 67 70 – Waterproof Flooring

6.9.11.1 Part 1 General

6.9.11.1(1) Performance Requirements

6.9.11.1(1)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.11.1(1)(b) Provide waterproof flooring on intended floors and upturned 150 mm at curbs. Ensure all seals in waterproof flooring membrane are impervious to water penetration.

6.9.11.1(2) Quality Assurance

6.9.11.1(2)(a) Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.

6.9.11.2 Part 2 Products

6.9.11.2(1) Materials

6.9.11.2(1)(a) Waterproof Flooring:

6.9.11.2.1.(a).1 Consisting of a flexible, liquid applied self priming unreinforced elastomeric polyurethane waterproofing membrane and aliphatic wearing course with silica sand broadcast into the wear coarse for slip resistance.

6.9.11.2.1.(a).2 For use in areas as set out in the Agreement.

6.9.11.2.1.(a).3 Acceptable Products: Stongard by Stonhard Canada or alternative as approved by the Authority.

6.9.11.2(1)(b) Aggregate: Clean, rounded, oven dried quartz 30-40 mesh silica sand, or as recommended by waterproof floor system manufacturer.

6.9.11.2(1)(c) All primers, sealants, accessories, etc. necessary for a complete installation.

6.9.11.3 Part 3 Execution

6.9.11.3(1) Not applicable.

6.9.12 Section 09 72 00 – Digitally Printed Wallcovering

6.9.12.1 Part 1 General

6.9.12.1(1) Performance Requirements

6.9.12.1(1)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.12.1(2) Quality Assurance

6.9.12.1(2)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.

6.9.12.2 Part 2 Products

6.9.12.2(1) Manufacturers

6.9.12.2(1)(a) Digitally printed wallcoverings and murals manufactured by Koroseal Interior Products, LLC or alternative as approved by the Authority.

6.9.12.3 Part 3 Execution

6.9.12.3(1) Not applicable.

6.9.13 Section 09 72 17 – Hygienic Wall Panels and Coverings

6.9.13.1 Part 1 General

6.9.13.1(1) Performance Requirements

6.9.13.1(1)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.13.1(1)(b) Ensure all wet wall panels and coverings are lapped with adjoining floor base material under Section 09 65 16 to create a seamless transition.

6.9.13.1(2) Quality Assurance

6.9.13.1(2)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.13.2 Part 2 Products

6.9.13.2(1) PVCu Wall Panels

6.9.13.2(1)(a) PVCu Wall Panels (ESRP)

6.9.13.2.1.(a).1 2.5 mm thick, extruded semi-rigid PVCu sheets that create a heat-formable hygienic wall system that reduces the growth of harmful bacteria and microorganisms. Provide welded seams to prevent water and mould penetration.

6.9.13.2.1.(a).2 Cladding to be coloured throughout and have a smooth finish.

6.9.13.2.1.(a).3 Wall cladding to be complete with thermoformed corners and accessories as required for complete system.

6.9.13.2.1.(a).4 Acceptable Products: Altro Whiterock by Altro Canada Inc. or alternative as approved by the Authority.

6.9.13.2(2) Standard Solid Surface Wall Panel System:

6.9.13.2(2)(a) Standard Solid Surface Wall Panel System:

6.9.13.2.2.(a).1 Solid acrylic polymer will be a non-porous, homogeneous material maintaining the same composition throughout the part with a composition of polyester or acrylic polymer, aluminum trihydrate filler and pigment.

6.9.13.2.2.(a).2 Panels will be formed from manufacturer's standard 6 mm thick sheet product.

6.9.13.2.2.(a).3 Provide mildew-resistant silicone sealant that is FDA compliant and 100% clear.

6.9.13.2.2.(a).4 Wall panels to be lapped over and sealed to cove base.

6.9.13.2.2.(a).5 Acceptable Products:

(a).5.1 Avonite Surfaces by Aristech Surfaces LLC;

(a).5.2 Corian by DuPont de Nemours, Inc.;

(a).5.3 Or alternative as approved by the Authority.

6.9.13.2(3) Solid Surface Wet Wall Panel System

6.9.13.2(3)(a) Wetwall Solid Surface Panel (WSSP):

6.9.13.2.3.(a).1 Solid acrylic polymer will be a non-porous, homogeneous material maintaining the same composition throughout the part with a composition of polyester or acrylic polymer, aluminum trihydrate filler and pigment.

6.9.13.2.3.(a).2 Panels will be formed from manufacturer's standard 6 mm thick sheet product.

6.9.13.2.3.(a).3 Provide matching cast recessed shampoo and soap holder where required.

6.9.13.2.3.(a).4 Provide mildew-resistant silicone sealant that is FDA compliant and 100% clear.

6.9.13.2.3.(a).5 Wall panels to be lapped over and sealed to cove base.

6.9.13.2.3.(a).6 Acceptable Products:

(a).6.1 Wet Wall Avonite Surfaces by Aristech Surfaces LLC;

(a).6.2 Corian by DuPont de Nemours, Inc.;

(a).6.3 Or alternative as approved by the Authority.

6.9.13.2(4) Fibreglass Reinforced Plastic Panels

6.9.13.2(4)(a) Fibreglass Reinforced Plastic Panels (FRP):

6.9.13.2.4.(a).1 Class A fire rated, impact, stain and scratch resistant panels fabricated from a homogeneous mixture of fibreglass, calcium carbonate and resin, 2.3 mm thick.

6.9.13.2.4.(a).2 Acceptable Products:

(a).2.1 Panolam FRP by Panolam Industries International Inc.;

(a).2.2 Standard FRP by Marlite;

(a).2.3 Or alternative as approved by the Authority.

6.9.13.2(5) Wet Room Vinyl Wall Coverings

6.9.13.2(5)(a) Wet Room Vinyl Wall Covering (WVW)

6.9.13.2.5.(a).1 Provide vinyl wall coverings complete with heat welded seams for wet rooms as indicated.

6.9.13.2.5.(a).2 Minimum 0.92 mm thick, waterproof vinyl wall coverings.

6.9.13.2.5.(a).3 Acceptable Products:

(a).3.1 Onyx+ by Forbo Flooring Systems;

(a).3.2 Aquarelle Wall HFS by Tarkett Corporation;

(a).3.3 Or alternative as approved by the Authority.

6.9.13.2(6) Accessories

6.9.13.2(6)(a) Accessories:

6.9.13.2.6.(a).1 Provide accessories as required for complete and water tight installation including sealants and adhesives.

6.9.13.2.6.(a).2 Types as recommended by hygienic panel and covering manufacturer.

6.9.13.3 Part 3 Execution

6.9.13.3(1) Not applicable.

6.9.14 Section 09 84 13 – Acoustic Wall Panels

6.9.14.1 Part 1 General

6.9.14.1(1) References

6.9.14.1(1)(a) ASTM D6207, Standard Test Method for Dimensional Stability of Fabrics to Changes in Humidity and Temperature.

6.9.14.1(1)(b) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.9.14.1(2) Performance Requirements

6.9.14.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.14.1(2)(b) Panels will have noise reduction coefficient value of 1.05.

6.9.14.1(3) Quality Assurance

6.9.14.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.14.2 Part 2 Products

6.9.14.2(1) Materials

6.9.14.2(1)(a) Acoustic Wall Panels:

6.9.14.2.1.(a).1 Provide cleanable, water, bacteria and fungi resistant acoustic wall panels with Class A fire rating to ASTM E84.

6.9.14.2.1.(a).2 Core:

(a).2.1 50 mm thick lightweight acoustically absorptive core, fabricated from semi-rigid porous expanded polypropylene acoustical bead foam (PEPP), free of surface defects and sanded to a uniform thickness;

(a).2.2 Sizing: Panels will be fabricated to required sizes using CAD/CAM (CIM) Robotics cutting system to panel core

dimensions with a tolerance of +/- 1.6 mm;

(a).2.3 Edges: Chemically hardened to withstand moderate impact during installation and ongoing maintenance. Square profile.

6.9.14.2.1.(a).3 Finish:

(a).3.1 Vinyl finish will be bonded to panel face, edges and returned a minimum of 25 mm onto back of panel. Finish will be flat and wrinkle free, antimicrobial for infection control and fully tailored at corners with no exposed darting;

(a).3.2 All finishes will be tested for suitability to ASTM D6207 and approved for use by panel manufacturer prior to procurement and fabrication;

(a).3.3 Acceptable Products: Sound Silencers by Acoustical Surfaces or alternative as approved by the Authority.

6.9.14.3 Part 3 Execution

6.9.14.3(1) Not applicable.

6.9.15 Section 09 91 00 – Paints and Coatings

6.9.15.1 Part 1 General

6.9.15.1(1) References

6.9.15.1(1)(a) ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

6.9.15.1(1)(b) Master Painters Institute (MPI), Painting Specification Manual.

6.9.15.1(2) Performance Requirements

6.9.15.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.15.1(2)(b) Perform work in accordance with MPI Premium grade.

6.9.15.1(2)(c) Maintain temperature and humidity recommended by the products manufacturers before, during and after installation. Ambient and surface temperatures will be not less than 15 deg C during application

and drying. Provide controlled ventilating during application and drying.

6.9.15.1(2)(d) All painting, stains and transparent finishes work will comply with the Master Painter's Institute (MPI) Architectural Painting Specification Manual, latest edition, requirements for products, preparation and application. All painting will be three coat work throughout, except where specified otherwise.

6.9.15.1(3) Quality Assurance

6.9.15.1(3)(a) Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats and as follows:

6.9.15.1.3.(a).1 Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual.

6.9.15.1(3)(b) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.15.1(3)(c) Moisture Tests: Test substrates for moisture content using moisture meter. Do not apply paint, stain and transparent finishes to substrates having a moisture content of more than 12%, or in excess of substrate moisture content as recommended by the paint, stain and transparent finishes manufacturer. Do not proceed with installation until moisture problem has been corrected.

6.9.15.1(3)(d) pH Scale Tests: Conduct pH scale tests in accordance with ASTM F710 to ensure alkali salt residue is within the limitation acceptable to manufacturer and to avoid failure, discolouration and softening of the paint, stain and transparent finishes. If pH scale results are higher than acceptable to the manufacturer then neutralize surfaces prior to beginning of installation. Neutralize by sanding, vacuuming and/or by water plus mild muriatic acidic application as recommended by manufacturer. Retest to assure that pH scale level has been neutralized.

6.9.15.2 Part 2 Products

6.9.15.2(1) Manufacturers

6.9.15.2(1)(a) Manufacturers: Subject to conformance with requirements, provide paints and coatings by one of the following:

6.9.15.2.1.(a).1 Benjamin Moore;

6.9.15.2.1.(a).2 PPG Architectural Coatings;

6.9.15.2.1.(a).3 Sherwin Williams;

6.9.15.2.1.(a).4 Or alternative as approved by the Authority.

6.9.15.2(2) Materials

6.9.15.2(2)(a) General: Comply with MPI Approved Products List including MPI Green Performance Standard. Only materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, etc.) listed in the latest edition of the MPI Approved Product List (APL) and certified under Environmental Choice Program CCD-047 are acceptable for use on this project. All such material will be from a single manufacturer for each system used.

6.9.15.2.2.(a).1 Other materials such as linseed oil, shellac, thinners, solvents, etc. will be the highest quality product of an MPI listed manufacturer and will be compatible with paint materials being used as required.

6.9.15.2.2.(a).2 All materials used will be lead and mercury free and will have low VOC content where possible.

6.9.15.2.2.(a).3 All paint materials will have good flowing and brushing properties and will dry or cure free of blemishes, sags, air entrapment, etc.

6.9.15.2.2.(a).4 Where required, paints and coatings will meet flame spread and smoke developed ratings designated by BC Building Code requirements and/or AHJ.

6.9.15.2.2.(a).5 Products of a quality to withstand repeated routine cleaning with hospital-grade disinfectants as the function of the area dictates.

6.9.15.2.2.(a).6 Use exterior paints of a quality designed to protect substrate materials from weather and climate conditions.

6.9.15.2.2.(a).7 Treat exterior masonry materials such as brick and concrete block with water-repellent coatings to prevent water ingress into or through the material.

6.9.15.2.2.(a).8 Paint handrails, doors, and frames with a contrasting colour from walls in consideration of the visually impaired.

6.9.15.2(2)(b) Colour, Gloss and Paint Types:

6.9.15.2.2.(b).1 Gloss values will be in accordance with MPI Paint Manual requirements. Allow for the following:

(b).1.1 Walls, doors and shelving: Use eggshell or semi-gloss for all walls, doors and painted shelving;

(b).1.2 Door frames and metal doors: Use semi-gloss for all door frames and metal doors;

(b).1.3 Paint Grade Doors: Use semi-gloss for all paint grade doors;

(b).1.4 Ceilings: Use eggshell paint for all ceilings;

(b).1.5 Floors, concrete: Use a two-component (base component A, curing agent B). Provide primer if part of coating system;

(b).1.6 Areas where Patients are receiving care or treatment: Use semi-gloss finish.

6.9.15.2.2.(b).2 All final colours, gloss levels and paint types (PT & EP) to be selected by the Authority.

6.9.15.2.2.(b).3 Epoxy paint (EP): Provide epoxy paint finishes where indicated and as specified herein.

6.9.15.2(2)(c) Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

6.9.15.2(2)(d) Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

6.9.15.2(2)(e) Patching Materials: Latex filler.

6.9.15.2(2)(f) Fastener Head Cover Materials: Latex filler.

6.9.15.2(3) Exterior Painting and Finishing Schedule

6.9.15.2(3)(a) General: Comply with the MPI Manual and below listed MPI System Codes for the intended exterior substrate surfaces.

6.9.15.2(3)(b) Structural Steel and Metal Fabrications (ungalvanized):

6.9.15.2.3.(b).1 EXT 5.1L - Polyurethane pigmented finish.

6.9.15.2.3.(b).2 Refer to Section 07 81 23 where intumescent fireproof coatings are required on structural steel members.

6.9.15.2(3)(c) Structural Steel and Metal Fabrications (galvanized):

6.9.15.2.3.(c).1 EXT 5.3L - Polyurethane pigmented finish.

6.9.15.2.3.(c).2 Refer to Section 07 81 23 where intumescent fireproof coatings are required on structural steel members.

6.9.15.2(3)(d) Galvanized Steel: Hollow metal doors, frames, handrails, etc.

6.9.15.2.3.(d).1 EXT 5.3L - Polyurethane pigmented finish.

6.9.15.2(3)(e) Concrete and Masonry: Refer to Section 09 96 23 for anti-graffiti coating.

6.9.15.2(4) Interior Painting and Finishing Schedule

6.9.15.2(4)(a) General: Comply with the MPI Manual and below listed MPI System Codes for the intended interior substrate surfaces.

6.9.15.2(4)(b) Concrete: Underground parking and similar auxiliary areas

6.9.15.2.4.(b).1 INT 3.1M - Institutional low odour/low VOC latex finish.

6.9.15.2(4)(c) Concrete: Areas subject to high physical or chemical abuse, such as kitchens, food service areas, laboratories, etc.

6.9.15.2.4.(c).1 INT 3.1P - Epoxy high build finish (EWC and ECC).

6.9.15.2(4)(d) Masonry: Parking garage and similar auxiliary areas

6.9.15.2.4.(d).1 INT 4.2E- Institutional low odour/low VOC latex finish. Finish system applied over block filler.

6.9.15.2(4)(e) Metal Fabrications: Steel handrails, etc.

6.9.15.2.4.(e).1 INT 5.1L - Epoxy finish.

6.9.15.2(4)(f) Metal Fabrications: Steel stairs, etc.

6.9.15.2.4.(f).1 INT 5.1R - High performance architectural latex finish.

6.9.15.2(4)(g) Structural Steel:

6.9.15.2.4.(g).1 INT 5.1R - High performance architectural latex finish.

6.9.15.2.4.(g).2 Refer to Section 07 81 23 where intumescent fireproof coatings are required on structural steel members.

6.9.15.2(4)(h) Steel (High Heat): Maximum 400 degrees F

6.9.15.2.4.(h).1 INT 5.2A - Heat resistant enamel finish.

6.9.15.2(4)(i) Galvanized Steel: Doors and frames

6.9.15.2.4.(i).1 INT 5.3M - High performance architectural latex finish.

6.9.15.2(4)(j) Galvanized Steel: Steel deck

6.9.15.2.4.(j).1 INT 5.3P - Alkyd dry fall finish.

6.9.15.2(4)(k) Plaster and Gypsum Board: Areas and rooms not subject to abuse such as lobbies, corridors, waiting areas, Patient Rooms, offices and meeting rooms.

6.9.15.2.4.(k).1 INT 9.2B - High performance architectural latex finish.

6.9.15.2(4)(l) Plaster and Gypsum Board: Rooms and areas requiring a very durable finish such laboratory, pharmacy, functional imaging and decontamination areas.

6.9.15.2.4.(l).1 INT 9.2E – Epoxy (EWC and ECC). (“Tile Like”) (over latex primer/sealer).

6.9.15.2(4)(m) Plaster and Gypsum Board: Areas subject to mild to moderate levels of moisture such as in the MDR, rooms with utility/process sinks and moisture/humidity producing Equipment.

6.9.15.2.4.(m).1 INT 9.2F - Epoxy-modified latex finish (EWC and ECC).

6.9.15.2(4)(n) Plaster and Gypsum Board: Intermediate performance alternate for areas and rooms not subject to abuse.

6.9.15.2.4.(n).1 INT 9.2M - Institutional low odour/low VOC latex finish.

6.9.15.2(4)(o) Concrete, masonry and gypsum board (conditions of extreme moisture, soiling and abuse): Refer to Section 09 96 56 for high performance coatings.

6.9.15.3 Part 3 Execution

6.9.15.3(1) Not applicable.

6.9.16 Section 09 96 23 – Anti-Graffiti Coatings

6.9.16.1 Part 1 General

6.9.16.1(1) References

6.9.16.1(1)(a) ASTM D6578/D6578M, Standard Practice for Determination of Graffiti Resistance.

6.9.16.1(2) Performance Requirements

6.9.16.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.16.1(3) Quality Assurance

6.9.16.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.16.2 Part 2 Products

6.9.16.2(1) Manufacturers

6.9.16.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide anti-graffiti coatings by one of the following:

6.9.16.2.1.(a).1 Benjamin Moore;
6.9.16.2.1.(a).2 PPG Architectural Coatings;
6.9.16.2.1.(a).3 Sherwin Williams;
6.9.16.2.1.(a).4 Or alternative as approved by the Authority.

6.9.16.2(2) Anti-Graffiti Coatings

6.9.16.2(2)(a) Anti-Graffiti Coating:

6.9.16.2.2.(a).1 Provide one of the following coating types:

(a).1.1 Clear, water-borne, breathable, single-component, non-sacrificial, siloxane coating;
(a).1.2 FEVE-based, clear, anti-graffiti coating; or
(a).1.3 Clear, aliphatic urethane anti-graffiti coating.

6.9.16.2.2.(a).2 Anti-graffiti coating type to be suitable for use on intended substrate.

6.9.16.2.2.(a).3 Low VOC coating, conforming to ASTM D6578/D6578M and capable of withstanding a minimum 25 cycles without loss of repellency.

6.9.16.3 Part 3 Execution

6.9.16.3(1) Not applicable.

6.9.17 Section 09 96 56 – High Performance Coatings (HPC)

6.9.17.1 Part 1 General

6.9.17.1(1) References

6.9.17.1(1)(a) ASTM D1308, Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

6.9.17.1(2) Performance Requirements

6.9.17.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.9.17.1(2)(b) Coatings will comply and have been tested in accordance with ASTM D1308.

6.9.17.1(3) Quality Assurance

6.9.17.1(3)(a) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

6.9.17.1(3)(b) Examine surfaces and conditions under which epoxy system is to be applied. Moisture content of surfaces and building air temperatures will be within limits recommended by the manufacturer. Do not start work until unsatisfactory conditions have been corrected. Application of materials indicates acceptance of surfaces.

6.9.17.1(3)(c) Surfaces will be free of membrane curing compounds, laitance, dust, dirt, grease, oil and other Contaminants that may affect proper adhesion of the coating. Remove projections and other conditions that may affect the installation of the epoxy coating system.

6.9.17.2 Part 2 Products

6.9.17.2(1) High Performance Coatings (HPC)

6.9.17.2(1)(a) Provide high performance epoxy wall and ceiling coatings or polyurethane wall and ceiling coatings as specified herein for areas subject to extreme moisture, soiling and abuse as scheduled.

6.9.17.2(1)(b) Epoxy Wall and Ceiling Coatings (HPC, Type 1):

6.9.17.2.1.(b).1 Primer (gypsum and cement board): Acrylic resin primer.

6.9.17.2.1.(b).2 Primer (Concrete and concrete block): High build, one component copolymer emulsion.

6.9.17.2.1.(b).3 Coating: Two-component, high solids, low odour, low VOC, water based, antimicrobial, glossy epoxy wall and ceiling coating hardening to a ceramic-like finish that is seamless and abrasion, chemical, and UV-resistant.

6.9.17.2.1.(b).4 Acceptable Products: Sikagard Duroplast-100N by Sika Canada Inc. or alternative approved by the Authority.

6.9.17.2(1)(c) Polyurethane Wall and Ceiling Coatings (HPC, Type 2):

6.9.17.2.1.(c).1 Primer: Types as recommended by coating manufacturer to suit intended substrate.

6.9.17.2.1.(c).2 Two-component, high solids, zero or low VOC, solvent-free, epoxy base coat and polyurethane finish coat, glazed wall coating that is seamless and abrasion, chemical, and UV-resistant.

6.9.17.2.1.(c).3 Acceptable Products: Resuwall Aqua by Sherwin Williams or alternative as approved by the Authority.

6.9.17.3 Part 3 Execution

6.9.17.3(1) Not applicable.

6.10 Specialties (Division 10)

6.10.1 Section 10 21 13 – Metal Toilet and Shower Partitions

6.10.1.1 Part 1 General

6.10.1.1(1) References

6.10.1.1(1)(a) ASTM A240/A240M, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet,

and Strip for Pressure Vessels and for General Applications.

6.10.1.1(1)(b) ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.10.1.1(1)(c) CSA B651, Accessible Design for the Built Environment.

6.10.1.1(2) Performance Requirements

6.10.1.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.1.1(2)(b) Incorporate Ligature Resistant design features to the maximum extent possible in publicly accessible washrooms.

6.10.1.1(2)(c) Regulatory Requirements: Comply with applicable provisions in CSA B651 for toilet compartments designated as accessible.

6.10.1.1(2)(d) Provide exposed surfaces that are permanent, water-resistant, corrosion-proof, and readily cleaned and maintained. Provide anti-graffiti coatings as required.

6.10.1.1(3) Quality Assurance

6.10.1.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.1.2 Part 2 Products

6.10.1.2(1) Materials

6.10.1.2(1)(a) Galvannealed sheet metal: Conforming to ASTM A653/A653M with minimum ZF001 (A01) zinc coating with 25 mm thick honeycomb cell core. Finish in polyester, baked enamel or powder coating.

6.10.1.2(1)(b) Stainless steel sheet metal: Conforming to ASTM A240/A240M, embossed stainless steel with 25 mm thick honeycomb cell core.

6.10.1.2(1)(c) Provide privacy channels to eliminate gaps between all panels and doors.

6.10.1.2(2) Accessories

6.10.1.2(2)(a) Pilaster Shoe: Formed ASTM A240/A240M, type 304 stainless steel with No. 4 finish, 175 mm high, with adjustable screw jack.

6.10.1.2(2)(b) Head Rails: Hollow stainless steel tube, 25 x 41 mm size, with anti-grip strips and cast socket wall brackets.

6.10.1.2(2)(c) Attachments, Screws, and Bolts: Stainless steel; Tamper Resistant type, heavy duty extruded aluminum brackets.

6.10.1.2(2)(d) Through Bolts and Nuts: Stainless steel with Tamper Resistant heads.

6.10.1.2(3) Stainless Steel Hardware

6.10.1.2(3)(a) Pivot hinges, gravity type, adjustable for door close positioning.

6.10.1.2(3)(b) Nylon bearings.

6.10.1.2(3)(c) Thumb turn door latch with exterior emergency access feature.

6.10.1.2(3)(d) Door strike and keeper Vandal Resistant type.

6.10.1.2(3)(e) Coat hook, collapsible type.

6.10.1.2(3)(f) Door pull for outswinging doors.

6.10.1.3 Part 3 Execution

6.10.1.3(1) Not applicable.

6.10.2 Section 10 21 16 – Phenolic Toilet and Shower Partitions

6.10.2.1 Part 1 General

6.10.2.1(1) References

6.10.2.1(1)(a) ASTM A240/A240M, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

6.10.2.1(1)(b) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.10.2.1(1)(c) CSA B651, Accessible Design for the Built Environment.

6.10.2.1(1)(d) NEMA LD 3, High-Pressure Decorative Laminates.

6.10.2.1(2) Performance Requirements

6.10.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.2.1(2)(b) Incorporate Ligature Resistant design features to the maximum extent possible in publicly accessible washrooms.

6.10.2.1(2)(c) Regulatory Requirements: Comply with applicable provisions in CSA B651 for toilet compartments designated as accessible.

6.10.2.1(2)(d) Provide exposed surfaces that are permanent, water-resistant, corrosion-proof, and readily cleaned and maintained. Provide anti-graffiti coatings as required.

6.10.2.1(2)(e) Surface Burning Characteristics: As determined by testing identical products according to ASTM E84, or another standard acceptable to AHJ, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

6.10.2.1.2.(e).1 Flame-Spread Index: 75 or less.

6.10.2.1.2.(e).2 Smoke-Developed Index: 450 or less.

6.10.2.1(3) Quality Assurance

6.10.2.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.2.2 Part 2 Products

6.10.2.2(1) Phenolic Panels

6.10.2.2(1)(a) NEMA LD 3 solid phenolic core with melamine laminate veneer material.

6.10.2.2(1)(b) Fabricate partitions by forming solid phenolic with finished faces and edges. Finish edges convex.

6.10.2.2(1)(c) Bevel corners and edges of cut-outs.

6.10.2.2(1)(d) Doors and Panels:

6.10.2.2.1.(d).1 Thickness: 25 mm.
6.10.2.2.1.(d).2 Door Width: 610 mm.
6.10.2.2.1.(d).3 Door Width for Handicapped Use: 915 mm, out-swinging.
6.10.2.2.1.(d).4 Height: 1473 mm.
6.10.2.2.1.(d).5 Urinal dividers: full height to underside the ceiling.

6.10.2.2(1)(e) Thickness of Pilasters: 32 mm.

6.10.2.2(2) Accessories

6.10.2.2(2)(a) Pilaster Shoe: Formed ASTM A240/A240M, type 304 stainless steel with No. 4 finish, 175 mm high, with adjustable screw jack.

6.10.2.2(2)(b) Head Rails: Hollow stainless steel tube, 25 x 41 mm size, with anti-grip strips and cast socket wall brackets.

6.10.2.2(2)(c) Attachments, Screws, and Bolts: Stainless steel; Tamper Resistant type, heavy duty extruded aluminum brackets.

6.10.2.2(2)(d) Through Bolts and Nuts: Stainless steel with Tamper Resistant heads.

6.10.2.2(3) Stainless Steel Hardware

6.10.2.2(3)(a) Pivot hinges, gravity type, adjustable for door close positioning.

6.10.2.2(3)(b) Nylon bearings.

6.10.2.2(3)(c) Thumb turn door latch with exterior emergency access feature.

6.10.2.2(3)(d) Door strike and keeper Vandal Resistant type.

6.10.2.2(3)(e) Coat hook, collapsible type.

6.10.2.2(3)(f) Door pull for outswinging doors.

6.10.2.3 Part 3 Execution

6.10.2.3(1) Not applicable.

6.10.3 Section 10 22 13 – Wire Mesh Partitions

6.10.3.1 Part 1 General

6.10.3.1(1) References

6.10.3.1(1)(a) AAMA 2604, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

6.10.3.1(1)(b) ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6.10.3.1(1)(c) ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

6.10.3.1(1)(d) ASTM A1011, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural High Strength Low Alloy with Improved Formability.

6.10.3.1(1)(e) ASTM F1267, Specification for Metal, Expanded Steel. CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

6.10.3.1(1)(f) CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

6.10.3.1(1)(g) CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.

6.10.3.1(1)(h) CSA W59-M, Welded Steel Construction (Metal Arc Welding).

6.10.3.1(2) Performance Requirements

6.10.3.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.3.1(3) Quality Assurance

6.10.3.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.3.1(3)(b) Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

6.10.3.1(3)(c) Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.

6.10.3.2 Part 2 Products

6.10.3.2(1) Materials

6.10.3.2(1)(a) Steel components: to CAN/CSA-G40.20/G40.21, Grade 350W.

6.10.3.2(1)(b) Mesh Filler Material:

6.10.3.2.1.(b).1 Conforming to ASTM A123, ASTM A1011 and ASTM F1267, Type 1, Class 1.

6.10.3.2.1.(b).2 Mesh Type: Acceptable Products: ASF.75 - 9R by Amico or alternative as approved by the Authority.

6.10.3.2.1.(b).3 Mesh Diamond Width: 23.4 mm x 50 mm long bond to bond with thirteen (13) diamonds per 305 mm.

6.10.3.2.1.(b).4 Mesh Size Opening Width: 17.5 mm x 39.7 mm inch long allowing 68 percent open area.

6.10.3.2.1.(b).5 Weight Galvanized or Colour Coated: 1.95 pounds per square foot.

6.10.3.2(1)(c) Partition Panels:

6.10.3.2.1.(c).1 Vertical and Horizontal Panel Framing: 38 mm x 19 mm x 6 mm cold-rolled steel channels; with 16 mm diameter bolt holes spaced not more than 450 mm on centres along centre of framing. Provide vertical panel stiffeners in shapes and sizes as recommended by manufacturers.

6.10.3.2.1.(c).2 Horizontal Panel Stiffeners: 2 cold-rolled steel channels, not less than 25 mm x 13 mm x 3 mm, bolted or riveted toe to toe through mesh or, 38 mm x 19 mm x 3 mm cold-rolled steel channels with wire woven through.

6.10.3.2.1.(c).3 Vertical Panel Stiffeners will be 6 mm x 19 mm steel bar securely welded to frame behind mesh on panels 4-feet or wider.

6.10.3.2(1)(d) Posts:

6.10.3.2.1.(d).1 Posts for 90 Degree Corners: 50 mm x 50 mm x 3 mm steel angles with 10 mm diameter bolt holes aligning with bolt holes in vertical framing; with floor anchor clips.

6.10.3.2.1.(d).2 Posts for Other Than 90 Degree Corners: Manufacturer's standard steel 50 mm OD pipe or tubing with 10 mm diameter bolt holes aligning with bolt holes in vertical framing.

6.10.3.2.1.(d).3 Adjustable Corner Posts: Manufacturer's standard steel pipe or tubing posts connected

by steel hinges at 914 mm on centres, attached to posts; with 1/4-inch diameter bolt holes aligning with bolt holes in vertical framing.

6.10.3.2.1.(d).4 Line Posts: 75 mm x 1.86 kg, or 88 mm x 31 mm x 3.213 mm steel channels with 125 mm x 450 mm x 6 mm thick steel base plates punched for attachment to floor.

6.10.3.2.1.(d).5 Three and Four Way Intersection Posts: 50 mm x 50 mm tubular steel, with 10 mm diameter bolt holes aligned for bolting to adjacent panels.

6.10.3.2(1)(e) Doors:

6.10.3.2.1.(e).1 Swing door will have mesh welded into a 32 mm x 32 mm x 3 mm steel angle frame.

6.10.3.2.1.(e).2 Provide swing doors complete with three each 100 mm x 100 mm 5-knuckle tight-pin butt hinges fastened to door panel and frame and pad lock lugs.

6.10.3.2(1)(f) Locking Devices: Standard key lock (outside).

6.10.3.2(1)(g) Welding Materials: Conforming to CSA W48 and CSA W59.

6.10.3.2(1)(h) Bolts, fasteners and fastening hardware: ASTM A307, manufacturer's standard to suit design and application.

6.10.3.2(2) Finish

6.10.3.2(2)(a) Two coat, thermo-setting, polyester powder finish coating.

6.10.3.2(2)(b) Steel surfaces exposed in the finished work will have minimum 60 microns dry film thickness (DFT) two coat, thermo-setting, polyester powder finish coating that comply with AAMA 2604.

6.10.3.3 Part 3 Execution

6.10.3.3(1) Not applicable.

6.10.4 Section 10 22 19 – Demountable Partitions

6.10.4.1 Part 1 General

6.10.4.1(1) References

6.10.4.1(1)(a) AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

6.10.4.1(1)(b) AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

6.10.4.1(1)(c) ANSI, H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

6.10.4.1(1)(d) ASTM A653/A653M, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.10.4.1(1)(e) ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.10.4.1(1)(f) ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

6.10.4.1(1)(g) ASTM C1396, Specification for Gypsum Board.

6.10.4.1(1)(h) ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.

6.10.4.1(1)(i) ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

6.10.4.1(1)(j) ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

6.10.4.1(2) Performance Requirements

6.10.4.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.4.1(2)(b) Design partition system to provide required STC when tested in accordance with ASTM E90.

6.10.4.1(2)(c) Design partition system to allow for all panels to be point accessible without affecting adjoining panels.

6.10.4.1(3) Quality Assurance

6.10.4.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.4.1(3)(b) Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

6.10.4.2 Part 2 Products

6.10.4.2(1) Materials

6.10.4.2(1)(a) Galvanized steel sheet: ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.

6.10.4.2(1)(b) Aluminum extrusions: ASTM B221 and ANSI H35.1 AA6063 alloy, T5 temper.

6.10.4.2(1)(c) Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 3.0 mm thick.

6.10.4.2(2) Components

6.10.4.2(2)(a) Top track: ASTM C645; cold rolled channels, formed from galvanized steel sheet, designed to accept snap-on trim from either side of wall.

6.10.4.2(2)(b) Bottom track: ASTM C645; roll formed from galvanized steel sheet, with 38 mm high legs.

6.10.4.2(2)(c) Steel studs and runners: ASTM C645; 'U' shape, roll formed from galvanized steel sheet, 0.6 mm thick minimum, pre-punched openings for system elements, configured to meet panel system requirements, depth as indicated on Contract Drawings.

6.10.4.2(2)(d) Cross locking Channels: ASTM C645; 3350 mm long, roll formed from galvanized steel channels.

6.10.4.2(2)(e) Wall Panels: ASTM C1396; gypsum board.

6.10.4.2(2)(f) Swing door frames: Extruded aluminum, free of exposed fasteners, aluminum door stops with continuous mohair or bulb seals. Frames to be reinforced, mortised, drilled and tapped for door hardware, in size shown on drawings.

6.10.4.2(2)(g) Swing doors: Extruded aluminum frame with glazing, free of exposed fasteners, reinforced, mortised, drilled and tapped for door hardware, in size shown on drawings. Provide hinges.

6.10.4.2(2)(h) Glazing frames: Extruded aluminum, complete with snap-on glazing stops and neoprene gaskets for setting glass.

6.10.4.2(2)(i) Fasteners: ASTM F738M; Stainless Steel Type 304.

6.10.4.3 Part 3 Execution

6.10.4.3(1) Not applicable.

6.10.5 Section 10 22 26 – Acoustic Operable Partitions

6.10.5.1 Part 1 General

6.10.5.1(1) References

6.10.5.1(1)(a) ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

6.10.5.1(1)(b) CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations.

6.10.5.1(1)(c) NEMA MG1, Motors and Generators.

6.10.5.1(2) Performance Requirements

6.10.5.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.5.1(2)(b) Design acoustic operable partitions in accordance with ASTM E90 to obtain a minimum Sound Transmission Coefficient (STC) as noted.

6.10.5.1(2)(c) Weight of panels not to exceed 45 Kg/m2.

6.10.5.1(3) Quality Assurance

6.10.5.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.5.1(3)(b) Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

6.10.5.2 Part 2 Products

6.10.5.2(1) Operable Panels

6.10.5.2(1)(a) Operable partitions to be electrically operated with continuously hinged panels.

6.10.5.2(1)(b) Panel faces to be laminated to substrate to meet STC and acoustical performance requirements.

6.10.5.2(1)(c) Frames to be minimum 16 gauge (1.42 mm) painted steel with integral factory applied aluminum vertical edge and face protection.

6.10.5.2(1)(d) Vertical sound seals will be of tongue and groove configuration, ensure panel-to-panel alignment and prevent sound leaks between panels.

6.10.5.2(1)(e) All panels will have bottom retractable seals that provide a minimum of 51 mm (2”) floor clearance during movement of the partition, including all panels adjacent to any pass door(s).

6.10.5.2(1)(f) Retractable bottom floor seal to exert downward seal force when activated. Floating or rigid seals that maintain contact with the floor during partition movement will not be acceptable.

6.10.5.2(1)(g) Motor will automatically extend/retract the bottom seals.

6.10.5.2(2) Suspension System

6.10.5.2(2)(a) Track design will provide precise alignment at the trolley running surfaces and provide integral support for adjoining ceiling, soffit, or plenum sound barrier. Track will be connected to the structural support.

6.10.5.2(2)(b) Factory assembled power units will be ULC listed and include motor, electronic torque limiter, two key control stations wired in series, emergency release, and all necessary equipment for electric operation.

6.10.5.2(2)(c) Roller chain drive will attach to carrier of lead panel. Limit switches will be provided to prevent over-travel.

6.10.5.2(3) Electrical Components

6.10.5.2(3)(a) Motor: NEMA MG1.

6.10.5.2(3)(b) Electric Operator: 300 mm per second travelling speed, or as otherwise required for size of unit; adjustable friction clutch brake actuated by solenoid

controlled motor starter; enclosed limit switch; enclosed magnetic reversing starter.

6.10.5.2(3)(c) Control Station: Two (2) standard keyed three button constant pressure type; 24-volt circuit. Key switch prepared for mortise lock cylinder; key switches alike.

6.10.5.2(3)(d) Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to CSA C22.1.

6.10.5.2(3)(e) Disconnect Switch: Factory mount disconnect switch in control panel.

6.10.5.2(3)(f) Limit Switches: Automatic type, at both extremes of travel, to prevent over-travel.

6.10.5.2(3)(g) Emergency Release: Mechanism to disengage motor drive system and permit manual operation.

6.10.5.2(3)(h) Pocket Door Interlock: Mechanism to prevent operation of panels unless storage pocket doors are fully open.

6.10.5.2(4) Safety Requirements

6.10.5.2(4)(a) Low profile hinges will be of steel and project no more than 6 mm beyond panel faces. Panels to have a minimum of three hinges.

6.10.5.2(4)(b) Panel will be supported by a single carrier allowing the panels to stack freely without the use of rub rails near the pocket.

6.10.5.2(4)(c) Partition will be operated by two (2) control stations wired in series and located on opposite sides and ends of the partition in location that provides clear view of partition path to prevent injury.

6.10.5.2(4)(d) The key stations will be designed for Staff only operation of the partition system.

6.10.5.2(5) Finishes

6.10.5.2(5)(a) Factory applied reinforced vinyl fabric with woven backing, wood veneer, or high pressure laminate.

6.10.5.3 Part 3 Execution

6.10.5.3(1) Not applicable.

6.10.6 Section 10 26 00 – Wall and Door Protection

6.10.6.1 Part 1 General

6.10.6.1(1) References

6.10.6.1(1)(a) ASTM D543, Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

6.10.6.1(1)(b) ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

6.10.6.1(1)(c) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.10.6.1(1)(d) NEMA LD3, High-Pressure Decorative Laminates.

6.10.6.1(2) Performance Requirements

6.10.6.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.6.1(3) Quality Assurance

6.10.6.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.6.1(3)(b) Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

6.10.6.2 Part 2 Products

6.10.6.2(1) Manufacturers

6.10.6.2(1)(a) Manufacturers (typical): Subject to conformance with requirements, provide corner guards, handrails, crash or bumper rails and similar items by Construction Specialties or approved alternative as approved by the Authority.

6.10.6.2(2) Protective Vinyl Wallcovering (PVW):

6.10.6.2.2.(a).1 Provide vinyl/acrylic wall protection that is high impact resistant, rigid sheet with nominal 2.0 mm thickness with chemical and stain

resistance to ASTM D543 with colour-matched vinyl/acrylic trim for joint/transitions.

6.10.6.2.2.(a).2 Acceptable Products:

(a).2.1 ProtectWALL by Tarkett Corporation;

(a).2.2 Or alternative as approved by the Authority.

6.10.6.2(3) Rigid High Impact Sheet (RHIS):

6.10.6.2.3.(a).1 Minimum 1.02 mm thick x 1.22 m x 2.44 m engineered PETG PVC-free wall protection material.

6.10.6.2.3.(a).2 High impact and graffiti-resistant, with chemical and stain resistance to ASTM D543, and able to withstand repeated routine cleaning with hospital-grade disinfectants. Fiberglass reinforced plastic (FRP) is not acceptable. Provide welded or chemically bonded seams to form a seamless continuous covering.

6.10.6.2.3.(a).3 Products will contain antimicrobial additives to retard mildew and bacterial growth. Sheet wall protection will be a high impact wall covering with preformed rigid sheet and matching trims, internal and external corners, containing no PVC.

6.10.6.2.3.(a).4 Secure wall protection to reinforcing and backing in the walls and ensure that such backing is sufficient to withstand expected impact loads.

6.10.6.2.3.(a).5 Acceptable Products:

(a).5.1 Acrovyn Wall Covering by Construction Specialties;

(a).5.2 ProtectWALL 2CR by Tarkett Corporation;

(a).5.3 Korogard by Koroseal Interior Products, LLC;

(a).5.4 or alternative as approved by the Authority.

6.10.6.2(4) Fibre Reinforced Laminate Wall Protection

6.10.6.2(4)(a) Fibre Reinforced Laminate Wall Protection (FRL):

6.10.6.2.4.(a).1 1.9 mm (0.075 inches) thick, monolithic panel with 20% continuous glass fibres; with the following properties:

(a).1.1 Barcol Hardness: ASTM D2583, 35 typical;

(a).1.2 Wear Resistance: NEMA LD3: Minimum 3,500;

(a).1.3 Surface Burning: ASTM E84, Class A. Flame Spread: 25 or less. Smoke Developed: 30 or less.

6.10.6.2.4.(a).2 Acceptable Products: Panolam FRL by Panolam Surface Systems or alternative as approved by the Authority.

6.10.6.2(5) Vinyl Wall Protection:

6.10.6.2(5)(a) 1.5 mm thick, impact, shock, scratch, stain and chemical resistant, heavy duty, heterogeneous, vinyl wall protection.

6.10.6.2(5)(b) Acceptable Products: ProtectWall by Tarkett Corporation or alternative as approved by the Authority.

6.10.6.2(6) Corner Guards

6.10.6.2(6)(a) Corner guards:

6.10.6.2.6.(a).1 Flush-mounted, one-piece 90-degree corner guards constructed of 16 gauge type 304 stainless steel with wing edges crimped for continuous tight fit against the wall surface.

6.10.6.2.6.(a).2 All corner guards to be adhered with no visible fasteners. Secure wall and corner guards to reinforcing and backing in the walls; such backing to be sufficient to withstand expected impact loads.

6.10.6.2.6.(a).3 Provide ‘U’ shape surface mounted end wall protectors at all such conditions.

6.10.6.2(7) Handrails

6.10.6.2(7)(a) Handrails: Materials and shapes appropriate for Patient support, with continuous uninterrupted supports, conforming to the following:

6.10.6.2.7.(a).1 Handrails will be of a colour that contrasts with the floor and wall for ease of location and use;

6.10.6.2.7.(a).2 Provide a tactile signal, such as a notch, 100 mm from the endpoint or interruption of handrails, or have the rail curve and connect back to the wall;

6.10.6.2.7.(a).3 Handrails will be 40 to 45 mm in diameter with a non-slip texture;

6.10.6.2.7.(a).4 Curve the end of handrails down to 680 mm for easier detection by visually impaired adults using cane technique;

6.10.6.2.7.(a).5 All handrails will be able to withstand an applied force of 2 kN.

6.10.6.2.7.(a).6 Provide handrails which are Ligature Resistant throughout the Facility, except for Staff only Back-of-House areas.

6.10.6.2(8) Chair Rails and Bed Bumpers

6.10.6.2(8)(a) Chair rails: Preformed material constructed of high impact vinyl or stainless steel with internal and external corners and end caps. Chair rails to be 200 mm wide; top of rail to be 980 mm AFF.

6.10.6.2(8)(b) Bed bumper: Minimum 1.22 m wide X 900 mm high mounted 150 mm AFF constructed of plastic laminate with phenolic core. Finish to withstand repeated routine cleaning with hospital-grade disinfectants.

6.10.6.2(9) Door Edge and Door Frame Protection

6.10.6.2(9)(a) Door Frame Guards: Door frame protection will be, one-piece polymer profile, 1.0 mm thick, 1219 mm high. Door frame guard will be adhesive applied, with a bead of matching coloured sealant at top.

6.10.6.2(9)(b) Door protection including edge guards, kick plates, mop plates, armour plates and stretcher plates: Type 304 stainless steel.

6.10.6.2(10) Accessories

6.10.6.2(10)(a) Accessories:

6.10.6.2.10.(a).1 Provide all components and accessories as required for complete installation of wall and door protection including fasteners, primers, adhesives and sealants.

6.10.6.2.10.(a).2 Use non-water-based and non-hazardous primer and adhesive materials.

6.10.6.3 Part 3 Execution

6.10.6.3(1) Not applicable.

6.10.7 Section 10 28 00 – Washroom Accessories

6.10.7.1 Part 1 General

6.10.7.1(1) References

6.10.7.1(1)(a) ASTM A269, Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

6.10.7.1(1)(b) ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.10.7.1(1)(c) ASTM A1008/A1008M, Steel, Sheet, Cold-Rolled Carbon, Structural, High-Strength Low Alloy and High Strength Low Alloy with Improved Formability.

6.10.7.1(1)(d) CAN/CSA B651, Accessible Design for the Built Environment.

6.10.7.1(1)(e) CAN/ULC S109, Flame Tests of Flame-Resistant Fabrics and Films.

6.10.7.1(2) Performance Requirements

6.10.7.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.7.1(2)(b) Washroom accessories and installation will be in conformance with BCBC requirements for Persons with Disabilities.

6.10.7.1(2)(c) Grab bars accessible to Persons with Disabilities (including security healthcare and detention healthcare grab bars): Comply with CAN/CSA B651.

6.10.7.1(3) Quality Assurance

6.10.7.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

6.10.7.2 Part 2 Products

6.10.7.2(1) General

6.10.7.2(1)(a) Provide washroom accessories in all washrooms. Provide and install the type, size, and number of washroom accessories as determined with the Authority. All accessories will be compatible with Authority provided consumable supplies.

6.10.7.2(1)(b) Unless noted otherwise, do not use recessed dispensers (such as those for paper towels, soap and waste receptacle).

6.10.7.2(1)(c) Unless noted otherwise, use commercial and hospital-grade accessories free from imperfections in manufacture and finish.

6.10.7.2(2) Materials

6.10.7.2(2)(a) Sheet Steel: ASTM A1008/A1008M.

6.10.7.2(2)(b) Stainless Steel Sheet: ASTM A480/A480M, Type 304.

6.10.7.2(2)(c) Tubing: ASTM A269, stainless steel.

6.10.7.2(2)(d) Fasteners, Screws, and Bolts: Hot dip galvanized, stainless steel where exposed to view Tamper Resistant, and security type.

6.10.7.2(2)(e) Expansion Shields: Fibre, lead, or rubber as recommended by accessory manufacturer for component and substrate.

6.10.7.2(3) Fold-Down Infant Change Tables

6.10.7.2(3)(a) Safety straps to hold infant securely.

6.10.7.2(3)(b) Antimicrobial finish able to withstand repeated routine cleaning with hospital-grade disinfectants.

6.10.7.2(3)(c) Minimum closed dimensions of 890 mm L x 560 mm H x 100 mm W with minimum open width of 58 cm.

6.10.7.2(3)(d) High-density polyethylene construction with stainless steel veneer front.

6.10.7.2(3)(e) Integral compartment for disposable, biodegradable liners 330 mm x 460 mm.

6.10.7.2(4) Shower Curtains

6.10.7.2(4)(a) Curtain textiles will comply with all Authority requirements and CAN/ULC-S109. Metal grommets on textiles are not acceptable.

6.10.7.2(4)(b) Curtains to be specially designed as Ligature Resistant with tracks recessed into the ceiling surface.

6.10.7.2(4)(c) Tracks will consist of one-piece extruded aluminum spanning from end point to end point and secured in place with Tamper Resistant fasteners. Tracks are not permitted to “break-away”.

6.10.7.2(4)(d) Provide attachments and cover escutcheons which are continuously sealed with silicone sealant in all wet areas.

6.10.7.2(5) Public Washrooms

6.10.7.2(5)(a) Provide the following accessories as required:

- 6.10.7.2.5.(a).1 soap dispenser;
- 6.10.7.2.5.(a).2 double stainless steel toilet paper dispenser;
- 6.10.7.2.5.(a).3 paper towel dispenser;
- 6.10.7.2.5.(a).4 paper towel / garbage disposal;
- 6.10.7.2.5.(a).5 mirror;
- 6.10.7.2.5.(a).6 grab bar accessible to Persons with Disabilities, with integral tactile grip finish;
- 6.10.7.2.5.(a).7 coat hook;
- 6.10.7.2.5.(a).8 secured sharps disposal container;
- 6.10.7.2.5.(a).9 sanitary napkin dispensers;
- 6.10.7.2.5.(a).10 sanitary napkin disposals; and
- 6.10.7.2.5.(a).11 solid polymer surface Utility shelf.

6.10.7.2(6) Patient Washrooms

6.10.7.2(6)(a) Provide the following accessories as required:

- 6.10.7.2.6.(a).1 soap dispenser;
- 6.10.7.2.6.(a).2 double stainless steel toilet paper dispenser;
- 6.10.7.2.6.(a).3 paper towel dispenser;
- 6.10.7.2.6.(a).4 paper towel / garbage disposal;
- 6.10.7.2.6.(a).5 mirror;
- 6.10.7.2.6.(a).6 grab bar accessible to Persons with Disabilities, with integral tactile grip finish;
- 6.10.7.2.6.(a).7 coat hook;
- 6.10.7.2.6.(a).8 shelf above or near the sink;

6.10.7.2(6)(b) In addition to the accessories listed above, provide Ensuite - Patient Rooms with:

- 6.10.7.2.6.(b).1 recessed shampoo and soap holder; and
- 6.10.7.2.6.(b).2 shower curtains and track.

6.10.7.2(7) Public Washrooms within the Emergency Department

6.10.7.2(7)(a) Provide the following accessories as required:

- 6.10.7.2.7.(a).1 Soap dispenser Ligature Resistant;
- 6.10.7.2.7.(a).2 Ligature Resistant, wall-mounted paper towel waste bin;

6.10.7.2.7.(a).3 Vandal Resistant mirrors that are unbreakable and securely fasten to the wall and do not distort the viewer's reflection, glass is not acceptable. Angled mirror as required;

6.10.7.2.7.(a).4 Ligature Resistant grab bar with integral weep holes, wall-mounted on one side to allow Staff assist from the other side;

6.10.7.2.7.(a).5 Ligature Resistant coat hook;

6.10.7.2.7.(a).6 Vandal Resistant shelf above sink; and

6.10.7.2.7.(a).7 Ligature Resistant toilet paper dispenser.

6.10.7.2(8) Staff Showers and Change Rooms

6.10.7.2(8)(a) Provide the following accessories as required:

6.10.7.2.8.(a).1 shower curtain track or rod as appropriate;

6.10.7.2.8.(a).2 grab bars (with integral tactile grip finish);

6.10.7.2.8.(a).3 mirrors;

6.10.7.2.8.(a).4 shower curtain;

6.10.7.2.8.(a).5 bench; and

6.10.7.2.8.(a).6 utility shelf.

6.10.7.2(9) Provide a fold-down adult change table in T1.10 Washroom - Adult Change Space to meet the following requirements:

6.10.7.2(9)(a) Wall-mounted installation complete with all structural supports and wall backing;

6.10.7.2(9)(b) Removable, durable 3-piece polyurethane foam mattress with adjustable head/back support;

6.10.7.2(9)(c) Minimum weight capacity of 200 kg (440 lbs);

6.10.7.2(9)(d) Minimum width of 785 mm (31″) with height adjustment from 300 mm to 985 mm AFF;

6.10.7.2(9)(e) Aluminium frame; and

6.10.7.2(9)(f) Pneumatic counter balance.

6.10.7.3 Part 3 Execution

6.10.7.3(1) Not applicable.

6.10.8 Section 10 51 00 – Lockers

6.10.8.1 Part 1 General

6.10.8.1(1) References

6.10.8.1(1)(a) ASTM A653/A653M, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.10.8.1(1)(b) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.10.8.1(2) Performance Requirements

6.10.8.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.8.1(2)(b) Provide seismic restraints in accordance with the BCBC for all lockers.

6.10.8.1(2)(c) Provide a sloped top at all standard locker locations.

6.10.8.1(3) Quality Assurance

6.10.8.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.8.2 Part 2 Products

6.10.8.2(1) Standard Metal Lockers

6.10.8.2(1)(a) Acceptable Products: 50 Series “Nova” by Lincora Canada Inc. or alternative as approved by the Authority.

6.10.8.2(1)(b) Metal lockers for use in Staff use only areas.

6.10.8.2(1)(c) Sheet Steel: ASTM A653/A653M; Mild, cold rolled and levelled unfinished steel. Finish steel surfaces with silver-based antimicrobial treated powder coating.

6.10.8.2(1)(d) Hardware: Vandal Resistant cadmium plated nuts, bolts, lock washers, nut covers, angle clips and fastenings.

6.10.8.2(1)(e) Lockers will include a provision for locking with padlock, and complete with number plates, and hanging hooks.

6.10.8.2(2) Standard Phenolic Lockers

6.10.8.2(2)(a) Solid phenolic lockers for use in all other areas.

6.10.8.2(2)(b) Panels to be fabricated from solid phenolic composite with locked core or panel material conforming to ASTM E84 Class A. Panels to be fabricated as follows:

- 6.10.8.2.2.(b).1 Doors: 13 mm thick with rounded edges.
- 6.10.8.2.2.(b).2 Tops, bottoms, and intermediate shelves: 13 mm with ventilation holes.
- 6.10.8.2.2.(b).3 Locker backs: 6 mm thick.
- 6.10.8.2.2.(b).4 Locker sides: 10 mm thick.
- 6.10.8.2.2.(b).5 Locker bodies: Eased edges and machine polished.

6.10.8.2(2)(c) Hinges will be 304-grade stainless steel.

6.10.8.2(2)(d) Interior hooks will be stainless steel.

6.10.8.2(2)(e) Doors will be attached to the hinge with through-bolting.

6.10.8.2(2)(f) Lockers to include number plates, hanging hooks, and a keyless mechanical combination cam lock with a key override – no wires, battery, nor card required.

6.10.9 Section 10 95 00 – Miscellaneous Specialties

6.10.9.1 Part 1 General

6.10.9.1(1) References

6.10.9.1(1)(a) CE, Conformité Européenne.

6.10.9.1(1)(b) CNSC, Canadian Nuclear Safety Commission.

6.10.9.1(1)(c) CSA, Canadian Standards Association.

6.10.9.1(1)(d) FCC, Federal Communications Commission.

6.10.9.1(1)(e) ROHS, Restriction of Hazardous Substances.

6.10.9.1(2) Performance Requirements

6.10.9.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.10.9.1(3) Quality Assurance

6.10.9.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.10.9.1(3)(b) Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

6.10.9.2 Part 2 Products

6.10.9.2(1) Safety Convex Mirrors

6.10.9.2(1)(a) Provide impact resistant convex mirrors made from shatterproof polycarbonate material with a minimum tensile strength of 9,400 psi.

6.10.9.2(1)(b) Mirror perimeter will be secured with fully enclosed heavy-duty powder coated steel frame mounted flush with the wall and ceiling and with countersunk screw holes with Tamper Resistant fasteners.

6.10.9.2(1)(c) Radiation treatment vaults: Provide convex mirrors for all radiation treatment vaults in conformance with CNSC requirements.

6.10.9.2(1)(d) Corridor and room mirrors:

6.10.9.2.1.(d).1 Provide Vandal Resistant and shatterproof convex mirrors at all intersections where stretchers, beds, equipment or carts are traveling and in all Treatment Bunker Interiors.

6.10.9.2.1.(d).2 Completely fill the cavity behind the mirrors with high-density water blown urethane foam.

6.10.9.2(1)(e) Parking area mirrors:

6.10.9.2.1.(e).1 Provide Vandal Resistant and shatterproof convex mirrors throughout underground parking where sightlines are compromised and/or at convergent corners.

6.10.9.2(2) Magnetic Whiteboards

6.10.9.2(2)(a) Surface designed for use with felt-type writing instruments as well as erasing with repeated cleaning with minimal effort.

6.10.9.2(2)(b) Acrylic enameled steel, scratch and abrasion-resistant writing surface that resists ghosting or staining. Whiteboards will use non-toxic, water based lamination adhesive.

6.10.9.2(2)(c) Continuous extruded aluminum frame, accessory holder tray with protective end caps, map rails and map hooks.

6.10.9.2(3) Mail Slots

6.10.9.2(3)(a) Provide prefabricated mail slots that are a minimum of 25 mm wide, 350 mm high and 400 mm deep.

6.10.9.2(4) Storage Shelving Systems

6.10.9.2(4)(a) Adjustable shelving systems to be specifically manufactured for storage purposes, such as plywood or steel-slotted angle industrial shelving for bulk materials of plastic laminate-faced plywood for clean storage.

6.10.9.2(4)(b) Provide storage shelving systems in accordance with the applicable requirements of the Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving, and Racks.

6.10.9.2(4)(c) Shelves will be cleanable with Authority approved detergents and disinfectants.

6.10.9.2(4)(d) Shelves will be adjustable and suitable for various storage requirements.

6.10.9.2(5) Entrance Mats

6.10.9.2(5)(a) Entrance mat, open "Z"-vinyl construction, low profile with foam backing.

6.10.9.2(5)(b) Recessed Frame: Zinc, stainless steel or brass exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.

6.10.9.2(6) Key Management System Cabinet

6.10.9.2(6)(a) Acceptable Products: Traka S-Touch Series by Assa Abloy or alternative as approved by the Authority.

6.10.9.2(6)(b) Provide a key management system to meet the following requirements. The location of the key management system will be as determined in consultation with the Authority through the Review Procedure:

6.10.9.2.6.(b).1 175 mm (7") capacitive touch screen;

6.10.9.2.6.(b).2 Full audit trail of all users and key transactions;

6.10.9.2.6.(b).3 Provide secure storage and management for four hundred (400) keys;
6.10.9.2.6.(b).4 Access by authorized users only via card reader and biometric fingerprint reader;
6.10.9.2.6.(b).5 Provide battery backup;
6.10.9.2.6.(b).6 Provide soft close-down with no data loss in the event of long-term power failure;
6.10.9.2.6.(b).7 Cabinet and door material: Zintec steel cabinet; solid metal door;
6.10.9.2.6.(b).8 Users per system: 40,000; and
6.10.9.2.6.(b).9 Comply with the following certifications: CE, FCC, CSA, ROHS.
6.10.9.2.6.(b).10 Provide key management systems in the following locations:
(b).10.1 W4.09 Workroom – FMO; and
(b).10.2 W4.01 Workshop – Main.

6.10.9.3 Part 3 Execution

6.10.9.3(1) Not applicable.

6.11 Equipment (Division 11)

6.11.1 Section 11 13 00 – Loading Dock Equipment

6.11.1.1 Part 1 General

6.11.1.1(1) Dock Lift Requirements

6.11.1.1(1)(a) Basic Requirements
6.11.1.1.1.(a).1 The dock lift and systems will be designed to accommodate the requirements of the Facility in a manner that contributes to the overall efficiency and effectiveness of Facility operations.
6.11.1.1.1.(a).2 The dock lift systems will be designed to ensure there is sufficient capacity to accommodate the wide range of user and functionality requirements, in a manner that satisfies expectations for safety, reliability, responsiveness, accessibility and operational efficiency. Provide labels, railings and protection against pinch points.
6.11.1.1.1.(a).3 Durable equipment finishes will be provided.
6.11.1.1.1.(a).4 Emergency power operation of dock lift will be provided.
6.11.1.1.1.(a).5 Dock lift will be configured and positioned On-Site to accommodate easy movement of material carts. Requirements for transport of

heavy equipment will be considered and accommodated.

6.11.1.1.1.(a).6 Refer to Section 5.7.18 Loading Docks for additional information.

6.11.1.1(1)(b) Performance Criteria for Dock Lift:

6.11.1.1.1.(b).1 Supply and install a group of one (1) exterior dock lift, with equipment and performance characteristics described in this Schedule. Provide all necessary components to make dock lift systems fully operational and functional. Components included will include the following:

(b).1.1 Electrical power to power unit, hydraulic hoses linking power unit and lift, underground pathway in concrete or metal connecting dock lift to power unit in Facility, dock pit sized to accommodate flush bottom level, two (2) bollards of concrete filled steel, storm drain in pit base and any other equipment, fittings or systems required for a fully functioning dock lift;

(b).1.2 Install dock lift with Direct Access to the loading dock in a paved at-grade receiving area.

6.11.1.1.1.(b).2 Provide all Permits, labour, materials, products, equipment, services and all else necessary for the design, manufacture, delivery, installation and services required for a complete and fully functioning dock lift system.

6.11.1.1.1.(b).3 Obtain and pay for governmental design submission, registration, inspection and permit, as required (except for ownership and operation license), and make such tests as required by the British Columbia Safety Authority prior to licensing.

6.11.1.1(1)(c) Codes, Bylaws and Regulations: Provide equipment and perform work in accordance with the latest edition of any Safety Code for Dock Lifts and any other code that may govern the installation.

6.11.1.1(1)(d) Wiring Diagrams and Manuals: Prior to Substantial Completion, supply to the Authority three sets of manuals that include information itemized below.

6.11.1.1(1)(e) Final shop drawings:

6.11.1.1.1.(e).1 Description of special features such as independent service, emergency power operation and security operation.

6.11.1.1.1.(e).2 Record wiring and schematic diagrams.

6.11.1.1.1.(e).3 Schedule of recommended routine maintenance procedures.

6.11.1.1.1.(e).4 Description of diagnostic procedures, including complete troubleshooting instructions.

6.11.1.1(1)(f) Training: As required by Section 5.5.6.1 Commissioning, provide a training session for the Authority consisting of a review of the documentation and operation of the equipment and features.

6.11.1.1(1)(g) Trademarks: Arrange that no equipment visible to the public has any trademark, company name, or logo.

6.11.1.1(1)(h) Operating Conditions:

6.11.1.1.1.(h).1 Provide equipment that will operate normally when the exterior temperature is between minus 40 and plus 35°C.

6.11.1.1.1.(h).2 Provide equipment that will operate normally when the power supply is within 10%of its rated voltage.

6.11.1.1(1)(i) Maintainability:

6.11.1.1.1.(i).1 Arrange the equipment such that there are no times, dates, trips, or other counters that would shut down the equipment or change its operation.

(i).1.1 Dock lift equipment provided under this specification will not contain proprietary features that limit the Authority’s ability to engage a registered maintenance contractor, other than the original manufacturer / installer, to provide routine maintenance services.

6.11.1.1.1.(i).2 In the event specialized tools or software are required to perform routine maintenance services, such tools will be either provided as “on board” equipment, or as separate devices. Such tools or software will be provided with the equipment and will become the property of the Authority.

6.11.1.1(1)(j) Hoistway / Pit Equipment:

6.11.1.1.1.(j).1 Provide structure and material consisting of reinforced concrete, guards, and all other equipment required for a complete installation.

6.11.1.1.1.(j).2 Provide pit surface sloped to drain that is connected to site storm drainage system.

6.11.1.1(1)(k) Electric Wiring:

6.11.1.1.1.(k).1 Provide copper conductors to connect the equipment.

6.11.1.1.1.(k).2 Run the conductors in metal conduit, duct or electrical metallic tubing.

6.11.1.1.1.(k).3 Provide travelling cable between dock lift and the power unit in the receiving room and the power unit and local electrical panel.

6.11.1.1(1)(l) Operational Features:

6.11.1.1.1.(l).1 Provide independent service capability.

6.11.1.1.1.(l).2 Provide emergency power operation of the dock lift such that dock lift is fed with emergency power and capable of operating in power outages.

6.11.1.1(1)(m) Operating Performance:

6.11.1.1.1.(m).1 Levelling - Arrange that the lift stops within 3 mm of the floor level.

6.11.1.1.1.(m).2 Operating time - Adjust the equipment so that the operating time is 30 seconds or less.

6.11.1.1.1.(m).3 Arrange the power unit equipment so that the noise level with the dock in operation is less than 72 decibels.

6.11.1.1(2) Dock Leveler Requirements

6.11.1.1(2)(a) Basic Requirements:

6.11.1.1.2.(a).1 Perform work in accordance with AHJ and as outlined herein.

6.11.1.1.2.(a).2 The dock leveler system will be designed to accommodate the requirements / needs of the Facility in a manner that contributes to the overall efficiency and effectiveness of the Authority's 24/7 operations.

6.11.1.1.2.(a).3 The dock leveler system will be designed to ensure there is sufficient capacity to accommodate the wide range of user and functionality requirements, in a manner that satisfies expectations for safety, reliability, responsiveness, accessibility and operational

efficiency. Provide labels and protection measures such as full range toe guards, for protection against pinch points.

6.11.1.1.2.(a).4 Durable equipment finishes will be provided.

6.11.1.1.2.(a).5 Emergency power operation of dock leveler will be provided.

6.11.1.1.2.(a).6 Dock leveler will be configured and positioned On-Site to accommodate easy movement of delivery pallets and/or material carts. Requirements for transport of heavy equipment will be considered and accommodated.

6.11.1.1(2)(b) Performance Criteria for Dock Leveler:

6.11.1.1.2.(b).1 Supply and install a group of one pre-formed pit-type dock leveler, with equipment and performance characteristics as generally described in this specification. Provide all necessary components to make dock leveler systems fully operational and functional, whether or not specifically referenced in this outline specification. Components will include the following: electrical power to power unit, hydraulic hoses linking power unit and leveler, dock pit sized to accommodate pit-type leveler (cast-in-place box type not acceptable), two site bollards of concrete filled steel, sloped bottom of pit base to drain water, and any other equipment, fittings or systems required for a fully functioning dock leveler.

6.11.1.1.2.(b).2 Install dock levelers in the following paved receiving areas (as described in Section 5.7.18 Loading Docks):

(b).2.1 Clean loading dock: 3 levelers;

(b).2.2 Soiled loading dock: 1 leveler;

(b).2.3 Provide all Permits, labour, materials, products, equipment, services and all else necessary for the design, manufacture, delivery, installation and services required for a complete and fully functioning dock leveler system.

6.11.1.1(2)(c) Codes, Bylaws and Regulations: Provide equipment and perform work in accordance with the latest edition of any Safety Code for Dock Levelers and any other code that may govern the installation.

6.11.1.1(2)(d) Wiring Diagrams and Manuals:

6.11.1.1.2.(d).1 Prior to Substantial Completion, supply to the Authority, three sets of manuals that include information itemized below:

6.11.1.1.2.(d).2 Final shop drawings:

(d).2.1 Description of special features such as independent service, emergency power operation and security operation;

(d).2.2 Record wiring and schematic diagrams;

(d).2.3 Schedule of recommended routine maintenance procedures;

(d).2.4 Description of diagnostic procedures, including complete troubleshooting instructions.

6.11.1.1(2)(e) Training: As required by Section 5.5.6.1 Commissioning, provide a training session for the Authority consisting of a review of the documentation and operation of the equipment and features.

6.11.1.1(2)(f) Trademarks: Arrange that no equipment visible to the public has any trademark, company name, or logo.

6.11.1.1(2)(g) Operating Conditions:

6.11.1.1.2.(g).1 Provide equipment that will operate normally when the exterior temperature is between minus 40 and plus 35°C.

6.11.1.1.2.(g).2 Provide equipment that will operate normally when the power supply is within 10%of its rated voltage.

6.11.1.1(2)(h) Maintainability:

6.11.1.1.2.(h).1 Arrange the equipment such that there are no times, dates, trips, or other counters that would shut down the equipment or change its operation.

6.11.1.1.2.(h).2 Dock leveler equipment provided under this specification will not contain proprietary features that limit the Authority’s ability to engage a registered maintenance contractor, other than the original manufacturer / installer, to provide routine maintenance services.

6.11.1.1.2.(h).3 In the event specialized tools or software are required to perform routine maintenance services, such tools will be either provided as

"on board" equipment, or as separate devices. Such tools or software will be provided with the equipment and will become the property of the Authority.

6.11.1.1(2)(i) Pre-formed Pits:

6.11.1.1.2.(i).1 Provide structures and material consisting of reinforced concrete and all other equipment required for a complete installation.

6.11.1.1.2.(i).2 Provide dock lift pit with surface sloped to drain, connected to oil/water separator and to site storm drainage system.

6.11.1.1.2.(i).3 Provide dock leveler pit with surface sloped to front of loading dock platform.

6.11.1.1(2)(j) Electric Wiring:

6.11.1.1.2.(j).1 Provide copper conductors to connect the equipment.

6.11.1.1.2.(j).2 Run the conductors in metal conduit, duct or electrical metallic tubing.

6.11.1.1(2)(k) Operational Features:

6.11.1.1.2.(k).1 Provide independent service capability.

6.11.1.1.2.(k).2 Provide emergency power operation of the dock leveler such that dock leveler is fed with emergency power and capable of operating in power outages.

6.11.1.1(2)(l) Operating Performance:

6.11.1.1.2.(l).1 Levelling: Arrange that the leveler stops within 3 mm of the floor level.

6.11.1.1.2.(l).2 Operating time: Adjust the equipment so that the operating time is 30 seconds or less.

6.11.1.1.2.(l).3 Arrange the power unit equipment so that the noise level with the dock in operation is less than 72 decibels.

6.11.1.1(3) Quality Assurance

6.11.1.1(3)(a) Equipment provided will have a proven track record of at least five years field operation in Canada in similar environments and of similar configuration.

6.11.1.1(3)(b) Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

6.11.1.1(3)(c) Installer's qualifications: Company approved by product manufacturer employing technicians with satisfactory training and experience.

6.11.1.2 Part 2 Products

6.11.1.2(1) Loading Dock Equipment

6.11.1.2(1)(a) Dock Lift, Acceptable Product/Manufacturer:

6.11.1.2.1.(a).1 SDL Dock Lift, Pit Mounted, Loadwarrier Series, Model SDL58-8, by Serco:

- (a).1.1 Platform 60” x 96”;
- (a).1.2 Capacity 8000 lbs;
- (a).1.3 Travel 60”;
- (a).1.4 Speed 10fpm;
- (a).1.5 Remote pump and 5 HP electric motor 600V 3P to be located in receiving area;
- (a).1.6 Removable guard rail with mid-rail, and kick plate;
- (a).1.7 Beveled toe guards;
- (a).1.8 Safety chains;
- (a).1.9 Dual hydraulic lifting cylinders, with velocity fuses;
- (a).1.10 Upper travel limit switch;
- (a).1.11 Hot Dipped Galvanized;
- (a).1.12 Electric Toe Guards;
- (a).1.13 Spring assisted bridge;
- (a).1.14 Hand held control with cord and plug;
- (a).1.15 In-motion warning beeper and flashing light;
- (a).1.16 Manual lowering Valve;
- (a).1.17 To be installed in pre-formed concrete dock lift pit, per manufacturer’s specifications, and structural design.

6.11.1.2.1.(a).2 Or alternate approved by the Authority.

6.11.1.2(1)(b) Dock Leveler, Acceptable Product/Manufacturer:

6.11.1.2.1.(b).1 HFC Hydraulic Dock Leveler Model HFC800 by Serco:

- (b).1.1 72” x 96” deck size;
- (b).1.2 Capacity 40K lb;
- (b).1.3 Pump and 1 HP electric motor 600V 3P;
- (b).1.4 Hydraulic velocity fuse safety stop;
- (b).1.5 Full range telescoping toe guards;
- (b).1.6 20” lip;
- (b).1.7 Galvanized finish;
- (b).1.8 Grease fittings;

(b).1.9 Steel NEMA 12 push-button control panel (interlock capable);
(b).1.10 Automatic return;
(b).1.11 Independent hydraulic lip control;
(b).1.12 “Nite-Lock”;
(b).1.13 Heavy duty BF410-14F dock bumpers;
(b).1.14 To be installed in pre-formed concrete leveler pit, per manufacturer’s specifications, and structural design.

6.11.1.2.1.(b).2 Or alternate approved by the Authority

6.11.1.3 Part 3 Execution

6.11.1.3(1) Not applicable.

6.11.2 Section 11 19 50 – Safety Padding

6.11.2.1 Part 1 General

6.11.2.1(1) Provide safety padding protection in the Secure Room for following items:

6.11.2.1(1)(a) walls,

6.11.2.1(1)(b) doors and frames,

6.11.2.1(2) Manufacturers: Minimum of 5-years experience in fabrication and installation of protective padding work.

6.11.2.1(3) References

6.11.2.1(3)(a) CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies; and

6.11.2.1(3)(b) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials

6.11.2.2 Part 2 Products

6.11.2.2(1) Marathon Engineering Corporation; or

6.11.2.2(2) alternative as approved by the Authority.

6.11.2.2(3) Safety padding underlayments and accessories:

6.11.2.2(3)(a) Ardex Engineered Cements;

6.11.2.2(3)(b) W.W. Henry Co.;

6.11.2.2(3)(c) Koster American Corporation; and

6.11.2.2(3)(d) Mapei Inc.

6.11.3 Section 11 40 00 – Food Services and Equipment

6.11.3.1 General Requirements

6.11.3.1(1) Food services includes the Patient Food Services kitchen that will provide receiving and storage, central kitchen facilities (preparation, production, chilling, prepared food holding and meal assembly), warewashing and departmental office (Staff support spaces) to support the Patients' needs within the Facility.

6.11.3.1(2) Nourishment Stations and Soiled Tray alcoves will be provided on the units to support Patient Food Service activities and service for Patients.

6.11.3.1(3) This Section will be read in conjunction with Appendix 1A [Clinical Specifications and Functional Space Requirements] and Appendix 1I [Food Services Equipment List].

6.11.3.1(4) The Design-Builder will obtain and pay for all design submission, registration, inspection and permit, as required by the British Columbia government for licensing of the kitchen, except for ownership and operation license.

6.11.3.1(5) To the extent practical, provide mobile Equipment to allow for movement and repositioning in the future, easy replacement and ease of cleaning below and behind.

6.11.3.1(6) Provided additional space underneath cooking exhaust hoods at a minimum 1.4 m to allow for positioning of equipment in the future.

6.11.3.1(7) For grease interceptor requirements including location, refer to Section 7.4.2.23(6).

6.11.3.1(8) Floor drains in kitchen to be directed to the grease traps.

6.11.3.2 Codes and Regulations

6.11.3.2(1) All food service areas will support Staff safety by incorporating features to control hazards and minimize risk, consistent with current legislation, guidelines and best practices i.e.: chemical, ergonomic, biological and physical.

6.11.3.2(2) Conform to all laws, bylaws, rules, regulations and requirements of all AHJ.

6.11.3.2(3) Consistent with obligations under the Agreement, the commercial kitchen plans, Equipment lists, and specifications will be submitted for a Health Department Review to the Authority and Provincial Health Services Authority.

6.11.3.2(4) Submissions will also be reviewed by the AHJ for life safety and BC Building Code compliance.

6.11.3.2(5) Food Equipment to be installed to meet seismic codes and requirements as dictated by local AHJ refer to Section 5.12.12.

6.11.3.2(6) All electrical systems and Equipment will conform to the Canadian Electrical Code, the Electrical Inspection Department Bulletins, the Technical Safety BC requirements and the Canadian Standards Association. All equipment will have a CSA approval label.

6.11.3.2(7) Any plumbing or drainage systems will conform to the Plumbing Code except as modified by regulations and bylaws of AHJ.

6.11.3.2(8) Steam Equipment will conform to applicable codes covering such Equipment as well as the rules, regulations and bylaws of the AHJ.

6.11.3.2(9) Each piece of Equipment will be accompanied by a label or certificate of approval.

6.11.3.2(10) All mechanical refrigeration system will be supplied with safety relief valves, shut-off valves for each piece of equipment, refrigerant leak detectors and all other items as required by local regulations.

6.11.3.2(11) All welded pressure vessels will be constructed to ASME standards. The vessels will bear the stamp and certificates framed under glass and hung adjacent to the vessel.

6.11.3.2(12) Equipment design and fabrication will conform with the National Sanitation Foundation and Provincial as well as Health Department Regulations.

6.11.3.2(13) Utilize energy star food service Equipment, where available.

6.11.3.3 Spatial Requirements

6.11.3.3(1) All areas within the Patient Food Services will be within one (1) contiguous space.

6.11.3.3(2) Patient Food Services areas will have a Ceiling Height of 3.05 m AFF, except for the following:

6.11.3.3(2)(a) All walk-in cold rooms, refrigerators and freezers will have a minimum Ceiling Height of 2.6 m AFF.

6.11.3.4 Materials

6.11.3.4(1) Materials for fixed surfaces to be impervious to moisture, corrosion resistant, smooth and easily cleaned.

6.11.3.4(2) Materials will be new, first grade, thickness will be standard gauge for sheet and plates.

6.11.3.4(3) Thickness of sheets and tubing are in millimeters. All tubing to be 1.6 mm wall, sizes shown are outside diameter and face.

6.11.3.4(4) Stainless steel will be Analysis 18 8, Type 304, No. 4 finish, 180 grit free from pits and imperfections. All finish lines to run vertically.

6.11.3.4(5) Galvanized iron, copper bearing sheet 381 grams per square meter, hot dipped and finished with one coat primer and one coat grey hammerloid air dry enamel.

6.11.3.4(6) Plywood, Douglas fir, conforming to CSA 0121. Plywood will be free of added urea-formaldehyde.

6.11.3.4(7) Plastic, non-absorbent thermoplastic with hardness Durometer 60 D to thicknesses as specified under individual items.

6.11.3.4(8) Plastic laminate conforming to CSA A172. Types 1 or 3, 1.6 mm and 1.3 mm thick respectively having standard 0.5 mm compensating backing sheet.

6.11.3.4(9) Sound deadening under all stainless steel tops to be Aquaplas DL 10, 3 mm thick, grey, rigid, waterproof insulation. Bituminous backing not accepted.

6.11.3.5 Hardware

6.11.3.5(1) All hardware components will be highly polished chrome plated, heavy duty Kason or Component Hardware Group Inc., unless noted otherwise.

6.11.3.5(2) Sliding door handles to be an integral part of door and to be full height of door.

6.11.3.5(3) Catches to be either concealed, self aligning floating magnet, or friction type, solid brass with satin nickel finish, or rustproof steel balls and springs with set screws for adjustable tension. Magnet holding power of 14 kgs minimum.

6.11.3.5(4) Provide Tamper Resistant cylinder locks for all custom made and standard doors and drawers with locks for functional groups keyed differently.

6.11.3.6 Miscellaneous

6.11.3.6(1) Garbage containers to be Rubbermaid #2620, yellow, complete with lid. Custom fabricate dolly and properly size to fit waste container.

6.11.3.6(2) Cutting boards to be removable and reversible, 12.7 mm thick, white, sanitary, plastic material (nonporous) and dishwasher safe. Board to have 76.2 mm x 25.4 mm elongated slot to serve as a handle. Mount in stainless steel slides with back stop.

6.11.3.6(3) Bumpers will have metal insert support and exterior casing in 1.6 mm stainless steel. Secure bumpers specified on purchased or fabricated mobile equipment at identical height.

6.11.3.6(4) Corner bumpers to be Colson #6927, fastened to unit with stainless steel screws. Seal all exposed gaps.

6.11.3.6(5) Wrap around bumpers to be Colson #6915, set into stainless steel channel, fastened to unit with stainless steel screws. Seal all exposed gaps.

6.11.3.6(6) Insert neoprene buttons in housings or bodies to soften noise on drawer or door closing.

6.11.3.6(7) Castings to be rough ground, polished, buffed to bright lustre, free from pit-marks, runs, checks, burrs and other surface imperfections. Low nickel content, white metal which yellows on exposure to atmosphere will not be accepted.

6.11.3.6(8) Provide sanitary bullet type feet made of stainless steel with internal adjustment of 38.1 mm.

6.11.3.6(9) Clips will be stainless steel.

6.11.3.6(10) Casters will be stem or plate mounted as required, diameter of wheel as specified. Units with swivel casters will have locking devices on two swivel casters (unless foot lock is specified). All casters to have non-marking cushion rubber wheels with thread guards.

6.11.3.6(11) Acceptable casters manufacturers are Colson, Darcor, Flexello, Kilian or alternative as approved by the Authority.

6.11.3.6(12) Purchased or custom fabricated equipment to be fitted with casters from only one (1) manufacturer unless moulded forms prevent substitution. Minimum mass rating of 363 kg per set of four (4). Adaptable for tubular legs or base frames.

6.11.3.6(13) Unless noted otherwise, wheels will be metal disc type with Delrin bearings and neoprene or polyolefin tread, 127 mm diameter (or

standard size of purchased equipment), and without thread guards.

6.11.3.6(14) Swivel bearings will be sealed ball or roller bearing. Brakes and wheel locks or other accessories will be provided as noted.

6.11.3.6(15) Casters on equipment which are to be used for freezer storage will have suitable tread and lubricant to withstand temperature differentials.

6.11.3.7 Wash Stations

6.11.3.7(1) Hand hygiene sinks with soap dispensers and/or hand disinfectant stations will be provided in all work areas within the production kitchen and at all point of entry and exit from the Patient Food Service kitchen.

6.11.3.7(2) Eyewash stations will be provided where bulk chemical storage occurs and where chemicals are used predominantly (dish wash and pot wash areas). Portable eyewash stations are not acceptable.

6.11.3.8 Room Finishes

6.11.3.8(1) This section will be read in conjunction with Appendix 1B [Minimum Room Requirements].

6.11.3.8(2) Provide heavy-duty non slip flooring that is washable, impervious to food acids and oils, suitable for rolling equipment with anti-mould/anti-fungi characteristics throughout the Patient Food Services and distributed Food Services areas and inside any refrigerated/freezers.

6.11.3.8(3) All corners between walls, floors, and ceilings within food service areas will be coved.

6.11.3.8(4) Ensure that all general areas relating to Patient Food Services are gradually sloped to central floor drains for general drainage and to enable mechanically assisted spray wash and chemical sanitation.

6.11.3.8(5) Provide wall finishes that are smooth, washable and durable in all food service areas and provide protection from cart damage.

6.11.3.8(6) Provide durable bumpers at bottom and midpoint of walls for additional protection from rolling carts and trucks. Stainless steel corner guards to be provided on all exterior corners unless noted otherwise.

6.11.3.8(7) Throughout the kitchen, provide wall protection consisting of fiberglass reinforced plastic from the top of floor coving to a minimum of 1.35 meters high to protect from cart damage.

6.11.3.8(8) Provide wall protection consisting of fiberglass reinforced plastic from the top of floor coving to a minimum of 1.35 meters high on all exposed walk-in coolers and freezers to protect from cart damage.

6.11.3.8(9) Walls behind cooking Equipment, dishwashing and pot washing Equipment will be protected with stainless steel sheets to underside of ceilings.

6.11.3.9 Mechanical Requirements

6.11.3.9(1) Provide all domestic hot and cold water, drains, vents, as per BC Building Code from Facility supply to the point of connection required for the complete operation of Equipment.

6.11.3.9(2) Provide shut off valves, back flow preventers, line strainers, shock absorbers, pressure, temperature and pressure gauges and control valves or devices.

6.11.3.9(3) Provide hot and/or cold-water lines to multiple components of food service Equipment such as dishwashers and booster heaters, hose reels, etc.

6.11.3.9(4) Provide drain lines, traps, vent piping, clean outs and grease traps, sediment interceptors, drains for floor pans, connected drains for Equipment, floor drains with funnels for open drains on Equipment, floor drains with funnels and drain lines for evaporator coils.

6.11.3.9(5) Provide all floor drains for general drainage purpose, maintenance and cleaning, throughout the Patient Food Services Component, as required.

6.11.3.9(6) Provide all hand sinks, slop sinks, janitorial sinks, grease traps and general sanitizing stations as set out in Appendix 1B [Minimum Room Requirements] and Appendix 1I [Food Services Equipment List].

6.11.3.9(7) Provide all base building water heating equipment capable of supplying the volume, pressure and temperature of hot water required to properly operate all food services Equipment.

6.11.3.9(8) Provide chrome plated piping wherever exposed.

6.11.3.9(9) Provide chrome plated overflow assemblies, drain fittings and traps with tail pieces for all sink type assemblies.

6.11.3.9(10) Provide chrome plated blowdown piping from items with relief or safety valves, extend piping to nearest hub or floor drain approximately 4" (100mm) above drain.

6.11.3.9(11) Provide inter-piping of all hot food well drains to one common 1 1/2" (38mm) chrome manifold and extend to 4" (100mm) above floor drain or funnel floor drain. The drain(s) will be trapped as required by BC Building Code complete with clean out. Provide a separate extended shut off valve for each well.

6.11.3.10 HVAC Requirements

6.11.3.10(1) Provide an island style or wall mount “demand control” type exhaust hood complete with make- up air to National Fire Protection Association (NFPA) #96 standards will be located above the cooking Equipment complete with an automatic fire suppression system for Equipment and exhaust hood protection.

6.11.3.10(2) The kitchen exhaust and make up air systems will be provided to allow for year-round tempered air. Provide negative air pressure in the kitchen areas to prevent food odours from permeating out of the Component and into other areas of the Facility.

6.11.3.10(3) The design of the exhaust system will provide for grease laden vapors to be filtered through an engineered system.

6.11.3.10(4) Air-conditioned moderate velocity air as well as ventilation will be provided in all food service areas.

6.11.3.10(5) Slight negative pressure will be provided for odour control in all of these areas.

6.11.3.10(6) Specific kitchen exhaust and make up air systems will be required in the production kitchen that provides year-round tempered air. Exhaust hoods to be ULC listed.

6.11.3.10(7) Provide specific exhaust in accordance with NFPA requirements at all cooking areas. Additional exhaust will be provided to vent odours and humidity from the dish and pot washing equipment.

6.11.3.10(8) Provide exhaust hoods with “demand ventilation” and digital monitoring system for a fully approved system installed in accordance with NFPA 96, 17a, and the AHJ.

6.11.3.10(9) All exhaust hoods will have built-in recessed LED light fixtures with full spectrum LED lights and high temperature ballasts.

6.11.3.10(10) Construct each hood of 1.25 mm stainless steel with a No. 4 finish and all joints welded and watertight as per NFPA-96, (1994).

6.11.3.10(11) Provide high efficiency grease extraction by centrifugal action through multi-directional baffles adjacent and parallel to cooking equipment, without the use of filters, cartridges, or rotating parts.

6.11.3.10(12) Provide and install a fully assembled and pre- wired control panel constructed of 1.25 mm stainless steel with No. 4 finish.

6.11.3.10(13) Provide electrical components, including fan selector switch, and FAN ON pilots with a visual screen and touch pad components.

6.11.3.10(14) Provide interconnecting wiring and piping within hoods for On-Site assembly. Provide control panels ready for final connections.

6.11.3.10(15) Provide and install removable stainless steel, enclosure panels and trim between hood and all adjacent surfaces and from the top of the exhaust hoods to the underside of the finished ceiling.

6.11.3.10(16) Provide battery operated 120 Volt uninterrupted power supply for controls. with a seven second delay.

6.11.3.10(17) Hang hoods, supplying and installing mild steel, hanging rods, turnbuckles and miscellaneous hardware necessary for secure, level and plumb installation ready for duct connection. Anchors to slab or beams if required.

6.11.3.10(18) Provide variable speed fan control system for exhaust systems over 2359 L/sec total air flow volumes as per BC Building Code requirements. Provide automatic balancing control dampers on individual exhaust hoods. Supply system with variable speed drive for exhaust fan matched to exhaust fan provided by Mechanical Division.

6.11.3.10(19) Provide all exhaust ductwork from exhaust fan(s) to food service equipment, exhaust ventilator(s) hood(s) or dishwashing and cart washing equipment in accordance with NFPA-96 and per the requirements of the BC Gas Utilization Code.

6.11.3.10(20) Provide all exhaust stainless steel duct work leading to exhaust ventilator(s) hood(s) take-off collars and connect to collars. Use watertight duct work and weld all joints as per the current edition of NFPA 96.

6.11.3.10(21) Provide make-up air system including fan, stainless steel duct work, distribution grills and/or connection to make-up air plenum on exhaust ventilator(s) (hoods), as required.

6.11.3.10(22) Provide exhaust ventilators including:

6.11.3.10(22)(a) all exhaust ventilators, integral make-up air plenums supplied and installed with exhaust ventilator(s) or (hoods); and

6.11.3.10(22)(b) exhaust ventilator(s) control panels complete with control relays as required for interlock to the building central alarm panel.

6.11.3.11 Condensate Hoods

6.11.3.11(1) Fabricate hoods of 1.25 mm stainless steel type 304, No. 4 finish with joints and seams fully welded and liquid tight.

6.11.3.11(2) Provide removable stainless steel condensate baffles.

6.11.3.11(3) Duct collars will be 1.6 mm stainless steel all welded complete with 25 mm flanged perimeter connection.

6.11.3.11(4) Provide 13 mm stainless steel condensate drain coupling and condensate trough.

6.11.3.11(5) Stainless steel removable enclosure panels will be provided from top of condensate hoods to underside of finished ceilings.

6.11.3.11(6) Support and hang condensate hoods by means of mild steel threaded rod, secured to structural ceiling member. Utilize turn-buckles to ensure a plumb and level installation, ready for duct connection.

6.11.3.12 Fire Suppression Systems

6.11.3.12(1) Provide fire suppression systems complete with piping, bottles, Fenwal thermostatic detection devices or fusible links as specified, release mechanisms and all other necessary accessories and components to form a complete operational and NFPA and ULC approved system.

6.11.3.12(2) Provide a fire suppression system to NFPA #96 and 17A standards and as approved by the AHJ, for surface protection of all cooking, hood plenums and ducts. System to be capable of fully automatic detection and actuation or remote actuation with the ability to alert the security station in case of a fire condition.

6.11.3.12(3) Provide hood, duct and surface protection for all cooking units.

6.11.3.12(4) Hood and duct protection achieved as part of hood construction or in combination with surface protection.

6.11.3.12(5) Fire detection by preset thermostats or fusible links, or both, with activation setting of 176°C or higher according to type of equipment beneath.

6.11.3.12(6) Activation of systems will generate discharge of water and/or chemical extinguishing medium, fan and electrical shutdowns.

6.11.3.12(7) Locate thermostats or links within 915 mm of potentially hazardous equipment.

6.11.3.12(8) Locate extinguishing discharge nozzle over hazardous equipment and provide maximum efficiency and efficient discharge of extinguishing medium.

6.11.3.12(9) Fit discharge nozzles with grease caps.

6.11.3.12(10) Will conform to NFPA 96 and to UL-300 or latest version and to the requirements of the AHJ.

6.11.3.12(11) Provide a minimum of one (1) ‘K’ class fire extinguisher and mounting bracket per coverage zone.

6.11.3.12(12) Provide remote fire pull stations for the exhaust ventilator/fire suppression system.

6.11.3.13 Materials

6.11.3.13(1) Materials for fixed surfaces to be impervious to moisture, corrosion resistant, smooth and easily cleaned.

6.11.3.13(2) Materials will be new, first grade, thickness will be standard gauge for sheet and plates.

6.11.3.13(3) Thickness of sheets and tubing are in millimeters. All tubing to be 1.6 mm wall, sizes shown are outside diameter and face.

6.11.3.13(4) Stainless steel will be Analysis 18 8, Type 304, No. 4 finish, 180 grit free from pits and imperfections. All finish lines to run vertically.

6.11.3.13(5) Galvanized iron, copper bearing sheet 381 grams per square meter, hot dipped and finished with one coat primer and one coat grey hammerloid air dry enamel.

6.11.3.13(6) Plywood, Douglas Fir, waterproof, conforming to CSA 0121. Plywood will be free of added urea-formaldehyde.

6.11.3.13(7) Plastic, non absorbent thermoplastic with hardness Durometer 60 D to thicknesses as specified under individual items.

6.11.3.13(8) Plastic laminate conforming to CSA A172. Types 1 or 3, 1.6 mm and 1.3 mm thick respectively having standard 0.5 mm compensating backing sheet.

6.11.3.13(9) Sound deadening under all stainless steel tops to be Aquaplas DL 10, 3 mm thick, grey, rigid, waterproof insulation. Bituminous backing not accepted.

6.11.3.14 Emergency Power

6.11.3.14(1) At a minimum, the following equipment will be on delayed vital power:

6.11.3.14(1)(a) Food Services Walk-in cold rooms and freezers;

6.11.3.14(1)(b) 50% of cooking equipment;

6.11.3.14(1)(c) Pot and Dishwashing within the kitchen;

6.11.3.14(1)(d) Exhaust ventilation and fire protection equipment; and

6.11.3.14(1)(e) Patient Food Services management system that maintains Patient diet profiles.

6.11.3.14(2) All other food service Equipment will be on conditional power.

6.11.3.15 Electrical Requirements

6.11.3.15(1) Provide inter-wiring of the kitchen ventilation and fire suppression system components such as; exhaust ventilator(s) (hood), surface fire suppression detector(s) in each hood, fire suppression building alarm fire and trouble interlocks as required, exhaust fans, makeup air units, cooking equipment shut down devices, and interlocks to BMS.

6.11.3.15(2) Provide all electrical control wiring required for the mechanical refrigeration systems including inter-connections from remote condensing units to the walk-in refrigerators and freezers.

6.11.3.15(3) Provide electrical wiring for the walk-in refrigerator and freezer including power supply to interior lights, light switches, door heaters, temperature alarms, evaporator coils, drain line heaters, electric defrost and solenoid valves.

6.11.3.15(4) Provide electrical inter-wiring of all walk-in refrigerator and freezer temperature alarms to building annunciator system, building security system and/or central refrigeration monitoring system as required.

6.11.3.15(5) Provide electrical inter-wiring between exhaust and make-up air fans, exhaust ventilator control panel, magnetic contractors and shunt trips etc. to shut down power to electric cooking equipment in the event of a fire condition in conjunction with the fire suppression system.

6.11.3.15(6) Provide delayed vital power supply to food service Equipment as per Section 6.11.3.14 to maintain food services during a power outage.

6.11.3.15(7) Provide Inter-wiring of the fire suppression system to the maintenance annunciator panel or building security system as required including building fire and trouble annunciation.

6.11.3.15(8) Provide low water cut-off devices for any Equipment in which immersion type electric heating elements are utilized.

6.11.3.15(9) Provide all internal wiring on custom fabricated items in a concealed and well supported manner and terminated inside circuit breaker panels or junction boxes ready for final connection by the electrical trades. All Equipment will be inspected by the AHJ and carry CSA and ULC approval.

6.11.3.15(10) Provide cords and plugs on Equipment as required and match the plug with the respective receptacle.

6.11.3.16 Approved Manufacturers and Models

6.11.3.16(1) Refer to Appendix 1I [Food Services Equipment List] which sets out acceptable manufacturers, models and minimum infrastructure requirements. The Design-Builder is responsible to coordinate all infrastructure requirements with the final equipment selection.

6.11.3.17 Walk-In Cold Rooms, Freezers and Refrigerators

6.11.3.17(1) Cold rooms will be capable of maintaining product at a temperature of 2°C.

6.11.3.17(2) Frozen storage rooms will be capable of maintaining temperatures of -23°C.

6.11.3.17(3) All temperature controlled rooms will be constructed of rigid pre-fabricated, walk-in type ULC-listed, CSA and NSF approved wall and ceiling panels with insulation between exterior and interior metal skins, meeting the requirements of the latest ASHRAE 90.1, current BCBC and BC Fire Code, R-25 for coolers, R-32 for freezers and floors insulation at R-28.

6.11.3.17(4) Cooling for all walk-ins will be part of a “rack refrigeration system”. This is a self-contained system that allows for an integrated 20% redundancy and continuous cooling in the event of a malfunction in any one of the compressors. The compressors for all the units will have an internal “Tree” piping arrangement, housed in an insulated cabinet complete with fan set up and a digital computer control and monitoring panel. Computer controls

also allow temperature monitoring and messages to a central computer/panel in the dietary offices and an internal security station. Refrigeration rack complete with refrigeration leak detection system. The system has a smaller footprint and is much cooler than a normal rack system. Cooling of compressors / condensers will utilize the Facility's chilled water system. Mount the system cabinet on a 100 mm concrete pad if there is a department below. Refer to Section 7.5.10.1(10) for connection to the chilled water system.

6.11.3.17(5) The rack refrigeration system will be housed in the X1.07 Compressor Room with exterior departmental corridor access as required by BC Building Code and with the required adjacency to the refrigerators and freezers within Patient Food Services.

6.11.3.17(6) Emergency exhaust system to be provided to the X1.07 Compressor Room as required by code. System complete with ventilation, strobe alarm, and audio alarm linked to the hospital building automated system.

6.11.3.17(7) Supply and install insulated liquid refrigerant supply, hot gas and suction return lines required to interconnect mechanical refrigeration system components including piping runs from indoor and/or outdoor air cooled condensing units, compressors, to evaporator coils within prefabricated, insulated walk-in type refrigerated and frozen room assembly required in order to form a complete operating mechanical refrigeration system.

6.11.3.17(8) Provide walk-in cold rooms, refrigerators and freezers with insulated walls and ceiling panels, complete with all refrigeration systems, piping, fittings and controls to render the walk-in cold rooms, refrigerators and freezers complete and fully operational.

6.11.3.17(9) Provide prefabricated insulated panels required to insulate building structural columns that occur within walk-in type refrigerated and frozen room assemblies.

6.11.3.17(10) The unexposed exterior top of ceiling will be 0.6 mm steel unfinished. The exposed interior and exterior wall and ceiling panels will be 1.0 mm colour coat PVC plastisol steel finish. Stainless steel sheet will be to ASTM A167, type 302/304 with No. 4 finish.

6.11.3.17(11) All insulated wall and ceiling panels, refrigeration lines, suspended HVAC and light fixtures will be installed in accordance with the BCBC.

6.11.3.17(12) Panel edges will have a matching groove type profile formed during manufacturing to provide a continuous foam to foam

airtight contact without the use of gaskets or seals, locked in position by means of male and female eccentric cam locking fastening devices from interior of the box. Use of gaskets only if applicable.

6.11.3.17(13) Install cold room and freezer units within 50 mm of walls.

6.11.3.17(14) Wall panels will be a minimum of 2.74 m high angle sections will be utilized as specified at wall junctions. All pre-fabricated walk-ins will be self-supporting structures and constructed with fire rated insulation carrying ULC listing/rating.

6.11.3.17(15) All insulated wall and ceiling panels will be a minimum of 100 mm thick for rigid poured in place polyurethane panels or if required by local code, 125 mm thick for “Rockwool” panels to maintain 55ºC temperature differential. All insulated wall and ceiling panels will have minimum R30 insulating value. Insulation to be rated self-extinguishing fire retardant to meet current codes for health care/hospital installations and will comply with CAN/ULC-S138, CAN/ULC-S102 and BCBC. Flame spread ratings to meet the requirements of the National Building Code, BCBC and their specific sections.

6.11.3.17(16) Caulk around perimeter of floor panels after installation on building floor slab. Fill space between perimeter of floor panels and edge of floor depression with concrete or non-shrink grout and trowel flush with building floor.

6.11.3.17(17) Door will be 1.07 m x 2.13 m hinged infitting type, to fit door opening, insulated and finished same as panels, with perimeter PVC accordion type removable/replaceable gasket with magnetic core at the top and alongside perimeter, door closer, inside safety release, brushed aluminum hardware with provisions for a padlock supplied by others. Door insulation will be as specified for wall panels. If required, reinforce adjacent panels to prevent door panels from twisting, racking or warping.

6.11.3.17(18) Doors will be complete with 100 mm high aluminum tread plate on exterior, interior and frame of doors.

6.11.3.17(19) Lock, inside safety release, 450 mm long stainless steel pull handle complete with floor door guide and door jamming device on fully closed status, 3 piece 40 mm x 150 mm door frame mounted against the walk-in opening and on which the aluminum track is mounted. Track complete with rubber door stops at either ends.

6.11.3.17(20) Door openings will be trimmed with non-conductive breaker strips.

6.11.3.17(21) Provide heavy duty self-closing spring loaded hinges and latches, 2 hinges per door.

6.11.3.17(22) Provide each door section on the latch side approximately 1.5 m above floor, one Celsius dial indicating thermometer with a range of -25 to 18°C.

6.11.3.17(23) Freezer doors will be complete with heater cable around perimeter of frame.

6.11.3.17(24) Threshold plate will be 2.0 mm stainless steel fastened to floor with stainless steel fastenings.

6.11.3.17(25) Provide checkered aluminum kickplate/bumper 1.0 m high on door fronts, rear and edges, frame and edges.

6.11.3.17(26) For sliding doors, provide manual type door 1.22 m and 1.53 m wide complete with corresponding traffic doors to fit openings, all with extruded aluminum sliding track, vision panels, kickplates, locks, safety release hardware, overhead railing, roller guides and door gasket.

6.11.3.17(27) Door will be complete with 100 mm high aluminum tread plate on exterior, interior and frame of doors.

6.11.3.17(28) Door will be complete with 400 mm x 400 mm, double thermal safety glass unit, heated window in stainless steel window frame.

6.11.3.17(29) Provide lock, inside safety release, 450 mm long stainless steel pull handle complete with floor door guide and door jamming device on fully closed status, 3 piece 40 mm by 150 door frame to mount against the walk-in opening and on which the aluminum track is mounted, track complete with rubber door stops at either end.

6.11.3.17(30) Provide sliding door with door frame heaters and prewired heated vent port. Provide approximately 200 mm floor depressions in the concrete floor slab underneath all cold rooms and freezers to accommodate minimum 100 mm rigid urethane board insulation with minimum 100 mm concrete topping reinforced with wire mesh, specified control joints and floor finish. Freezers to have electrical under floor heating cables. This will prevent equipping cold rooms and freezers with insulated floors mounted on top of the Facility floor slab or use of internal ramps. All floor insulation needs to be encased in concrete and not used as a finished floor. Floor insulation to meet ASHRAE 90.1 requirements.

6.11.3.17(31) Supply and installation of viewing windows (heated for freezers) on sliding and hinged doors.

6.11.3.17(32) Finished flooring to be applied to concrete topping to match kitchen flooring.

6.11.3.17(33) The refrigerator and freezer walk-ins and refrigeration systems will be equipped with an alarm system. The alarm system will monitor internal temperatures and compressor pressures to ensure that all systems are maintained within the specified temperature and pressure ranges. If either a temperature or pressure goes outside the specified range the alarm system will go into an audio and visual alarm state. The cold rooms and freezers will be equipped with a local audible and visual hi/low temperature alarm as well as connected to the BMS for signaling faults.

6.11.3.17(34) Evaporator coils inside each cooler or freezer to be equipped with the latest digital monitoring device capable of alerting the monitoring station of any malfunction.

6.11.3.17(35) All mechanical refrigeration systems will utilize CFC free refrigerants meeting current codes.

6.11.3.17(36) Heat tape wrapped condensate drain lines are required from the evaporator coil to funnel type floor drains and in all applications, defrost heaters for freezers will be provided.

6.11.3.17(37) Cold rooms and freezers will be equipped with ceiling hung packaged evaporator coils connected to liquid refrigerant supply lines and gas suction lines leading to the condensing units. Condensing units will be air cooled or water cooled if a chilled water loop is available all year long. Reinforce ceiling panels as required to support evaporator.

6.11.3.17(38) All light fixtures within the cold rooms and freezers will have LED light fixtures for -23 to 2°C operation.

6.11.3.17(39) Provide 1.0 m high aluminum tread plate on exposed exterior and interior wall panels.

6.11.3.17(40) Provide through wall grommets for service penetrations through cold room wall and ceiling panels. Seal grommets with sealing compound.

6.11.3.17(41) Provide 125 mm x 125 mm x 1.80 m high 2.8 mm stainless steel corner guards on all exterior corners and insulated panels around building structural columns.

6.11.3.17(42) Provide 454 mm x 454 mm insulated ceiling access panel, finished as per exterior and interior panels.

6.11.3.17(43) Provide removable enclosure panels from top of insulated walk in type refrigerated and frozen storage room assemblies to finished ceiling. Colour and finish to match colour and finish of room assemblies.

6.11.3.17(44) Provide stainless steel flashings as required to conceal openings in prefabricated insulated walk-in type panels.

6.11.3.17(45) Condensate drains from the cooling coil will be installed and connected to hub or floor drains complete with traps and cleanouts as required by local AHJ.

6.11.3.17(46) Compressors will operate from a minimum of 16 – 18 hours of operation at ambient temperatures of 35ºC.

6.11.3.18 Metal Storage Units

6.11.3.18(1) Provide storage units with wire shelves and associated accessories for walk-in cold rooms, walk-in refrigerators and walk-in freezers to meet the functional requirements of the Authority.

6.11.3.18(2) References

6.11.3.18(2)(a) ASTM A480/A480M-15 Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.11.3.18(2)(b) ASTM A484/A484M-15 Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings.

6.11.3.18(3) Storage units and shelving will be constructed of carbon steel and coated with antimicrobial zinc phosphate base electrostatically applied. Stainless steel wire will be series 304.

6.11.3.18(4) Shelves will be adjustable in 50 mm increments to permit easy assembly and adjustment without the use of tools and able to support a uniform load of 360 kg per shelf.

6.11.3.18(5) Storage units will be able to withstand repeated routine cleaning with hospital-grade disinfectants, reduce maintenance and maximize infection prevention and control.

6.11.3.18(6) Fabricated shelving components will include tubular posts with bolt down foot or casters, shelves, and ‘S’ hooks for connecting units, if required. Provide clips for 4 shelves per storage unit.

6.11.3.18(7) Where required, drawers will be constructed from wire and installed with additional space in the rear to allow full air circulation. Bins and baskets will be constructed from wire.

6.11.3.18(8) Where storage units are required to be mobile, caster wheels will be lockable.

6.11.3.18(9) No shelves mounted on doors of walk-in cold rooms, refrigerators or freezers will be accepted.

6.11.3.18(10) Shelving will be minimum 150 mm above floor finish and 50 mm from the adjacent walls.

6.11.3.18(11) Provide engineered seismic restraints by manufacturer in compliance with BCBC.

6.11.3.18(12) Storage units will be guaranteed for one year against defective materials, design and workmanship.

6.11.3.19 Fabrication

6.11.3.19(1) Fabricated equipment to be all stainless steel construction unless noted otherwise specified.

6.11.3.19(2) Millwork will have tight joints using 25.4 mm X 50.8 mm, or 50.8 mm X 101.6 mm framing where required and rigidly held in place. Use glue block where necessary.

6.11.3.19(3) Exposed plywood edges will have solid hardwood edge facing.

6.11.3.19(4) All work to be glued and blind screwed or nailed. Surface nails or screws will be set or plugged.

6.11.3.19(5) Arrange adjacent parts of continuous laminate work to match in colour and pattern.

6.11.3.19(6) Apply plastic laminate in accordance with manufacturers' directions. Apply to fir plywood or poplar faced fir plywood, phenolic bonded graded solid on both faces, with a thermosetting adhesive. No urea formaldehyde adhesives permitted.

6.11.3.19(7) Straight self edging to be plastic laminate. Do not mitre the edge corners. Accurately fit plastic laminate together to provide tight, flush, butt joints.

6.11.3.19(8) Gables, bottoms, tops, sides and doors to be 19.1 mm thick plywood. Drawers to have 19.1 mm thick solid wood fronts, 12.7 mm thick solid wood sides and backs and 6.4 mm thick hardboard bottom.

6.11.3.19(9) Shelving will be 19.1 mm thick plywood and adjustable. Particle board is not acceptable.

6.11.3.19(10) Machine dressed work and finished work will be free from drag, feathers or roughness of any kind. Remove machine marks by sanding.

6.11.3.19(11) Construction methods will allow for expansion and contraction of the materials.

6.11.3.19(12) Stainless Steel Worktables and Counters

6.11.3.19(12)(a) Provide countertops of 2.0 mm stainless steel cut out for sink bowls, etc., reinforced as required with 2.75 mm stainless steel channels.

6.11.3.19(12)(b) Provide work tables with sinks complete with dished and boxed edge, unless noted otherwise.

6.11.3.19(12)(c) Reinforcing channels or saddles will not be exposed below edges.

6.11.3.19(12)(d) Kickplates where required will be of 1.6 mm stainless steel and secured to Equipment, easily removed. Seal to floor.

6.11.3.19(12)(e) Use foodservice industry standard edges.

6.11.3.19(12)(f) Worktable and counters with sink, work tops to slope towards sinks at a slope of 20 mm per meter. For dish tables 8 mm per metre toward dishwashing machine. Front edge level over full length.

6.11.3.19(13) Backsplash

6.11.3.19(13)(a) Provide 2.0 mm stainless steel fully welded construction.

6.11.3.19(13)(b) Integral section of table or countertop will be turned up on a 19 mm radius to the height specified, then boxed or splayed.

6.11.3.19(13)(c) Enclose, fill and weld all exposed ends and back. Exposed backs at upturns and splashbacks will be faced with 1.2 mm stainless steel back panel to bottom of splashback. Such panels will be removable as required for access to mechanical and electrical parts. Seal backs to wall with clear silicone.

6.11.3.19(14) Legs and bracing

6.11.3.19(14)(a) Provide 1.6 mm stainless steel wall, 41 mm O.D. tubular construction.

6.11.3.19(14)(b) Provide framework for table tops to maintain a height of 900 mm above finished floor.

6.11.3.19(14)(c) Leg spacing maximum 1600 mm apart, 760 mm front to back.

6.11.3.19(14)(d) Bullet feet, Component Hardware Model A10-0851. When table has service connections, dowel and secure to floor using Component Hardware Model A10-0854. Secure to one (1) set of feet only when bridging a structural expansion joint.

6.11.3.19(14)(e) Braces will be continuously welded to legs, polished with minimum reduction in volume.

6.11.3.19(14)(f) Cross brace legs in pairs and longitudinal brace at front, centre or back to suit requirements. All set at 250 mm above floor.

6.11.3.19(14)(g) Legs will be continuously welded to stainless steel saddles of inverted U shape 100 mm wide x 20 mm deep x 2.75 mm. Flanges angled back or rounded at each end.

6.11.3.19(15) Angle slides

6.11.3.19(15)(a) Provide 1.6 mm stainless steel construction.

6.11.3.19(15)(b) Slides will be of 50 mm x 50 mm section, length to suit. Leading corners rounded, fully welded to supports on vertical edge (for fabrication) or secured by no less than four (4) s.s. screws (for Millwork).

6.11.3.19(15)(c) Round exposed corners and provide back stops. Mount units in key hole slots to ease cleaning and removal.

6.11.3.19(15)(d) Back stops to be provided to limit travel.

6.11.3.19(15)(e) Verify tray, pan or basket size to ensure accurate fit.

6.11.3.19(16) Drawers

6.11.3.19(16)(a) Front will be double pan construction with insulation equal to cabinet body. Where drawer fronts are shown to have a plastic laminate finish, the double pan construction will be reversed so that the plastic laminate is contained by the outer edges of the back pan.

6.11.3.19(16)(b) Frames will be 1.6 mm stainless steel channel, welded to drawer front.

6.11.3.19(16)(c) Pulls will be formed of stainless steel and welded onto the top edge of drawers.

6.11.3.19(16)(d) Slides for refrigerated cabinets will be Component Hardware S52 series; for other drawers Component Hardware S26 series as specified under "Hardware".

6.11.3.19(16)(e) All slides to be installed so that drawers are self closing.

6.11.3.19(16)(f) Housing of 1.0 mm stainless steel fully enclosed for drawers under worktables and open cabinets.

6.11.3.19(16)(g) Drawers will accommodate one plastic pan Component Hardware S80 series or one stainless steel pan Component Hardware S81 series for 510 x 510 x 125 mm insert.

6.11.3.19(16)(h) Provide rubber buttons at end of frames to cushion drawer.

6.11.3.19(16)(i) Locks as specified under "Hardware".

6.11.3.19(16)(j) Bread drawers will have 510 x 510 x 250 mm deep stainless steel removable pan.

6.11.3.19(17) Sink Bowls

6.11.3.19(17)(a) All of 2.0 mm stainless steel polished inside and outside, where exposed, integrally welded into tops.

6.11.3.19(17)(b) Round corners of 19.1 mm rad. in all vertical and horizontal corners, all welded. Solder not accepted.

6.11.3.19(17)(c) Bottoms drawn, not creased to drain hole.

6.11.3.19(17)(d) Drain hole at lowest point to suit type of waste specified for item:

6.11.3.19.17.(d).1 Centre type, with removable basket strainers and tailpiece.

6.11.3.19.17.(d).2 Lever type, with one piece connected overflow assembly, 'snap-in' strainer and tailpiece.

6.11.3.19.17.(d).3 Corner type, with stainless steel overflow, removable strainer and tailpiece.

6.11.3.19(17)(e) Provide sound deadening compound as specified under tops and multiple sink bowls.

6.11.3.19(17)(f) Multiple sinks to have 1.0 mm stainless steel front apron over full length of bowls. Island units to have apron on both sides.

6.11.3.19(17)(g) Faucets and valves will be T and S, or Fisher supplied including pre-rinse fixtures, pot fillers, PRV, check valves and anti-syphon valves as required for the proper operation of equipment.

6.11.3.19(17)(h) Drain-troughs 127 mm wide x 50.8 mm deep, all welded, square cornered, pitched to drain.

6.11.3.19(17)(i) Anti-splash inserts of expanded stainless steel in 50.8 mm x 50.8 mm stainless steel angle frame, with lift out holes or handles.

6.11.3.19(18) Shelving

6.11.3.19(18)(a) Provide 1.6 mm stainless steel all welded construction.

6.11.3.19(18)(b) Boxed edges on all four (4) sides. Notch corners to fit contour of legs as required for work tables.

6.11.3.19(18)(c) Shelves with sides or backs will be turned up 50 mm and set to backs or folded if away from walls.

6.11.3.19(18)(d) Shelves will be easily removable and in sections capable of being pulled out through a single door opening.

6.11.3.19(18)(e) Overshelves to be boxed with backs set to walls and secured with stainless steel tubular brackets.

6.11.3.19(18)(f) Wire shelves to be 5 mm O.D. on 25 mm centres, set in a 10 mm O.D. perimeter frame either stainless steel or heavy-duty chrome plated finish as specified.

6.11.3.19(18)(g) Provide a removable bottom shelf in any counter or table set on an enclosed base with mechanical and electrical services.

6.11.3.19(18)(h) Removable bottom shelf in counters or tables with sink for access to clean-out valve on trap.

6.11.3.20 Installation

6.11.3.20(1) Caulk and seal equipment to walls, base pads, curbs, and adjacent equipment where required.

6.11.3.20(2) Leave installed work neat, cleaned and polished, well fitted into position, level, and in proper operating condition.

6.11.3.20(3) Promptly remove all rubbish and debris from the building and site as the work proceeds and on completion.

6.11.3.20(4) Activate, test and adjust all Equipment and apparatus installed under this Agreement. Refinish and repair any painted and finished surfaces damaged during erection and installation. Hand over the completed installation in first class condition and working order.

6.11.3.20(5) Ensure electrical Equipment is accompanied by label or certification of approval by Canadian Standards Association and the AHJ.

6.11.3.20(6) Ensure steam pressure equipment is accompanied by a "Certificate of Boiler" to satisfy Federal and Provincial requirements.

6.11.3.20(7) Finished work will be perfectly true and plumb with no warping, buckling or open seams. All edges, hidden or exposed will be ground smooth and rounded. Rivet heads, weld marks, or other imperfections are not acceptable.

6.11.3.20(8) Cutting and repairs for the proper installation of services.

6.11.3.20(9) Obtain permits or special inspections.

6.11.3.20(10) Identify equipment with metal plates or labels permanently secured which include, where applicable:

6.11.3.20(10)(a) Manufacturer's name or recognized trademark;

6.11.3.20(10)(b) Complete model identification;

6.11.3.20(10)(c) Model, serial number and CSA U.L.C. and NSF identifications;

6.11.3.20(10)(d) Electrical characteristics;

6.11.3.20(10)(e) Direction of drive;

6.11.3.20(10)(f) Controls;

6.11.3.20(10)(g) Circuits, lines, etc.; and

6.11.3.20(10)(h) Specific operating instructions.

6.11.3.20(11) Identify equipment with temporary labels showing location and Item number per Specifications.

6.11.3.20(12) After installation has been completed and all items checked and adjusted where necessary for satisfactory operation, arrange for inspection of equipment.

6.11.3.20(13) Coordinate the removal, storage, relocation and installation of all foodservice equipment as required according to the project schedule.

6.11.4 Section 11 70 00 – Healthcare Equipment

6.11.4.1 Part 1 General

6.11.4.1(1) References

6.11.4.1(1)(a) ANSI Z136, Guidelines for Implementing a Safe Laser Program.

6.11.4.1(1)(b) ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

6.11.4.1(1)(c) ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

6.11.4.1(1)(d) CAN/ULC S109, Flame Tests of Flame-Resistant Fabrics and Films.

6.11.4.1(1)(e) NAPRA, National Association of Pharmacy Regulatory Authorities.

6.11.4.1(1)(f) NEMA LD3, High-Pressure Decorative Laminates.

6.11.4.1(1)(g) ROHS, Restriction of Hazardous Substances Directive.

6.11.4.1(2) Performance Requirements

6.11.4.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.11.4.1(3) Quality Assurance

6.11.4.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.11.4.2 Part 2 Products

6.11.4.2(1) Headwalls

6.11.4.2(1)(a) Acceptable Products: Amico, Class 1 or alternative as approved by the Authority.

6.11.4.2(1)(b) Headwalls will be designed so that raising/lowering of the bed or stretchers will not catch/interfere the headwall or adjacent equipment and cause damage to either one.

6.11.4.2(1)(c) Provide multiple rails system for the installation of headwall accessories and the storage of a small quantity of medical surgical supplies for ease of access for direct Patient care.

6.11.4.2(1)(d) Provide all rails, accessories, and backing required for mounting monitors, baskets and other equipment as required.

6.11.4.2(1)(e) Headwalls to provide the following:

6.11.4.2.1.(e).1 Non-institutional and modern design elements including finishes and colours that are coordinated with the interior design concept.

6.11.4.2.1.(e).2 Services outlets, lighting and lighting controls as required.

6.11.4.2.1.(e).3 Fibre reinforced laminate (FRL):

(e).3.1 Wood-grain fibre reinforced laminate as specified herein, to all exposed surfaces or has wood-look components in prefabricated system;

(e).3.2 1.9 mm (0.075 inches) thick, monolithic panel with 20% continuous glass fibres; with the following properties:

(e).3.2.1 Barcol Hardness: ASTM D2583, 35 typical;

(e).3.2.2 Wear Resistance: NEMA LD3: Minimum 3,500 cycles;

(e).3.2.3 Surface Burning: ASTM E84, Class A. Flame Spread: 25 or less. Smoke Developed: 30 or less.

(e).3.3 Acceptable Products: Panolam FRL by Panolam Surface Systems or alternative as approved by the Authority.

6.11.4.2.1.(e).4 In all inpatient Patient Rooms, provide a place for Authority’s artwork to be incorporated into the design.

6.11.4.2.1.(e).5 Reveals and joints that align and are coordinated with other features in the room such as bed bumpers and sheet wall protection.

6.11.4.2(2) Privacy Curtains

6.11.4.2(2)(a) Curtain textiles will comply with all Authority requirements and CAN/ULC-S109. Provide open mesh along the top of all curtains as required for sprinkler protection. Metal grommets on textiles are not acceptable.

6.11.4.2(2)(b) All tracks will be structurally supported. Attach the track assembly to the ceiling with solid wood blocking or sheet metal blocking, attached with pan head screws through the acoustic ceiling tile and into the blocking. For GB ceilings, attach with toggle bolt assemblies through the GB. Attaching to acoustic tile T-bar ceiling is not acceptable.

6.11.4.2(2)(c) Provide curtain rod extenders or other devices as required to ensure that the x-y gantry ceiling lift systems will not interfere with curtains or be obstructed by curtains.

6.11.4.2(2)(d) Provide attachments and cover escutcheons which are continuously sealed with silicone sealant in all wet areas.

6.11.4.2(2)(e) Provide a hookless curtain system and tracks at all privacy curtain locations.

6.11.4.2(3) Window/Chamber, Pass-Throughs

6.11.4.2(3)(a) Emergency Department Window/Chamber Pass-Throughs:

6.11.4.2.3.(a).1 Wall mounted, Type 304 stainless steel unit with satin finish, ventilated HEPA pass-through unit with HEPA filter, including the following features:

(a).1.1 Silicone bulb gasket.

(a).1.2 Static dissipative PVC window.

(a).1.3 Mechanical interlocking mechanism, allowing only one door to open at a time.

(a).1.4 Latching system with ergonomic lifting mechanism that eliminates rotary stress on wrists and hinges.

(a).1.5 Unit is complete with mounting brackets.

(a).1.6 Approximate size:

(a).1.6.1 Opening dimensions: 280 x 560 mm.

(a).1.6.2 Chamber dimensions: 305 mm D x 610 mm H x 305 mm W (12” x 24” x 12”).

6.11.4.2.3.(a).2 Acceptable Products: Pass-Through, CleanSeam, Model 2636-02D-2 by Terra Universal or alternative as approved by the Authority.

6.11.4.2(3)(b) Laboratory Services Window/Chamber Pass-Throughs:

6.11.4.2.3.(b).1 Provide specimen pass-through for Staff collection of specimen samples.

6.11.4.2.3.(b).2 Flush, wall mounted, Type 304 stainless steel unit with smudge resistant finish, specimen pass-through for samples such as urine and other fluids or tissue cultures, including the following features:

(b).2.1 Mechanical interlocking mechanism, allowing only one door to open at a time.

(b).2.2 Full length, stainless steel continuous piano hinge.

(b).2.3 Removable spill-tray.

(b).2.4 Approximate size: 140 mm D x 254 mm H x 279 mm W.

6.11.4.2.3.(b).3 Acceptable Products: Specimen Pass-Thru Cabinet by Terra Universal or alternative as approved by the Authority.

6.11.4.2(3)(c) Medical Device Processing Window/Chamber Pass-Throughs:

6.11.4.2.3.(c).1 Wall mounted, automated, clear anodized aluminum, in-line vertical lift, medical device processing pass-through window, including the following features:

(c).1.1 Includes a single operable panel and a non-operable fixed panel, with moving panels operable via dual rope and counterbalance system.

(c).1.2 Window includes integral continuous Type 304 stainless steel shelf with brushed finish, extends 635 mm on either side of window, along the full

width of the window, secured with stainless steel brackets.

(c).1.3 Automated window is equipped with a microwave no-touch sensor plate for opening and closing for hands-free operation.

(c).1.4 Clear anodized 6063 T5 extruded aluminum frames with dry glazed, clear tempered glass for viewing window.

(c).1.5 Approximate size: 914 mm (36”) service width by 1149 mm (45-1/4”) finished opening height.

6.11.4.2.3.(c).2 Acceptable Products:

(c).2.1 AMSCO Automated Pass-Through Window (CSSD) by Steris Corporation.

(c).2.2 Or alternative as approved by the Authority.

6.11.4.2(3)(d) Pharmacy Services Window/Chamber Pass-Throughs:

6.11.4.2.3.(d).1 Pharmacy Services Pass-Throughs - Non-Hazardous and Hazardous:

(d).1.1 NAPRA, fabricated from Type 304 stainless steel or a smooth, non-porous, anti-static material resistant to damage from cleaning and disinfecting products, including the following features:

(d).1.1.1 Mechanical interlocking mechanism, allowing only one door to open at a time.

(d).1.1.2 Sealed with silicone bulb gasket.

(d).1.1.3 Approximate size: 350 mm D x 350 mm H x 350 mm W (14” x 14” x 14”).

(d).1.2 Acceptable Products: Subject to conformance with requirements of this Section, provide Pharmacy pass-throughs by one of the following:

(d).1.2.1 Clean Air Products.

(d).1.2.2 Terra Universal.

(d).1.2.3 Or alternative as approved by the Authority.

6.11.4.2(3)(e) Oncology Pharmacy Services Window/Chamber Pass-Throughs:

6.11.4.2.3.(e).1 NAPRA, fabricated from Type 304 stainless steel or a smooth, non-porous, anti-static material resistant to damage from cleaning and disinfecting products, including the following features:

(e).1.1 Mechanical interlocking mechanism, allowing only one door to open at a time.

(e).1.2 Sealed with silicone bulb gasket.

(e).1.3 Approximate size: 350 mm D x 350 H mm x 350 mm W (14” x 14” x 14”).

6.11.4.2.3.(e).2 Acceptable Products: Subject to conformance with requirements of this Section, provide Oncology Pharmacy pass-throughs by one of the following:

(e).2.1 Clean Air Products.

(e).2.2 Terra Universal.

(e).2.3 Or alternative as approved by the Authority.

6.11.4.2(3)(f) Functional Imaging Window/Chamber Pass-Throughs:

6.11.4.2.3.(f).1 Wall mounted, Type 304 stainless steel unit with satin finish, ventilated cleanroom pass-through unit with HEPA or ULPA filter, including the following features:

(f).1.1 Perforated inner sides for air recirculation.

(f).1.2 Stainless steel continuous flush-mount hinges.

(f).1.3 Silicone bulb gasket.

(f).1.4 Clear tempered or laminated safety glass viewing windows.

(f).1.5 Stainless steel lever compression door latches.

(f).1.6 Mechanical Interlock with stainless steel handles.

(f).1.7 Bottom of unit to be stainless steel with perforations.

(f).1.8 Approximate size: 350 mm D x 350 mm H x 350 mm W (14” x 14” x 14”).

6.11.4.2.3.(f).2 Pass-through to exceed U.S. Department of Energy High Energy Particle Arrestance (HEPA) standard by removing at least 99.99 percent of airborne particles 0.3 micrometers (µm) in diameter.

6.11.4.2.3.(f).3 For efficient transfer of parts and equipment in and out of a cleanroom while maintaining control of particulates in the cleanroom environment.

6.11.4.2.3.(f).4 Designed to provide end users with an ergonomic working environment that is suited to their specific needs such as not lifting of heavy items by avoiding deep counters in front of pass-throughs. Refer to Fraser Health Ergonomic Standard for Workstations.

6.11.4.2.3.(f).5 Acceptable Products:

(f).5.1 Wall-Mounted HEPA Filtered Pass-Thrus CAP18WHF by Clean Air Products.

(f).5.2 Ventilated Negative Pressure Pass-Through with FFU by Enviropass.

(f).5.3 Ventilated Cleanroom Pass Through by Nicos Group.

(f).5.4 General-Use Pass-Throughs with Recirculating HEPA Filtration by Terra Universal.

(f).5.5 Or alternative as approved by the Authority.

6.11.4.2(3)(g) Perioperative Window/Chamber Pass-Throughs:

6.11.4.2.3.(g).1 Wall mounted, Type 304 stainless steel unit with satin finish, perioperative pass-through unit with laser film, including the following features:

(g).1.1 Pass-through complete with laser protective glass window having a visible light transmission of 70% with light green colour, meeting ANSI Z136.1 and ROHS compliance.

(g).1.2 Unit is complete with stainless steel double pan door, angle trims and shelf and hardware such as hinges, friction roller catch and pull handles.

(g).1.3 Mechanical interlocking mechanism, allowing only one door to open at a time.

(g).1.4 Sealed with silicone bulb gasket.

(g).1.5 Approximate size: 600 mm D x 600 mm H x 600 mm W (24” x 24” x 24”).

6.11.4.2.3.(g).2 Acceptable Products:

(g).2.1 Model No. SC2-2424-24-PT Pass Through Cabinet by Continental Metal Products Co., Inc.

(g).2.2 Or alternative as approved by the Authority.

6.11.4.2(4) Safe Boxes

6.11.4.2(4)(a) Provide safe boxes with the following features:

6.11.4.2.4.(a).1 LED display;
6.11.4.2.4.(a).2 3 to 6-digit PIN code options;
6.11.4.2.4.(a).3 Mechanical key override – single key for all safe boxes;
6.11.4.2.4.(a).4 On hold time after 4 wrong consecutive attempts;
6.11.4.2.4.(a).5 Anti-drill rotating bolts;
6.11.4.2.4.(a).6 Battery powered;
6.11.4.2.4.(a).7 Power status display on screen;
6.11.4.2.4.(a).8 ADA compliant keyboard;
6.11.4.2.4.(a).9 “Code to close” technology;
6.11.4.2.4.(a).10 Approximate external dimensions: 190 mm in height, 430 mm in width, and 460 mm in depth; and
6.11.4.2.4.(a).11 Approximate volume: 38 lt.

6.11.4.2(5) Medical Gas Racks

6.11.4.2(5)(a) Provide medical gas racks in the following locations, and where otherwise required by the Authority:

6.11.4.2.5.(a).1 Alcove - Oxygen Tank Storage;
6.11.4.2.5.(a).2 Alcove - Oxygen Tank Storage;
6.11.4.2.5.(a).3 Storage - Gas Cylinders;
6.11.4.2.5.(a).4 Storage - Gas Cylinders – Centralized;
6.11.4.2.5.(a).5 Manifold Room – Centralized; and
6.11.4.2.5.(a).6 Technical Area.

6.11.4.2(5)(b) Medical Gas Racks:

6.11.4.2.5.(b).1 Provide wall mounted medical gas tank racks for securement to wall assemblies.
6.11.4.2.5.(b).2 Ensure racks can accommodate loading capacity of intended medical gas tanks.
6.11.4.2.5.(b).3 Cylinder shape opening in racks to accommodate size of medical gas tanks or consist of chain or similar restraint feature to secure tank in rack.
6.11.4.2.5.(b).4 Rack to be fabricated from stainless steel or galvanized steel construction, finished with manufacturer’s standard powder coat finish.

6.11.4.3 Part 3 Execution

6.11.4.3(1) Not applicable.

6.11.5 Section 11 73 00 – X-Y Gantry Ceiling Lift System

6.11.5.1 Part 1 General

6.11.5.1(1) References

6.11.5.1(1)(a) CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations.

6.11.5.1(2) Performance Requirements

6.11.5.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.11.5.1(2)(b) Provide x-y gantry ceiling lift system in locations as set out in Appendix 1B [Minimum Room Requirements] and Appendix 1H [Equipment and Furniture].

6.11.5.1(2)(c) Provide X-Y gantry ceiling lift systems with functional coverage of the room or space in accordance with Fraser Health Standard: Patient Handling Equipment for Facility Design and Procurement.

6.11.5.1(2)(d) Electrical Components, Devices, and Accessories: UL and ULC listed and labeled in accordance with CSA C22.1, by a testing agency acceptable to AHJ, and marked for intended use.

6.11.5.1(2)(e) Provide system conforming to all WorkSafe BC regulations.

6.11.5.1(2)(f) Provide x-y gantry ceiling lift with a minimum load bearing capacity of 1000 lbs for the rails and boom, load-tested to 150%.

6.11.5.1(2)(g) Authority provided motors:

6.11.5.1.2.(g).1 Design-Builder to accommodate capacities of Authority provided motors; refer to Appendix 1H [Equipment and Furniture].

6.11.5.1(3) Quality Assurance

6.11.5.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

6.11.5.1(3)(b) Coordinate x-y gantry ceiling lift system with other systems including equipment, privacy curtains, lights and sprinklers.

6.11.5.1(3)(c) Coordinate the electrical system components of the x-y gantry ceiling lift system with all clinical and housekeeping activities in the Patient room or bay to allow for easy service access.

6.11.5.2 Part 2 Products

6.11.5.2(1) Lift Performance

6.11.5.2(1)(a) Provide complete x-y gantry ceiling lift systems including all structural supports, ceiling lift rails, tracks, anchors, backing and electrical power.

6.11.5.2(1)(b) Provide x-y gantry ceiling lift systems that do not contain proprietary features or components which would limit the Authority’s ability and flexibility to maintain and upgrade.

6.11.5.2(1)(c) The x-y gantry ceiling lift system will electrically charge at any location along the support track. Provide the ability to disconnect the electrical power safely at the connect point, without FMO Staff having to travel to an electrical panel.

6.11.5.2(1)(d) The x-y gantry ceiling lift system tracks will not obstruct or be obstructed by, partially or completely, any over-bed ceiling-mounted fixtures such as curtains, curtain tracks, lights or cameras.

6.11.5.2(1)(e) Provide access to x-y gantry ceiling lift system components above the ceiling through such means as ceiling access panels for periodic inspection purposes. Access panels will provide space for the Authority to access the connection points of the x-y gantry ceiling lift system for verification, quality control and regular maintenance.

6.11.5.2(2) Lift System Access

6.11.5.2(2)(a) Provide x-y gantry ceiling lift coverage into ensuite washrooms in accordance with FHA Patient Handling Equipment for Facility Design and Procurement including pony walls to provide a seamless transition into the washroom for full coverage of both the washroom and Patient Room with a single ceiling lift system.

6.11.5.2(2)(b) Lift to extend over the entire bed or stretcher to allow for in-bed/stretcher positioning.

6.11.5.2(2)(c) Ensure space is allotted for motor parking and handset/carry bar holder in a location accessible but not obtrusive to Staff.

6.11.5.3 Part 3 Execution

6.11.5.3(1) Not applicable.

6.11.6 Section 11 76 00 – Fully-Integrated Modular Ceiling System

6.11.6.1 Part 1 General

6.11.6.1(1) Performance Requirements

6.11.6.1(1)(a) The Authority's preference is for the Design-Builder to provide a Fully-Integrated Modular Ceiling System in support of Section 3.1 Design Objectives including the goal to incorporate efficiencies and innovations to minimize long-term operation and maintenance costs. The Authority deems areas such as Operating Rooms and Procedure Rooms as appropriate applications for the Fully-Integrated Modular Ceiling System. Other areas can be reviewed and determined in consultation with the Authority, as required.

6.11.6.1(1)(b) Perform work in accordance with AHJ and as outlined herein.

6.11.6.1(1)(c) Design fully integrated modular diffuser system including the following components:

- 6.11.6.1.1.(c).1 Air supply from a single large diffuser system of modular construction consisting of a continuous ceiling grid with an aluminum air frame HEPA filter grid channel;
- 6.11.6.1.1.(c).2 An integrated LED lighting system;
- 6.11.6.1.1.(c).3 Integrated boom mounts;
- 6.11.6.1.1.(c).4 Guillotine style, room side adjustable dampers; and
- 6.11.6.1.1.(c).5 Laminar air diffusers.

6.11.6.1(1)(d) Provide DOP testing port for HEPA filter.

6.11.6.1(2) Quality Assurance

6.11.6.1(2)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this

section with minimum three years documented experience.

6.11.6.1(2)(b) Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

6.11.6.2 Part 2 Products

6.11.6.2(1) Manufacturers

6.11.6.2(1)(a) Acceptable Products: AirFrame by SLD Technologies Inc. or alternative as approved by the Authority.

6.11.6.2(2) System Performance/Components

6.11.6.2(2)(a) The fully integrated modular diffuser system will completely seal off the ceiling space from the room in accordance with requirements as set out in Section 5.14 Infection Prevention and Control.

6.11.6.2(2)(b) The diffuser system will include a steel air delivery duct that is an integrated part of the ceiling system. The steel duct is required to pressurize the system for distribution through each individual supply air opening in the ceiling.

6.11.6.2(2)(c) The ceiling system will accept equipment boom loads directly as part of an engineered system. The Integrated Modular Diffuser System supplier will provide shop drawings signed and sealed by a Professional Engineer registered in the Province of British Columbia. The Design-Builder's Structural Engineer-of-Record will provide signed and sealed drawings for anchorage to building structure including seismic restraint.

6.11.6.2(2)(d) The fully integrated modular diffuser system will utilize an LED lighted grid and powder-coated steel HEPA filtered air frame.

6.11.6.2(2)(e) HEPA filters, diffusers, guillotine style balancing dampers and blank pans will be capable of being loaded from the bottom of the system directly into the grid opening.

6.11.6.2(2)(f) All lighting components will be accessible from the room side.

6.11.6.2(2)(g)	The system will incorporate a hinged damper/diffuser assembly capable of being independently opened for repeated cleaning as well as access for HEPA filter installation. The system will utilize a damper/diffuser assembly that is room side adjustable.
6.11.6.2(2)(h)	The damper/diffuser assembly will incorporate Tamper Resistant fasteners for access to the guillotine style damper adjustment mechanism.
6.11.6.2(2)(i)	Systems that utilize balancing dampers located upstream of the HEPA are not permitted.
6.11.6.2(2)(j)	Systems that utilize balancing dampers that are not room side adjustable are not permitted.
6.11.6.2(2)(k)	Grid members will be formed together into modules. Grid will be caulked with an appropriate sealant as necessary.
6.11.6.2(2)(l)	The ceiling support grid will be structurally designed so as to remain dimensional stability.
6.11.6.2(2)(m)	The lighted grid system will have integrated LED lighting within the grid channel.
6.11.6.2(2)(n)	Light fixtures that block the airflow within the supply air, such as recessed light troffers, are not permitted.
6.11.6.2(2)(o)	All lighting components will be pre-installed. Systems that require field installation of lighting components are not permitted. Lighting circuits will utilize quick connect fittings for module to module connection.
6.11.6.2(2)(p)	The complete lighting system consisting of LED assemblies, drivers, wireway, lenses, and wiring will be an integral part of the lighted grid. The LED lighted grid will be CSA approved (or equivalent) and so identified;
6.11.6.2(2)(q)	The drivers will be housed within the grid channel or remote mounted, and in either case, provided with access in accordance with Section 7.7.13.1(5). Drivers will be CSA approved (or equivalent) and so identified.

6.11.6.2(2)(r) Wiring within the grid for the lighting circuit will be contained within and protected by the grid system. The system will have the ability to handle circuits from two different power branches (UPS and vital). The system will have the ability to handle line voltage and low voltage control wiring circuits. The light lens will sit flush with the bottom of the air frame grid channel. Light lens covers will be clear acrylic or polycarbonate ribbed diffusers that snap flush to the grid channel without external fasteners;

6.11.6.2(2)(s) LED lighting components will be able to easily snap into the grid without the use of rivets, nuts, bolts or other hardware fasteners;

6.11.6.2(2)(t) In addition to the room lighting requirements in other sections, the system will use Indigo-Clean™ LED technology with indigo disinfection mode. Indigo disinfection mode is a high power 405nm indigo LED array for continuous environmental disinfection.

6.11.6.2(2)(u) The HEPA filtered air frame system will incorporate air passages on all sides to jet air underneath the lighted grid so as to wash the area below the lights of particles. The top duct, steel structures and air frame channels will be protected with a powder-coat finish. All hardware will be stainless steel.

6.11.6.2(2)(v) The lighted grid system will be capable of attaching clips for suspending x-y gantry ceiling lifts, equipment supports, and other components as required.

6.11.6.2(2)(w) Solid blank filler panels will be constructed of powder coated steel or aluminum with welded corners, an upward facing trough and designed to affect an airtight seal in the channel grid. The finish of the panel will match the ceiling grid finish.

6.11.6.2(3) Air Supply Integrated to Ceiling Grid

6.11.6.2(3)(a) Provide an air delivery duct attached to the ceiling grid as an integral part of the ceiling grid diffuser system. Modules will be supplied completely pre-assembled with the lighting grid, HEPA filtered air frame and duct as one piece.

6.11.6.2(3)(b) Modules will be welded or rivet style construction using steel roof panels welded to HSS framing or steel side panels. System will be sized so as to meet structural load requirements. Holes will be provided at the perimeter of the module roof for suspension. The entire ceiling grid module will be coated with a baked-on powder coating.

6.11.6.2(3)(c) Units will be manufactured to dimensional tolerance of +/- 1/8" on width and length and diagonal dimensions or squareness of +/-1/8".

6.11.6.2(3)(d) The HSS framed modules will be capable of accepting equipment boom loads directly as part of an engineered structural system.

6.11.6.2(4) Finish

6.11.6.2(4)(a) Provide powder coating to all duct surfaces to ensure all exterior and interior surfaces are protected.

6.11.6.3 Part 3 Execution

6.11.6.3(1) Not applicable.

6.11.7 Section 11 81 29 – Fall Protection Equipment

6.11.7.1 Part 1 General

6.11.7.1(1) References

6.11.7.1(1)(a) ANSI H35.1, Alloy and Temper Designation Systems for Aluminum (Metric).

6.11.7.1(1)(b) ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

6.11.7.1(1)(c) ASTM B221, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

6.11.7.1(1)(d) CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

6.11.7.1(1)(e) CSA Z91, Health and Safety Code for Suspended Equipment Operations.

6.11.7.1(1)(f) CSA Z271, Design of Suspended Access Equipment.

6.11.7.1(2) Performance Requirements

6.11.7.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.11.7.1(2)(b) Provide fall protection and window washing access in accordance with Part 11 of WSBC guidelines, and CSA Z271 and CSA Z91.

6.11.7.1(2)(c) Provide a complete system with safety tie-back, lifeline anchors, horizontal life line system and associated equipment for the Authority's 24/7 safe building maintenance operations including window-washing.

6.11.7.1(2)(d) Provide roof anchors with sufficient capacity to support the use of a window washing platform suspended from the roof level. Window washing by a worker suspended by a vertical lifeline from a roof anchor is not permissible.

6.11.7.1(3) Quality Assurance

6.11.7.1(3)(a) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.11.7.2 Part 2 Products

6.11.7.2(1) Materials

6.11.7.2(1)(a) Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W.

6.11.7.2(1)(b) Aluminum: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.

6.11.7.2(1)(c) Stainless steel: ASTM A276, Type 304.

6.11.7.3 Part 3 Execution

6.11.7.3(1) Not applicable

6.12 Furnishings (Division 12)

6.12.1 Section 12 24 13 – Roller Window Shades

6.12.1.1 Part 1 General

6.12.1.1(1) References

6.12.1.1(1)(a) ANSI/WCMA A100.1, Standard for Safety of Window Covering Products.

6.12.1.1(1)(b) ASHRAE 74, Methods of Measuring Solar-Optical Properties of Materials.

6.12.1.1(1)(c) ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

6.12.1.1(1)(d) CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations.

6.12.1.1(1)(e) CAN/ULC S109, Flame Tests of Flame-Resistant Fabrics and Films.

6.12.1.1(2) Performance Requirements

6.12.1.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.12.1.1(2)(b) Product Standard: Provide roller shades complying with ANSI/WCMA A 100.1.

6.12.1.1(2)(c) Design window covering to be Ligature Resistant where required.

6.12.1.1(2)(d) Fire Test Response Characteristics: Provide roller shade band materials with the fire test response characteristics indicated, as determined by testing identical products per test method indicated by ULC or another testing and inspecting agency acceptable to AHJ. Flame-Resistance Ratings: Passes CAN/ULC S109.

6.12.1.1(2)(e) Design roller shades systems in Patient rooms as recessed into ceiling to protect roller blind when not in use, keep it clear when windows are cleaned, and protect roller shade from dust collection.

6.12.1.1(3) Quality Assurance

6.12.1.1(3)(a) Source Limitations: Obtain roller windows shades through one source from a single manufacturer.

6.12.1.1(3)(b) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.12.1.1(3)(c) Electrical Components, Devices, and Accessories: Listed and labeled as defined in CSA C22.1, by a testing agency acceptable to AHJ, and marked for intended use.

6.12.1.1(3)(d) Coordinate size and finish of roller shade valence to account for all access and maintenance requirements of roller shade box assembly.

6.12.1.2 Part 2 Products

6.12.1.2(1) Manufacturers

6.12.1.2(1)(a) Manufacturers: Subject to conformance with requirements of this Section, provide window shades by one of the following:

6.12.1.2.1.(a).1 Fraser Shading Systems.

6.12.1.2.1.(a).2 Solarfective Products Ltd.

6.12.1.2.1.(a).3 Or alternative as approved by the Authority.

6.12.1.2(2) Fabric

6.12.1.2(2)(a) General:

6.12.1.2.2.(a).1 Fabric to be waterproof, washable, rot-proof, flame-resistant, fungal and bacteria-resistant, colourfast to light, glare-reducing, and able to control heat gain and provide external visibility, monolithic and not divided into more than one sheet per window panel.

6.12.1.2.2.(a).2 Flammability per CAN/ULC S109: Pass.

6.12.1.2.2.(a).3 Fungal Resistance: No growth when tested per ASTM G21.

6.12.1.2(2)(b) Solar control, PVC-coated polyester or fibreglass:

6.12.1.2.2.(b).1 Tested to ASHRAE Standard 74-1988 for shading coefficient.

6.12.1.2.2.(b).2 Fabric Width: As required to cover window openings.

6.12.1.2.2.(b).3 Pattern: Satin texture.

6.12.1.2.2.(b).4 Style: Twill weave.

6.12.1.2.2.(b).5 Material Openness Factor: 2 - 3 percent.

6.12.1.2.2.(b).6 Bottom Hem: Straight.

6.12.1.2(2)(c) Room darkening (Blackout), glass fibre, coated and flocked:

6.12.1.2.2.(c).1 Fabric Width: As required to cover window openings.

6.12.1.2.2.(c).2 Pattern: Satin texture.

6.12.1.2.2.(c).3 Material Openness Factor: 0

6.12.1.2.2.(c).4 Bottom Hem: Straight.

6.12.1.2.2.(c).5 Room-Darkening Channels: Extruded aluminum side and centre channels with brush pile edge seals, mounting base and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side jamb light control and sill light control.

6.12.1.2(3) Manually Deployed Shades

6.12.1.2(3)(a) The unit will consist of a tension activated lifting mechanism providing easy lift action utilizing a multi-layer coil spring system. The lifting mechanism will contain a memory lock, which will maintain pre-tensioning when the shade is removed from the bracket and will not require re-tensioning when shade is reinserted into the bracket. The multi-layer coil spring mechanism will be free floating along a grooved non-drive mechanism will be reversible for future alterations and maintenance On-Site.

6.12.1.2(3)(b) Special designed Internal tension idler (I.T.I) limiter automatically adjusts and controls the amount of torque and speed ratio in order to provide a constant smooth operation of the shade system regardless of width and height.

6.12.1.2(3)(c) Drive sprocket will contain a planetary gear system for increased operational performance, speed ratio control, smoothness of lift, and balance to the chain and shade system.

6.12.1.2(3)(d) Operating system easy lift action will alleviate stress on the chain in order to avoid any chain breakage.

6.12.1.2(3)(e) Shade will be able to be pulled down by the bottom bar without stripping or damaging the mechanism.

6.12.1.2(3)(f) Shade mechanism will not be able to be stripped or damaged.

6.12.1.2(3)(g) Noise reduction seals will be used for sound isolation and absorption of the mechanism.

6.12.1.2(4) Electrically Deployed Shades

6.12.1.2(4)(a) Shade Motors:

6.12.1.2.4.(a).1 Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor operating at 110v AC (60hz), single phase, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor.

6.12.1.2.4.(a).2 Conceal motors inside shade roller tube/ enclosure.

6.12.1.2.4.(a).3 Use motors rated at the same nominal speed for all shades in the same room.

6.12.1.2.4.(a).4 Total hanging weight of shade band will not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly.

6.12.1.2(4)(b) Motor Control Systems:

6.12.1.2.4.(b).1 Upper and lower stopping points (operating limits) of shade bands will be programmed into motors via a handheld removable program module / configurator.

6.12.1.2.4.(b).2 Intermediate stopping positions for shades will be 4 predefined intermediate positions, for a total of 6 defined and aligned positions. All shades on the same switch circuit with the same opening height will align at each intermediate stopping position.

6.12.1.2.4.(b).3 Motors will be addressable through a 2 motor bus interface module via a hand-held removable program module and will be capable of responding to a minimum of seven different user defined stored addresses including multiple overlapping sub groups and three reserved control input addresses for use by building management systems, Life Safety Systems and other emergency inputs.

6.12.1.2.4.(b).4 The BI and I.CON controller system will have the capability of two-way communication with the motors. Each I.CON controller, (bus Interface or BI) will allow for a unique address message to be received from the handheld configurator and/or a PC controller or switch.

6.12.1.2.4.(b).5 Shade motor control components (bus interfaces, wall switches, bus supplies, auxiliary control input devices, and similar items) will be connected in series via the low voltage (12VDC) two way digital communication bus line.

6.12.1.2.4.(b).6 Bus line will be capable of being installed in a free topology to provide maximum flexibility for installation and future maintenance.

6.12.1.2(4)(c) Wall Switches:

6.12.1.2.4.(c).1 Shades will be operated by 4 button low voltage standard switches or programmable intelligent switches [IS]. Standard switch will be wired to a bus interface and the bus interface will be programmed to transmit an address for the local switch.

6.12.1.2.4.(c).2 Intelligent switches may be installed anywhere on the bus line. Each IS will be capable of storing one control level address to be broadcast along the bus line.

6.12.1.2.4.(c).3 An address that is transmitted by either a switch or central controller will be responded to by those motors with the same address in their control table.

6.12.1.2.4.(c).4 IS will provide for interface with other low voltage input devices via a set of dry contact terminals located on the switch.

6.12.1.2.4.(c).5 Standard switch or IS may control an individual, sub-group or group of motors in accordance with the address in each motor/BI unit.

6.12.1.2(4)(d) Other System Components:

6.12.1.2.4.(d).1 Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).

6.12.1.2.4.(d).2 Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer's design criteria.

6.12.1.2.4.(d).3 Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

6.12.1.2.4.(d).4 Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and

without requiring end or centre supports to be removed.

6.12.1.3 Part 3 Execution

6.12.1.3(1) Not applicable.

6.12.2 Section 12 35 00 – Specialty Casework

6.12.2.1 Part 1 General

6.12.2.1(1) Summary

6.12.2.1(1)(a) Provide specialty casework for rooms and spaces as set out in Appendix 1B [Minimum Room Requirements]. Unless noted otherwise, specialty casework will consist of the following:

6.12.2.1.1.(a).1 Laboratory casework systems for the Laboratory, Pharmacy, Cyclotron/Radiopharmaceutical Facility, Oncology Pharmacy, Chemistry Lab, Quality Control Rooms, Micro Lab, and Clean Rooms; and

6.12.2.1.1.(a).2 Healthcare casework for the Reception Desks, Medication Rooms, PPE dispensers and Care Team Stations (CTS).

6.12.2.1(2) References, Regulations and Standards

6.12.2.1(2)(a) WorkSafe BC - Occupational Health and Safety Regulation, Part 30 Laboratories.

6.12.2.1(2)(b) Health Canada – Laboratory Biosafety Guidelines 3rd edition.

6.12.2.1(2)(c) CSA Z8000 Canadian Healthcare Facilities, 9.12 Clinical laboratory.

6.12.2.1(2)(d) Public Heath Agency of Canada: Canadian Biosafety Standard & Canadian Biosafety Handbook.

6.12.2.1(2)(e) International Organization for Standardization, ISO 15189 Medical laboratories – Requirements for quality and competence, & ISO 15190 Medical laboratories – Requirements for safety.

6.12.2.1(2)(f) National Foundation (NSF), NSF/ANSI 49 – 2019 Biosafety Cabinetry: Design, Construction, Performance, and Field Certification.

6.12.2.1(2)(g) Scientific Equipment and Furniture Association SEFA - Recommended Practices.

6.12.2.1(2)(h) National Association of Pharmacy Regulatory Authorities (NAPRA).

6.12.2.1(2)(i) Building and Institutional Furniture Manufacturers Association (BIFMA).

6.12.2.1(2)(j) Builders Hardware Manufacturers Association (BHMA).

6.12.2.1(2)(k) Fraser Health Ergonomic Standard for Workstations Version 5.0.

6.12.2.1(2)(l) Fraser Health Ergonomic Standard for Design of Shelving and Racks.

6.12.2.1(2)(m) AAMA 2605, Performance Requirements and Test Procedures for Superiors Performing Organic Coatings on Aluminum Extrusions and Panels.

6.12.2.1(2)(n) ASTM A480/A480M, Specification for General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet and Strip.

6.12.2.1(2)(o) ASTM A653/A653M, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6.12.2.1(3) Basic Requirements

6.12.2.1(3)(a) This section is to be read in conjunction with Appendix 1A [Clinical Specifications and Functional Space Requirements], Appendix 1B [Minimum Room Requirements] and Appendix 1H [Equipment and Furniture].

6.12.2.1(3)(b) Coordinate the specialty casework selections with the interior design.

6.12.2.1(3)(c) Provide all grommets, mounting brackets, height adjustability, storage, work surfaces, charting counters and Care Team Stations to meet the needs of each department.

6.12.2.1(3)(d) Provide power and data in accordance with the manufacturer’s specifications and requirements. Refer to Section 7.7 Electrical (Division 26) and Section 7.8 Communications (Division 27) for additional requirements.

6.12.2.1(3)(e) The Design-Builder will be responsible to coordinate all elements of a room's design, architectural, electrical and communications, with the Authority supplied items listed in Appendix 1H [Equipment and Furniture]. This includes pathways, junction boxes, receptacles and the specific routing of electrical and data cabling to and through the wire ways.

6.12.2.1(3)(f) Coordinate mechanical services in accordance with Section 7.3.1.3 and Section 7.5.

6.12.2.1(3)(g) Perform work in accordance with AHJ and as outlined herein.

6.12.2.1(3)(h) Design casework to have structural rigidity and chemical resistivity to withstand the service conditions to which they are exposed.

6.12.2.1(3)(i) Design laboratory casework to comply with OHS Regulation and CSA Z8000 and the applicable standards they reference, to Biosafety Containment Level 2 (CL2).

6.12.2.1(3)(j) Design casework to conceal and organize instrument tubing, electrical and data cables.

6.12.2.1(3)(k) Laboratory casework, work surfaces and installation to follow applicable SEFA Recommended Practices.

6.12.2.1(3)(l) Design-Builder to provide information of suggested cleaning methods and agents from material suppliers.

6.12.2.1(4) Quality Assurance

6.12.2.1(4)(a) Retain a Laboratory Design and Equipment Specialist Consultant who will lead design and review for this section and attend all user consultation meetings.

6.12.2.1(4)(b) Manufacturer qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

6.12.2.1(4)(c) Installer qualifications: Perform work of this Section by company approved by Product manufacturer

and having 5 years recent experience in work of comparable complexity and scope.

6.12.2.1(4)(d) Coordinate power and data needs with Electrical (Division 26) and Communications (Division 27).

6.12.2.1(5) Laboratory Requirements

6.12.2.1(5)(a) The Design-Builder will provide laboratory casework:

6.12.2.1.5.(a).1 appropriate for the specific and specialized functions to be performed by Staff using the casework;

6.12.2.1.5.(a).2 providing end users with an ergonomic working environment that is suited to their specific needs, including with height-adjustable work surfaces where required;

6.12.2.1.5.(a).3 having structural rigidity and chemical resistivity to withstand the service conditions to which they are exposed; and

6.12.2.1.5.(a).4 complying with Public Health Agency of Canada Guidelines for Biosafety Containment Level 2 (CL2) Laboratories.

6.12.2.1(5)(b) Laboratory casework will be modular.

6.12.2.1(5)(c) All epoxy resin material workbench tops will be chemical resistant and allow for decontamination of CL2 laboratory surfaces.

6.12.2.1(5)(d) Provide all laboratory workbenches with cabinets for a minimum 50% of the length of the benches.

6.12.2.1(5)(e) Laboratory workbench systems will hide and organize instrument tubing, electrical and/or data cables.

6.12.2.1(5)(f) Laboratory casework will be versatile and accommodate a flexible and adaptable fit (reconfiguration) within the overall design.

6.12.2.1(5)(g) Laboratory casework will be freestanding where possible to accommodate open laboratory spaces and allow for easy reconfiguration and movement within the laboratory space.

6.12.2.1(5)(h) Laboratory casework will meet the standards identified in Recommended Practices for Laboratory Grade Casework - SEFA 8-2010 guidelines for laboratory furniture, casework,

shelving and tables testing. Construction and finishes will be tested in accordance with SEFA 8 procedures.

6.12.2.1(5)(i) The Design-Builder will retain a laboratory design and equipment specialist consultant who will attend in person and lead all laboratory casework user consultation meetings.

6.12.2.1(5)(j) The Design-Builder will provide adaptable, modular leg frame and cantilevered laboratory casework as required to meet the functional requirements described in Appendix 1A [Clinical Specifications and Functional Space Requirements].

6.12.2.1(6) Design Requirements

6.12.2.1(6)(a) Provide vibration-free work surfaces for microscopes and other equipment as required, refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] and Appendix 1H [Equipment and Furniture].

6.12.2.1(6)(b) Provide height adjustable work surfaces adjustable from 762 mm to 915 mm AFF.

6.12.2.1.6.(b).1 Sized appropriately to accommodate all Equipment (refer to Appendix 1H [Equipment and Furniture]) and the functional requirements as described in Appendix 1A [Clinical Specifications and Functional Space Requirements].

6.12.2.1(6)(c) Provide professional balance tables for ergonomic and efficient weighing in the Balance Room to meet the specific requirements the Authority and Equipment, refer to Appendix 1H [Equipment and Furniture].

6.12.2.1(6)(d) Provide suspended and floor mounted cabinets which are interchangeable and can be easily moved from workstation to workstation.

6.12.2.1(6)(e) Provide suspended base cabinets which can be relocated while fully loaded and installed in any position between table leg frames.

6.12.2.1(6)(f) Provide independently supported work surfaces, under counter cabinets, and overhead storage components.

6.12.2.1(6)(g) Provide leg frames, work surface supports and horizontal structural base frame which are fully welded construction.

6.12.2.1(6)(h) Support cores will be equipped with access ports that allow integration of cabling, conduit and piping within the vertical support structure.

6.12.2.1(6)(i) Provide slotted vertical standards to mount a wide variety of shelving materials.

6.12.2.1(7) Pharmacy Requirements

6.12.2.1(7)(a) The Design-Builder will provide laboratory casework to meet applicable standards such as NAPRA and requirements as specified herein:

6.12.2.1.7.(a).1 Appropriate for the specific and specialized functions to be performed by Staff using the specialty casework;

6.12.2.1.7.(a).2 Providing end users with an ergonomic working environment that is suited to their specific needs, including with height-adjustable work surfaces where required; and

6.12.2.1.7.(a).3 Having structural rigidity and chemical resistivity to withstand the service conditions to which they are exposed.

6.12.2.1(7)(b) All workbench tops will be chemical resistant and meet requirements of USP 797, USP 800 standards and NAPRA.

6.12.2.1(7)(c) Provide all pharmacy workbenches with cabinets for a minimum 50% of the length of the benches.

6.12.2.1(7)(d) Specialty casework to be:

6.12.2.1.7.(d).1 Versatile and accommodate a flexible and adaptable fit (reconfiguration) within the overall design; and

6.12.2.1.7.(d).2 Freestanding where possible to accommodate open pharmacy spaces and allow for easy reconfiguration and movement within the pharmacy space.

6.12.2.1(8) Medication Room Requirements

6.12.2.1(8)(a) Provide modular, standardized storage and stocking systems including bins as required by the Authority to meet functional requirements.

6.12.2.1(8)(b) Provide the ability to store medications at eye-level height.

6.12.2.1(8)(c) Provide sufficient capacity in the storage and stocking systems to prevent overcrowding of medication stock.

6.12.2.1(8)(d) Provide ability for medications to be arranged alphabetically by drug formulation.

6.12.2.1(8)(e) Provide the ability for high risk medications to be stored away and separately from other medications.

6.12.2.1(8)(f) Provide the ability for Staff to easily and safely locate medications and supplies.

6.12.2.1(8)(g) Design the storage and stocking system ergonomically based on the range of motion of Staff to provide easy access to medications, workstations and supplies.

6.12.2.1(9) Care Team Station and similar multi-disciplinary team work environments:

6.12.2.1(9)(a) Refer to Section 5.21 for requirements.

6.12.2.2 Part 2 Products

6.12.2.2(1) Acceptable manufacturers and systems for laboratory casework include:

6.12.2.2(1)(a) Co/Struc System, by Herman Miller;

6.12.2.2(1)(b) SAI Scientifically Advanced Interiors; or

6.12.2.2(1)(c) alternative as approved by the Authority.

6.12.2.2(2) Acceptable manufacturers and systems for healthcare casework include:

6.12.2.2(2)(a) Ethospace, or Commend by Herman Miller; or

6.12.2.2(2)(b) alternative as approved by the Authority.

6.12.2.2(3) Materials

6.12.2.2(3)(a) Sheet Steel: ASTM A653/A653M, Mild, cold rolled and leveled unfinished steel.

6.12.2.2(3)(b) Stainless Steel: ASTM A480/A480M, Type 316.

6.12.2.2(3)(c) Epoxy resin work surfaces and counter tops: Solid epoxy resin to be chemical resistant and allow for decontamination of CL2 laboratory surfaces, with the following properties:

- 6.12.2.2.3.(c).1 Non-porous;
- 6.12.2.2.3.(c).2 Monolithic;
- 6.12.2.2.3.(c).3 Resistant to corrosive effect of laboratory chemicals;
- 6.12.2.2.3.(c).4 Self-extinguishing;
- 6.12.2.2.3.(c).5 Heat Resistant;
- 6.12.2.2.3.(c).6 Smooth, no-glare surface; and
- 6.12.2.2.3.(c).7 Seamless joining.

6.12.2.2(3)(d) Stainless steel sheet metal work surfaces and counter tops:

- 6.12.2.2.3.(d).1 Compliant with ASTM A480/A480M, Type 316, with #4 finish;
- 6.12.2.2.3.(d).2 Finished marine edge to countertop; and
- 6.12.2.2.3.(d).3 Straight lengths, one-piece with minimum seams. All joints welded and finished to match top.

6.12.2.2(3)(e) Service Fittings and Fixtures:

- 6.12.2.2.3.(e).1 Cup Sinks: Stainless steel with waste fittings;
- 6.12.2.2.3.(e).2 Natural Gas Outlet;
- 6.12.2.2.3.(e).3 Air Outlet;
- 6.12.2.2.3.(e).4 Vacuum Outlet;
- 6.12.2.2.3.(e).5 Water Outlet; and
- 6.12.2.2.3.(e).6 Escutcheons: Stainless steel.

6.12.2.2(3)(f) Electrical Outlet Covers: Stainless steel.

6.12.2.2(3)(g) Sound Deadening Material: Inorganic, for sandwich panel fabrication.

6.12.2.2(3)(h) Sealant: Sanitary type.

6.12.2.2(3)(i) Hardware: Manufacturer's standard, commercial-quality, heavy-duty, conforming to BHMA A156.11.

- 6.12.2.2.3.(i).1 Locks: Cam or half-mortise type, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, E07111, or E07021.
- 6.12.2.2.3.(i).2 Provide a minimum number of keys per lock and master keys as required by the Authority. Provide locks on all drawers and doors. Keying of locks will be as required by the Authority.

6.12.2.2(4) Finishes

6.12.2.2(4)(a) Metal (Except Stainless Steel): Degrease and finish as follows:

6.12.2.2.4.(a).1 Provide chemical-resistant finish to comply with AAMA 2605. Provide laboratory casework manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 0.05 mm (2 mils).

6.12.2.2.4.(a).2 Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test will be no more than four Level 3 conditions.

6.12.2.2(4)(b) Stainless Steel: No. 4 brushed finish.

6.12.2.2(4)(c) Shop finish all components.

6.12.2.2(4)(d) Coat metal surfaces in contact with cementitious materials with bituminous paint.

6.12.2.3 Part 3 Execution

6.12.2.3(1) Not applicable.

6.13 Special Construction (Division 13)

6.13.1 Section 13 21 00 – Walk-in Refrigerators and Cold Rooms

6.13.1.1 Provide walk-in refrigerators and cold rooms complete with insulated walls and ceiling panels, doors, access panels and all refrigeration systems, piping, fittings and controls to render the refrigerators and cold rooms complete and fully operational. Remote condensing units will be water cooled and 100% redundant.

6.13.1.2 Provide a laboratory/medical grade walk-in cold room in Q2.03 Walk-In Cooler - Racks, as set out in Section 6.13.1.13.

6.13.1.3 Provide laboratory/medical grade walk-in refrigerators meeting the following requirements for each of the rooms listed below, in conjunction with the requirements set out in Appendix 1A [Clinical Specifications and Functional Space Requirements] and as reviewed with the Authority:

6.13.1.3(1) E2.02 Storage – Chemistry, E3.01.11 Storage – Specimen, E3.01.12 Storage - Primary - STAT – Backup, and E4.04 Refrigerated Storage – Reagents:

6.13.1.3(1)(a) Operating temperature range of 3 to 6 °C;

6.13.1.3(1)(b) Minimum clear interior dimensions of 2.5 m (L) x 1.85 m (W) x 2.5 m (H); and

6.13.1.3(1)(c) Dual condenser unit for redundancy.

6.13.1.3(2) E4.02 Storage - Blood Components:

6.13.1.3(2)(a) Operating temperature range of 1 to 6°C;

6.13.1.3(2)(b) Minimum clear interior dimensions of 2.743 m (L) x 3.658 m (W) x 3.048 m (H);

6.13.1.3(2)(c) Dual condenser unit for redundancy; and

6.13.1.3(2)(d) Dual display glass door with a minimum of 16 stainless steel shelves for quick entry access to products. Include a door on the side for entrance with trolley.

6.13.1.3(3) E2.03 Walk-In Refrigerator – Lab

6.13.1.3(3)(a) Operating temperature range of 2 to 8°C;

6.13.1.3(3)(b) Dual condenser unit for redundancy; and

6.13.1.3(3)(c) Dual display glass door with a minimum of 6 stainless steel shelves for quick entry access to products. Include a door on the side for entrance with trolley.

6.13.1.4 All laboratory/medical grade walk-in cold rooms and refrigerators will be designed to provide temperature stability and include a calibrated thermometer to monitor internal temperature and a temperature display mounted on the outside of the unit. Provide data loggers for each unit designed to interact through wireless communications for temperature monitoring, alarms and notifications.

6.13.1.5 Data logging via wired communication will also be accommodated for all stand-alone laboratory/medical grade refrigerators and freezers, as required for the Equipment listed in Appendix 1H [Equipment and Furniture],

6.13.1.6 The refrigerator and freezer walk-ins and refrigeration systems will be equipped with a sophisticated alarm system. The alarm system will monitor internal temperatures and compressor pressures to ensure that all systems are maintained within the specified temperature and pressure ranges. If either a temperature or pressure goes outside the specified range, the alarm system will go into an audio and visual alarm state. The cold rooms and freezers will be equipped with a local audible and visual hi/low temperature alarm as well as connected to the BMS for signaling faults.

6.13.1.7 Evaporator coils inside each cooler or freezer will be equipped with the latest digital monitoring device capable of alerting the monitoring station of any malfunction.

6.13.1.8 All temperature-controlled rooms will be constructed of rigid factory-assembled wall and ceiling panels of fire resistant mineral fibre core with bonded 304 stainless steel sheet metal facings, listed with accredited material testing firm. Doors and frames to be stainless steel with polyurethane insulation, and with door opening typically 1219 mm wide. Construction will follow engineered design meeting Authority's requirements, ASHRAE 90.1, and will be compliant with applicable regulations.

6.13.1.9 The unexposed exterior top of ceiling will be 0.6 mm steel unfinished. The exposed interior and exterior wall and ceiling panels will be 1.0 mm Colour coat PVC plastisol steel finish. Stainless steel sheet will be to ASTM A167, type 302/304 with No. 4 finish.

6.13.1.10 All insulated wall and ceiling panels, refrigeration lines, suspended HVAC and light fixtures will be installed in accordance with the BCBC.

6.13.1.11 Provide floor depressions to accommodate in-slab insulation below all equipment such as cold storage rooms, walk-in refrigerators and freezers and to ensure a level access both into and out of the units.

6.13.1.12 Provide a thermal scan of all walk-in refrigerator and freezer rooms (walls, doors and ceiling panels) to ensure airtight seams and penetrations. Report to indicate that installation meets construction standards and performance requirements.

6.13.1.13 Walk-In Cooler - Racks

6.13.1.13(1) Provide a secure laboratory/medical grade cold room to serve Q2.03 Walk-In Cooler – Racks with odour-handling systems to meet the following requirements:

6.13.1.13(2) The Store-Cadaver will have an operating temperature of +2/+4 degrees C;

6.13.1.13(3) The unexposed exterior top of ceiling will be 0.6 mm steel unfinished. The exposed interior and exterior wall and ceiling panels will be stainless steel finish. Stainless steel sheet will be to ASTM A167, type 302/304 with No. 4 finish;

6.13.1.13(4) Provide sufficient manoeuvring space for cadaver lift;

6.13.1.13(5) Provide capacity for cadavers as follows:

6.13.1.13(5)(a) Two (2) standard racks (4 cadavers stacked in each rack); and

6.13.1.13(5)(b) One (1) bariatric rack (3 cadavers stacked in rack).

6.13.1.13(6) Provide wall bumpers, corner guards and door protection.

6.13.1.14 Configuration of the area will be coordinated with the Authority-supplied equipment outlined in Appendix 1H [Equipment and Furniture], including the cadaver lift and cadaver storage racks.

6.13.2 Section 13 49 00 – Radiation Shielding Systems

6.13.2.1 Part 1 General

6.13.2.1(1) References

6.13.2.1(1)(a) ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

6.13.2.1(1)(b) ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.13.2.1(1)(c) CNSC, Canadian Nuclear Safety Commission.

6.13.2.1(1)(d) CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

6.13.2.1(1)(e) CSDMA, Canadian Steel Door Manufacturers Association.

6.13.2.1(1)(f) Federal Specification DD-G-451, Glass, Float or Plate, Sheet, Figured.

6.13.2.1(1)(g) Federal Specification QQL-201F, Lead Sheet.

6.13.2.1(1)(h) MIL-C-3673 (DM), Cassette Transfer Cabinets.

6.13.2.1(1)(i) NCRP, National Council on Radiation Protection and Measurements.

6.13.2.1(2) Performance Requirements

6.13.2.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.13.2.1(2)(b) Interlocking lead brick system including support framing will be designed and constructed to post-disaster standards in accordance with applicable code requirements. Submit shop drawings for the system which are signed and sealed by a Professional Engineer for review and acceptance by the Authority. Interlocking lead brick system will

resist seismic forces without dilapidating or falling apart during a seismic event.

6.13.2.1(2)(c) Provide materials and workmanship, including joints and fasteners, that maintain continuity of radiation protection at all points and all directions of intended rooms.

6.13.2.1(2)(d) Radiation shielding system will comply with the following standards and requirements as specified in this Section:

- 6.13.2.1.2.(d).1 Diagnostic Accreditation Program, WSBC, and applicable Health Canada Safety Code (e.g. 35 and 36);
- 6.13.2.1.2.(d).2 Canadian Nuclear Safety Commission: Keeping Radiation Exposures and Doses “As Low as Reasonably Achievable (ALARA)” Regulatory Guide G-129 Revision 1; and
- 6.13.2.1.2.(d).3 All other applicable standards.

6.13.2.1(2)(e) Radiation shielding system and measures provided will ensure that Staff and public (excluding Staff working in PET CT/SPECT Suite and Theranostics zones of PET CT/Theranostics, and Staff working in Production and Cyclotron zones of Cyclotron/Radiopharmaceutical Facility) receive < 0.05 mSv/yr from medical radiation.

- 6.13.2.1.2.(e).1 Radiation shielding system and measures provided will ensure that Staff working in PET CT/SPECT Suite and Theranostics zones of PET CT/Theranostics, and Staff working in Production and Cyclotron zones of Cyclotron/Radiopharmaceutical Facility receive < 1.0 mS v /yr from medical radiation.

6.13.2.1(2)(f) The Design-Builder will retain a Radiation Protection Adviser for each of these areas meeting the following requirements and qualifications:

- 6.13.2.1.2.(f).1 General areas unless noted otherwise below: independent physicist certified by the CCPM in diagnostic radiological physics;
- 6.13.2.1.2.(f).2 For linear accelerators, MRI-Sim and CT-Sim’s:
  - (f).2.1 is a qualified medical physicist;
  - (f).2.2 an MRI specialist medical physicist;
  - (f).2.3 who is certified by the CCPM in Radiation Oncology Physics;

(f).2.4 who has minimum ten (10) years experience in providing radiation protection for medical facilities; and

(f).2.5 is approved by the Authority.

6.13.2.1.2.(f).3 For cyclotron and PET-CT/theranostics:

(f).3.1 who is certified by the Canadian College of Physicists in Medicine or the Canadian Radiation Protection Association or an equivalent recognized body;

(f).3.2 who has minimum ten (10) years experience in providing radiation protection for cyclotron production facilities and nuclear medicine facilities; and

(f).3.3 is approved by the Authority.

6.13.2.1(2)(g) Correct deficiencies resulting from the testing requirements until all deficiencies are approved by the Authority at no additional cost to the Authority.

6.13.2.1(2)(h) Where possible, obtain radiation protection materials and accessories produced as standard products from single manufacturer. All manufacturers will be regularly engaged in production of X-Ray shielding materials, equipment, and accessories.

6.13.2.1(2)(i) Provide a radiation shielding system throughout the Facility including rooms, areas and corridors. The radiation protection shield will:

6.13.2.1.2.(i).1 protect Staff and Patients from the Equipment as set out in Appendix 1H [Equipment and Furniture]; and

6.13.2.1.2.(i).2 encompass walls, doors, floors, Millwork, specialty casework, ceilings, windows and all other systems as required for complete safety and protection.

6.13.2.1(2)(j) The radiation shielding system will generally consist of the following elements or as otherwise required by the Radiation Protection Adviser:

6.13.2.1.2.(j).1 Concrete structure including wall and floor slabs;

6.13.2.1.2.(j).2 Concrete filled door frames and window frames;

6.13.2.1.2.(j).3 Borated polyethylene sheets;

6.13.2.1.2.(j).4 High density concrete or borated concrete;

6.13.2.1.2.(j).5 Shielded doors with lead and borated polyethylene (BPE) encapsulated in steel casing;

6.13.2.1.2.(j).6 Lead sheets, interlocking bricks, strips, and plates;

6.13.2.1.2.(j).7 Leaded glass (X-ray shielding glass); and

6.13.2.1.2.(j).8 Lead or lead-lined building materials and products including the following:

- (j).8.1 hollow-metal doors;
- (j).8.2 hollow-metal door frames;
- (j).8.3 flush wood core doors;
- (j).8.4 door hardware;
- (j).8.5 observation-window frames; and
- (j).8.6 modular shielding partitions.

6.13.2.1(2)(k) Final shielding calculations will be performed once a final design/layout is approved by the Authority. Final calculations, design/layout will then be submitted by the Design-Builder to CNSC for approval prior to commencing Construction.

6.13.2.1(2)(l) Provide poured normal density (or borated if required) concrete walls, minimum 2.35 g/cm3. Filled breeze/cinder block is not acceptable.

6.13.2.1(2)(m) For all shielded rooms, except for cyclotron vault and SPECT scanner room, doors will be either steel doors or solid wood core doors.

6.13.2.1(2)(n) All shielded walls will extend to the underside of structure above and meet any ceiling shielding.

6.13.2.1(2)(o) All steel stud and gypsum wallboard partitions, electrical junction boxes, conduit, cabling, mechanical pipes and alike, will be routed outside of the shielding system.

6.13.2.1(2)(p) All shielded rooms will have door and window frames filled with concrete.

6.13.2.1(2)(q) Provide all required structural elements to support the lead vent shielding under the ductwork openings.

6.13.2.1(2)(r) Any penetrations in shielding, such as HVAC, services, recessed electrical boxes and similar, must be presented to the Radiation Safety Officer well in advance so a radiation impact can be performed. Such penetrations must ensure

continuity of the radiation shielding system. Depending on the location and size of the penetration, provide additional shielding around vents and pipes for penetrations as required.

6.13.2.1(2)(s) Where large HVAC penetrations require additional lead vent shielding, provide all structural supports such as shelves under the duct opening to support the required shielding. For double shielded doors, provide a shielded astragal. Alternatively, provide a fabricated astragal consisting of 50 x 3 mm metal strip with lead rubber attached with strong double adhesive tape; screw applied to door with lead rubber facing door side and installed to have an overlap of 25 mm from door edge.

6.13.2.1(2)(t) Provide radiation safety devices as required by the Provincial Occupational Health and Safety Guidelines, Regulations and Health Canada Safety Code 25 and all applicable CNSC regulations. Refer to Section 7.7 Electrical (Division 26).

6.13.2.1(2)(u) Unless noted otherwise, provide a radiation shielding system where required by the Equipment listed in Appendix 1H [Equipment and Furniture] and all other areas such as:

- 6.13.2.1.2.(u).1 The following rooms in Inpatient Unit:
  - (u).1.1 B2.03 Patient Room - Private – Shielded
  - (u).1.2 B2.04 Ensuite - Patient Room - Shielded
  - (u).1.3 B2.10 Soiled Holding – Shielded
- 6.13.2.1.2.(u).2 The following rooms in Perioperative:
  - (u).2.1 D2.06 Operating Room - HDR
  - (u).2.2 D2.08 Sealed Source Room
  - (u).2.3 D2.02 Anteroom - Isolation OR
  - (u).2.4 D2.03 Anteroom - Isolation OR
  - (u).2.5 D2.04 Operating Room - Isolation
  - (u).2.6 D2.05 Operating Room
- 6.13.2.1.2.(u).3 The following rooms in Radiation Therapy Delivery:
  - (u).3.1 L1.03 Treatment Bunker Interior
  - (u).3.2 L1.06 Orthovoltage/Superficial
- 6.13.2.1.2.(u).4 The following rooms in Radiation Therapy Planning:
  - (u).4.1 K3.08 Imaging Room - CT – Simulation
  - (u).4.2 K3.09 Control Room - CT

6.13.2.1.2.(u).5 The following rooms in Functional Imaging:

- (u).5.1 M1.18 Shipping/Receiving Room
- (u).5.2 M1.22 Quality Control Room - Clean Rooms
- (u).5.3 M1.23 Quality Control Room - Small Clean Room
- (u).5.4 M1.24 Packaging Room
- (u).5.5 M1.26 Clean Room
- (u).5.6 M1.27 Small Clean Room
- (u).5.7 M1.29 Storage - Containment Waste
- (u).5.8 M1.30 Workshop - Electronic - Cyclotron
- (u).5.9 M1.31 Equipment Room - Cyclotron
- (u).5.10 M1.32 Storage - Shielded - Cyclotron
- (u).5.11 M1.33 Cyclotron Vault
- (u).5.12 M2.09 Stretcher Bay - Holding
- (u).5.13 M2.14 Hot Lab
- (u).5.14 M2.15 PET Injection/Uptake Room - Chair
- (u).5.15 M2.16 PET Injection/Uptake Room, Stretcher
- (u).5.16 M2.17 Washroom - Patient
- (u).5.17 M2.21 Imaging Room - PETCT Scanner
- (u).5.18 M2.22 Imaging Room - SPECT Camera
- (u).5.19 M2.25 Exam/Treatment Room - Shielded
- (u).5.20 M2.26 Washroom - Patient - Shielded
- (u).5.21 M2.29 Hot Lab
- (u).5.22 M2.31 Soiled Holding – Contaminated
- (u).5.23 Service corridor for Hot Cells

6.13.2.1.2.(u).6 Future CC rooms and spaces refer to Section 5.1.3.

6.13.2.1(2)(v) For cassette transfer cabinets, provide radiation shielding that meets or exceeds MIL-C-3673 (DM). CR cassette storage is required to be protected from scatter radiation to reduce baseline ‘radioactive fog’ and to meet requirements as specified in Safety Code 35 and NCRP.

6.13.2.1(2)(w) Lead sheet installation, general:

6.13.2.1.2.(w).1 For sheet lead applied directly to partition steel studs, provide a continuous and complete protective shield that forms an unbroken barrier around the room.

6.13.2.1.2.(w).2 Where lead sheet is attached directly to studs, all lead seams must be located on studs and overlap by at least 20 mm. Screw heads do not need to be capped with lead.

6.13.2.1.2.(w).3 Lead materials must overlap all doors and window frames and prevent Line of Sight openings for radiation to pass through. Ensure lead sheet shielding occurs on correct side of frame.

6.13.2.1.2.(w).4 Lead sheet to be installed at rear side of stud for large openings. Overlap all edges at large openings 100 mm. Lead to overlap by 20 mm at all joints.

6.13.2.1.2.(w).5 Where there are structural concrete pillars more than 200 mm in size, lead must overlap concrete by at least 100 mm from adjacent wall.

6.13.2.1.2.(w).6 Where pipes or wiring conduits penetrate floor or ceiling assemblies, form a cylindrical collar from lead sheet for the penetration and to tightly fit the pipe; secure collar in place.

6.13.2.1(2)(x) Lead-laminated (lead-lined) GB is not acceptable.

6.13.2.1(2)(y) Cyclotron Radiation Vault - Roof Hatch and General Features:

6.13.2.1.2.(y).1 Provide fully shielded design for cyclotron vault conforming to requirements as specified in this Section and herein.

6.13.2.1.2.(y).2 Provide roof hatch for cyclotron vault for lowering cyclotron requirement into vault and for future instance of decommissioning equipment. Design vault to accommodate for a minimum hatch opening size of 5 m x 3.2 m to accommodate installation of cyclotron equipment.

6.13.2.1.2.(y).3 Vault to be complete with sliding neutron shielding door and operating mechanism as specified in Section 08 34 49.

6.13.2.1(3) Quality Assurance

6.13.2.1(3)(a) The Design-Builder and its Radiation Protection Adviser will be responsible for providing a complete radiation shielding system for the Facility and compliance with all applicable regulatory bodies including CNSC. The Radiation Protection Adviser will provide the following:

6.13.2.1.3.(a).1 Determine sizes, spacing, and loading components, thicknesses and configurations of concrete, lead and lead-lined materials in accordance with applicable codes and regulations; and

6.13.2.1.3.(a).2 Test specified radiation protective work and to conduct Radiation Protection Survey of the Facility after radiation shielding materials are installed. For linear accelerator and Cyclotron shielding, survey to be completed after equipment is installed. Survey to be completed by the Radiation Protection Adviser.

6.13.2.1.3.(a).3 The Radiation Protection Advisor will perform the survey in coordination with the Authority's Radiation Safety Officer who will review and approve the survey before it is deemed complete.

6.13.2.1(3)(b) The Design-Builder's Radiation Protection Adviser will work collaboratively with the Authority's Radiation Safety Officer throughout the design process for approvals and coordination of deliverables; refer to Section 2.5.1.19.

6.13.2.1(3)(c) Obtain radiation protection materials and accessories produced as standard products from single manufacturer regularly engaged in production of X-Ray shielding materials, equipment, and accessories.

6.13.2.1(3)(d) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

6.13.2.1(3)(e) Installer qualifications: Company specializing in installing the products specified in this section with minimum five years documented experience.

6.13.2.1(3)(f) The Design-Builder will provide a full quality control, inspection, and testing program for all installations and provide verification reports assuring compliance to all requirements.

6.13.2.1(3)(g) All radiation shielding systems will be designed and installed under the supervision of the Radiation Protection Adviser.

6.13.2.1(3)(h) Maintain a full record of lead installation On-Site including written reports and complete photo documentation of entire installation.

6.13.2.2 Part 2 Products

6.13.2.2(1) Manufacturers

6.13.2.2(1)(a) Acceptable Products (Radiation Protection, typical):

6.13.2.2.1.(a).1 MarShield.

6.13.2.2.1.(a).2 Nelco Worldwide.

6.13.2.2.1.(a).3 Or alternative as approved by the Authority.

6.13.2.2(2) Materials

6.13.2.2(2)(a) Lead sheet:

6.13.2.2.2.(a).1 Provide sheet lead that meets or exceeds the Federal Specification QQL-201F Chemical Analysis, Grade C, 99.9% pure unpierced virgin lead, free of dross, oxide inclusions, scale, laminations, blisters and cracks. Variation in sheet thickness: Not to exceed 3 percent.

6.13.2.2.2.(a).2 Provide lead sheet of appropriate weight and thickness into wall and door assemblies and leaded glass manufactured for radiation shielding purposes into window assemblies.

6.13.2.2.2.(a).3 Lead must be “rolled” lead, not acoustic or sound proofing lead.

6.13.2.2.2.(a).4 Lead must be rolled lead, not acoustic or soundproofing lead.

6.13.2.2(2)(b) Lead glass:

6.13.2.2.2.(b).1 Provide lead glass or lead louvers occurring in radiation shielded doors that is equivalent rated to sheet lead in doors, meet or exceed Federal Specification DD-G-451.

6.13.2.2.2.(b).2 Thickness of glazing to provide the protection required, equal to the lead thickness occurring in the adjacent wall.

6.13.2.2.2.(b).3 Provide all components and accessories as required for complete and secure installation of lead glass vision panels, windows including tape, shims, setting blocks, and stops.

6.13.2.2.2.(b).4 All required accessory items must be compatible and as approved by lead glass manufacturer to meet radiation requirements of this Section.

6.13.2.2(2)(c) Stainless steel materials:

6.13.2.2.2.(c).1 Sheet and plate: To ASTM A480/A480M, type 304 with No. 4 finish.

6.13.2.2.2.(c).2 Extrusions and shapes: To ASTM A276, type 304 with No. 4 finish.

6.13.2.2(3) Radiation Shielded Doors and Frames:

6.13.2.2(3)(a) Lead lined swing doors:

6.13.2.2.3.(a).1 Construct lead lined swing doors utilizing a single layer of sheet lead in centre, thickness to be equal to that of wall in which the lead lined door is installed. Sheet lead to extend to edges of door.

6.13.2.2.3.(a).2 Prepare door for lead lined glass as required. Overlap lead glass with sheet lead minimum 13 mm.

6.13.2.2.3.(a).3 Wood doors: Meet or exceed (ANSI/NWMA) Industry Standard for wood doors, NCRP Report No.49, 147 or 151 or other applicable radiation standards. Wood doors to match fibre reinforced laminate (FRL) facing specified in Section 08 14 00.

6.13.2.2.3.(a).4 Lead lined hollow metal door frames: Welded steel frames, minimum gauges as per CSDMA requirements.

6.13.2.2(4) Custom Shielded Cabinets:

6.13.2.2(4)(a) Radiation protection shielding requirements as listed below are minimums and will be as determined by the Radiation Protection Adviser and approved by the Authority's Radiation Safety Officer.

6.13.2.2(4)(b) Cabinet sizes are minimums and will be as determined in consultation with the Authority.

6.13.2.2(4)(c) Provide Type 304 stainless steel inner and outer sheet materials, stainless steel hinges, gasketing, styrofoam, and plywood, complete with lead sheet materials as required to meet radiation shielding requirements as specified herein.

6.13.2.2(4)(d) Provide the following custom shielded cabinets for Work of this Project:

6.13.2.2.4.(d).1 Workshop - Electronic - Cyclotron (M1.30):

(d).1.1 Acceptable Products: Radioactive isotope cabinet, Model 244-006 by

Biodex or alternative approved by the Authority.

(d).1.2 Approximate size: Minimum 400 mm (16”) tall x 400 mm (16”) wide x 400 mm (16”) deep.

(d).1.3 Radiation protection shielding: Provide minimum 50 mm (2”) thick lead sheet for all sides and door.

(d).1.4 Quantity: Refer to Appendix 1H [Equipment and Furniture].

6.13.2.2.4.(d).2 Storage - Shielded - Cyclotron (M1.32):

(d).2.1 Approximate size: 862 mm (34-1/2”) tall x 687 mm (27-1/2”) wide x 587 mm (23-1/2”) deep.

(d).2.2 Radiation protection shielding: Provide minimum 50 mm (2”) thick lead sheet for all sides and 12.7 mm (1/2”) thick lead sheet for door and back of cabinet.

(d).2.3 Quantity: Refer to Appendix 1H [Equipment and Furniture].

6.13.2.2.4.(d).3 Storage - Containment Waste (M1.29):

(d).3.1 Approximate size: 900 mm (36”) tall x 900 mm (36”) wide x 450 mm (18”) deep shelving unit with individual cubbies, sized at 300 mm (12”) tall x 450 mm (18”) wide with individual doors.

(d).3.2 Radiation protection shielding: Provide minimum 12.7 mm (1/2”) thick lead sheet for doors only.

(d).3.3 Quantity: Refer to Appendix 1H [Equipment and Furniture].

6.13.2.2.4.(d).4 Hot Lab (M2.14):

(d).4.1 Approximate size: 862 mm (34-1/2”) tall x 687 mm (27-1/2”) wide x 587 mm (23-1/2”) deep.

(d).4.2 Radiation protection shielding: Provide minimum 50 mm (2”) thick lead sheet for all sides and minimum 12.7 mm (1/2”) thick lead sheet for door and back of cabinet.

(d).4.3 Quantity: Refer to Appendix 1H [Equipment and Furniture].

6.13.2.2.4.(d).5 Hot Lab (M2.29):

(d).5.1 Approximate size: 862 mm (34-1/2”) tall x 687 mm (27-1/2”) wide x 587 mm (23-1/2”) deep.

(d).5.2 Radiation protection shielding: Provide minimum 12.7 mm (1/2”) thick lead sheet for all sides, door and back of cabinet.

(d).5.3 Quantity: Refer to Appendix 1H [Equipment and Furniture].

6.13.2.2.4.(d).6 Soiled Holding - Contaminated (M2.31):

(d).6.1 Approximate size: 900 mm (36”) tall x 900 mm (36”) wide x 450 mm (18”) deep shelving unit with individual cubbies, sized at 300 mm (12”) tall x 450 mm (18”) wide with individual doors.

(d).6.2 Radiation protection shielding: Provide minimum 6.35 mm (1/4”) thick lead sheet for doors only.

(d).6.3 Quantity: Refer to Appendix 1H [Equipment and Furniture].

6.13.2.2.4.(d).7 Quality Control Room – Clean Room (M1.22) and Quality Control Room - Small Clean Room (M1.23):

(d).7.1 Approximate size: Minimum 400 mm (16”) tall x 400 mm (16”) wide x 610 mm (24”) deep.

(d).7.2 Radiation protection shielding: Provide minimum 50 mm (2”) thick lead sheet for all sides and door.

(d).7.3 Quantity: Refer to Appendix 1H [Equipment and Furniture].

6.13.2.2(5) Fabrication

6.13.2.2(5)(a) Radiation shielded doors and frames:

6.13.2.2.5.(a).1 Line doors with lead and label such doors with lead thickness. Doors in walls will have the same radiation shielding as the walls in which they are located, unless otherwise required by the Radiation Protection Adviser.

6.13.2.2.5.(a).2 Provide door frames, specially designed for the weight of the door, and with radiation shielding equivalent to the wall in which they are located. Where there are double doors, provide a shielded astragal.

6.13.2.2.5.(a).3 For medical imaging rooms, fabricate radiation-shielded doors using a single layer of sheet lead with wood core laminated on each side of the lead. Bond cores using poured lead dowels at edges. Other option is

to fabricate doors with two layers of sheet lead, one at each side of central core with veneer cover each side.

6.13.2.2.5.(a).4 Fabricate lead lined hollow metal doors with a single sheet of lead located in centre of door extended to all edges using steel stiffeners as support.

6.13.2.2.5.(a).5 Fabricate radiation-shielded door frames with lead-lining in accordance with CSDMA requirements. Ensure that proper overlap of lead shielding is provided at all interfaces with radiation shielded doors.

6.13.2.2(6) Part 3 Execution

6.13.2.2(6)(a) Not applicable.

6.13.3 Section 13 49 23 – Radio Frequency Shielding Systems

6.13.3.1 Part 1 General

6.13.3.1(1) References

6.13.3.1(1)(a) ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

6.13.3.1(1)(b) ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.13.3.1(1)(c) ASTM B209/B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6.13.3.1(1)(d) ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

6.13.3.1(1)(e) ASTM B283, Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed).

6.13.3.1(1)(f) CNSC, Canadian Nuclear Safety Commission.

6.13.3.1(2) Performance Requirements

6.13.3.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.13.3.1(2)(b) Provide a RF and magnetic shield system for the Facility to accommodate the Equipment as set out in Appendix 1H [Equipment and Furniture]. At a

minimum, the RF and magnetic shield system will include the following areas:

6.13.3.1.2.(b).1 Medical Imaging;

(b).1.1 F6.12 Imaging Room – MRI

6.13.3.1.2.(b).2 Radiation Therapy Planning;

(b).2.1 K4.12 Imaging Room – MRI – Simulation

6.13.3.1.2.(b).3 Future CC rooms and spaces refer to Section 5.1.3.

6.13.3.1(2)(c) Coordinate the following in the Design of the RF and magnetic shield system:

6.13.3.1.2.(c).1 Electrical connections to the RF-Filters;

6.13.3.1.2.(c).2 HVAC system to and from the wave guide type RF air vents; and

6.13.3.1.2.(c).3 Piping to and from the RF penetrations.

6.13.3.1(2)(d) Use of the following dissimilar metals in the RF and magnetic shield system will not be permitted:

6.13.3.1.2.(d).1 Dissimilar metals that exhibit an anodic voltage differential greater than 0.25 V;

6.13.3.1.2.(d).2 Copper or aluminum in direct contract with concrete;

6.13.3.1.2.(d).3 Zinc plated framing members in direct contract with copper; and

6.13.3.1.2.(d).4 Copper plated steel or brass framing in direct contract with galvanized steel.

6.13.3.1(2)(e) Provide a RF and magnetic shield system which creates an enclosure to contain RF and/or EMI to ensure proper performance of the MRI equipment.

6.13.3.1(2)(f) The RF and magnetic shield systems will be designed to suit the MRI Equipment as listed in Appendix 1H [Equipment and Furniture], including attenuation of:

6.13.3.1.2.(f).1 Magnetic field;

6.13.3.1.2.(f).2 Electric field;

6.13.3.1.2.(f).3 Plane Wave; and

6.13.3.1.2.(f).4 Sound.

6.13.3.1(2)(g) Flooring Requirements

6.13.3.1.2.(g).1 Provide fully seam soldered, copper sheeting floor underlayment covered with self leveling cement grout.

6.13.3.1.2.(g).2 All wiring trenches and Raceways will be lined with copper and made electrically continuous with the floor panels.

6.13.3.1(2)(h) Ceiling Requirements

6.13.3.1.2.(h).1 Provide RF panels consisting of rigid composition board laminated on both sides, one with copper and one aluminum.

6.13.3.1(2)(i) Door and Window Requirements

6.13.3.1.2.(i).1 Provide door and door frame assemblies which maintain the RF shield integrity by means of a continuous RF door seal around the perimeter of the door.

6.13.3.1.2.(i).2 Provide windows that are minimum 5 mm thick tempered glass both sides, hermitically sealed, with anodized aluminum trim and include a double layer stainless steel RF screen material exceeding the performance of the RF shield in which it's installed.

6.13.3.1.2.(i).3 Provide RF window screens consisting of 304 stainless steel wire cloth and placed at an angle to prevent the Maury Effect and reflections.

6.13.3.1.2.(i).4 Provide Safe IV port will be installed in RF shielded MRI doors to provide safe and easy passage of intravenous lines into the MRI room, without compromising the RF shield and allows infusion pumps and other medical equipment to remain outside the MRI room while remaining fully connected with the Patient.

6.13.3.1(2)(j) Finish Requirements

6.13.3.1.2.(j).1 Provide interior finishes consisting of non-ferrous materials.

6.13.3.1(2)(k) Provide radio-frequency shielding systems and door and frames that conform to CNSC requirements, WSBC, and applicable Health Canada Safety Code (e.g. 35 and 36).

6.13.3.1(2)(l) Provide materials, door and frames and workmanship that maintain continuity of radio-frequency shielding at intended shielding systems and door and frame applications.

6.13.3.1(3) Quality Assurance

6.13.3.1(3)(a) Obtain radio-frequency shielding materials produced as standard products from single manufacturer regularly engaged in production of radio-frequency shielding materials.

6.13.3.1(3)(b) Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

6.13.3.1(3)(c) Installer qualifications: Company specializing in installing the products specified in this section with minimum five years documented experience.

6.13.3.1(3)(d) The Design-Builder will provide a full quality control, inspection, and testing program for all installations and provide verification reports assuring compliance to all requirements.

6.13.3.2 Part 2 Products

6.13.3.2(1) Manufacturers

6.13.3.2(1)(a) Manufacturers (radio-frequency doors and frames): Subject to conformance to requirements of this Section, provide radio-frequency shielded doors and frames by Nelco Worldwide or alternative as approved by the Authority.

6.13.3.2(2) Materials

6.13.3.2(2)(a) Aluminum:

6.13.3.2.2.(a).1 Aluminum extrusions: ASTM B221 extruded aluminum alloy AA-6063- T5 or T6.

6.13.3.2.2.(a).2 Aluminum plate and sheet: ASTM B209/B209M; of type and characteristics to match finished extrusions.

6.13.3.2(2)(b) Stainless Steel:

6.13.3.2.2.(b).1 Stainless steel plate and sheet: ASTM A480/A480M, Type 304, No. 4 finish.

6.13.3.2.2.(b).2 Stainless steel extrusions and shapes: ASTM A276, Type 304, No. 4 finish.

6.13.3.2(2)(c) Copper: To ASTM B283, 12 ounce sheet for door application.

6.13.3.2(3) Radio-Frequency Shielded Door and Frames

6.13.3.2(3)(a) Radio-Frequency Shielded Door:

6.13.3.2.3.(a).1 Solid core door, with two sides laminated with 12 ounce copper.

6.13.3.2.3.(a).2 Door facing to match fibre reinforced laminate (FRL) facing specified in Section 08 14 00.

6.13.3.2.3.(a).3 Fingerless seal: Fingerless seal of continuous brass expansion strips.

6.13.3.2(3)(b) Hinges: Clear anodized continuous aluminum hinge.

6.13.3.2(3)(c) Threshold:

6.13.3.2.3.(c).1 Preassembled threshold and door frame as one unit for optimal shielding integrity.

6.13.3.2.3.(c).2 Zero rise, custom aluminum threshold.

6.13.3.2(3)(d) Pneumatic system: Pneumatic sealing to create a tighter radio-frequency seal.

6.13.3.2(3)(e) Frame: ASTM A276, stainless steel frame, built with tapers on all faces to create a bond with radio-frequency door seals.

6.13.3.3 Part 3 Execution

6.13.3.3(1) Not applicable.

6.14 Conveying Equipment (Division 14)

6.14.1 Section 14 20 00 – Elevators

6.14.1.1 Elevators – General

6.14.1.1(1) The Design-Builder will retain a vertical transportation consultant that is a professional engineering firm specializing in vertical transportation as part of the Project team. The vertical transportation consultant will provide Design and Construction services for the duration of the Project. These services will include a comprehensive vertical transportation analysis for the purposes of determining the number, size and speed of the vertical transportation equipment to suit the requirements of the Facility.

6.14.1.1(2) The comprehensive vertical transportation analysis will determine the number, size and speed of the elevators. The requirements set out in a prescriptive manner herein are based on the Indicative Design and will be considered minimums.

6.14.1.1(3) Submit analysis conforming to performance requirements to demonstrate suitable Design for a contemporary hospital facility of this nature. Submit analysis report to the Authority for review, with report clearly defining all assumptions and basis of analysis. Refer to Vertical Transportation Final Indicative Design Report by GUNN for additional information.

6.14.1.1(4) Refer to LMFM Technical Guidelines Division 14 – Vertical Transportation Technical Guidelines and Compliance Log, that have been provided, as a guideline of requirements for this Project. Design-Builder will complete the Compliance Log and submit to the Authority for review and acceptance under the Review Procedure. Where contradictions exist between the Statement of Requirements and the Technical Guidelines, the most stringent requirement as determined by the Authority will be met.

6.14.1.1(5) Elevator service in the Facility will be evaluated based on demands placed on the system during a typical five-minute, heavy two-way traffic period, (i.e., considerable traffic is being handled in both the UP and DOWN directions), with passenger and vehicles entering and exiting the cars at various floors throughout the elevator round trip.

6.14.1.1(6) Elevator analysis will provide service excellence in health care facilities, is predicated on the projected peak population, of visitors, Patients, and Staff counts, in the Facility and the projected vehicle traffic.

6.14.1.1(7) Handling Capacity

6.14.1.1(7)(a) Public Passenger Elevators will provide vertical transportation for the entire public population plus 25% of the Staff population, for their designated areas;

6.14.1.1(7)(b) Public Passenger Elevators will have a minimum handling capacity of at least 12% of the public and Staff population utilizing these elevators, for a peak 5-minute period;

6.14.1.1(7)(c) Staff and Patient Service Elevators will have a minimum handling capacity of at least 4% of total number of beds and 12% of total Staff population utilizing these elevators for a peak 5-minute period;

6.14.1.1(7)(d) A stair factor of 20% will be applied to Staff traveling between ground level and level 2, and 5% for Staff traveling between ground level and level 3;

6.14.1.1(7)(e) Handling capacity refers to the number of passengers that are transported by the elevator for a prescribed peak 5-minute period.

6.14.1.1(8) Interval

6.14.1.1(8)(a) Interval-based calculations will be used for the public and service elevators; the average interval for adequate elevator service will be between 30 and 50 seconds.

6.14.1.1(8)(b) The interval is defined as the average time between elevator departures from the ground level.

6.14.1.1(8)(c) The interval is defined as the average time between elevator departures from the ground level.

6.14.1.1(9) Load factor: Passenger Elevators will provide adequate service with a load factor below 40%. Staff and Patient Service Elevators will provide adequate service with a load factor below 40% or a minimum of one (1) bariatric bed inclusive of four (4) Staff. Load factor refers to the number of passengers transported by each elevator during one trip expressed as a percentage of the maximum number of passengers permitted by CSA B44 – Safety Code for Elevators and Escalators.

6.14.1.1(10) Separation of traffic: provide distinct separation of traffic types, with dedicated Parking Shuttle Passenger Elevators for parking levels, Public Passenger Elevators for public and Staff use, Staff and Patient Service Elevators for Patient traffic, and a Freight Elevator and MDR Elevators for materials and logistics traffic.

6.14.1.1(11) Elevator locations: elevators will be located to provide separation of traffic types as well as to minimize walking distances.

6.14.1.1(12) Elevator grouping: elevators will be arranged in groupings rather than providing single units at various locations to provide the best elevator service. In consolidating elevator service, traffic congestion, infant security and walking distance will be included in the design.

6.14.1.1(13) Staff/emergency/service elevator cabs: non-public elevators used to transport Patients will be able to accommodate a bariatric bed, up to four Staff, two IV pumps, portable ventilator; and have enough space to allow for Staff to carry out emergency procedures within the elevator and will be capable of transporting at least 12% of the Staff population for a peak 5 minute period.

6.14.1.1(14) Scope of Work

6.14.1.1(14)(a) Provide passenger and service elevators as required to satisfy the equipment and performance specifications as herein described.

6.14.1.1(14)(b) Provide separate groups of elevators for:

6.14.1.1.14.(b).1 Core Hospital Public Passengers;

6.14.1.1.14.(b).2 Cancer Centre Public Passengers;
6.14.1.1.14.(b).3 Staff and Patient Service;
6.14.1.1.14.(b).4 Parking Shuttle Passengers;
6.14.1.1.14.(b).5 MDR Clean;
6.14.1.1.14.(b).6 MDR Soiled; and
6.14.1.1.14.(b).7 Energy Centre Freight.

6.14.1.1(14)(c) Provide heavy duty equipment engineered and designed to provide long term reliable operation and performance based on the needs of the Facility.

6.14.1.1(14)(d) Design and perform the elevator Work in accordance with the latest revision of the LMFM Technical Guidelines Division 14 – Vertical Transportation.

6.14.1.1(14)(e) Provide equipment and perform elevator work in accordance with all applicable standards, codes and regulations; refer to Section 2.4 Standards and Guidelines.

6.14.1.1.14.(e).1 Requirements of the Elevating Devices Safety Regulation and the Safety Standards Act of BC.

6.14.1.1(14)(f) Include all work required for registration, testing and licensing of elevators by jurisdictional authorities.

6.14.1.1(14)(g) Use Good Industry Practice taking into consideration infection prevention and efficient flow, while also addressing movement control requirements.

6.14.1.1(15) Quality Assurance

6.14.1.1(15)(a) All systems will conform to the non-proprietary requirements of the LMFM Technical Guidelines Division 14 – Vertical Transportation, and components will have a demonstrated record of reliable performance, in similar applications, for a minimum of five years.

6.14.1.1(15)(b) Provide equipment capable of maintaining the Authority’s 24/7 operations with power fluctuations up to 10% of normal supply voltage and machine / controller / hoistway temperatures of 0–40°C.

6.14.1.1(16) Trademarks

6.14.1.1(16)(a) Manufacturer / elevator contractor trademarks or logos will not be visible to the public.

6.14.1.1(17) Maintainability

6.14.1.1(17)(a) Provide elevator equipment that will not restrict the ability to engage a competent elevator maintenance contractor other than the original manufacturer / installer for the provision of all maintenance, diagnostic, repair and replacement services. Where microprocessor-based control systems are supplied, provide on-board diagnostic tools and associated manuals containing all set-up parameters, code references and troubleshooting instructions required for routine maintenance, repairs, replacement, refurbishment and operating adjustment procedures.

6.14.1.1(17)(b) Elevator equipment will not include any software, counters, timers, or other devices that will automatically shut down, alter, or otherwise affect normal equipment operation.

6.14.1.1(18) Non-proprietary

6.14.1.1(18)(a) Non-proprietary will refer to all elevator systems and equipment meeting established standards for universal serviceability and maintainability. These standards to include the following elements:

6.14.1.1.18.(a).1 Parts and equipment can be purchased, installed and maintained by any elevator company;

6.14.1.1.18.(a).2 Repairs, upgrades, parts integration, replacement, diagnostic and programming information, tooling at sale or upon request, technical support and training where required to support the products will be readily available for not less than 25 years;

6.14.1.1.18.(a).3 Control systems will include diagnostic tool functions, either onboard or in a separate device provided that such maintenance, adjustment and troubleshooting device or system provides unrestricted access to all parameters, levels of adjustment, and provides alerts for necessary maintenance of the equipment;

6.14.1.1.18.(a).4 A proprietary tool will not be required for any reason. Any lost or damaged tool to be

promptly replaced or repaired at reasonable market cost;

6.14.1.1.18.(a).5 Manuals, engineering drawings, circuit diagrams and prints will be provided with the equipment at time of delivery. All documentation will be available for replacement purchase, at reasonable cost, by any installing or maintaining elevator contractor or persons so designated by the Authority;

6.14.1.1.18.(a).6 Software or software keys will not expire;

6.14.1.1.18.(a).7 Software operation will not degrade, and all service updates to the original software will be provided by the control manufacturer free of charge to the Authority for not less than 25 years; and

6.14.1.1.18.(a).8 The control manufacturer will provide direct support and diagnostic information to the Authority and their designated maintenance company. Factory and/or On-Site training regarding installation, adjustment, maintenance and troubleshooting of the equipment will be available from the original equipment manufacturer for not less than 25 years. Training fees will be reasonable and appropriate to the market.

6.14.1.1(18)(b) Elevators will be designed to ensure maintenance can be carried out within areas that are not used for sterile storage or where Patients are receiving care or treatment.

6.14.1.2 Elevators – Products

6.14.1.2(1) Core Hospital Public Passenger Elevators

6.14.1.2(1)(a) Provide, as a minimum, a group of four (4) overhead traction type passenger elevators serving levels of the Facility which contain Core Hospital Components requiring access by the Public or vendors; refer to Appendix 1A [Clinical Specifications and Functional Space Requirements].

6.14.1.2(1)(b) Elevators will have rated capacity of 1820 kg (4000 lb), minimum rated speed of 2.54 mps (500 fpm).

6.14.1.2(1)(c) Provide entrances at each floor served, with 1220 mm (48”) wide x 2135 mm (7’-0”) high clear

horizontal sliding, centre-opening doors and finished in stainless steel.

6.14.1.2(1)(d) Provide cab configuration to accommodate front openings only. Configurations using both front and rear openings can be confusing to the public and will not be used. All elevators in this group will have stops at the same levels. Car enclosure will have nominal clear inside dimensions of 2340 mm (7’-8”) wide, 1650 mm (5’-5”) deep and a minimum overall height of 2745 mm (9’-0”), with 2590 mm (8’-6”) to underside of suspended ceiling.

6.14.1.2(1)(e) Provide car enclosure with stainless steel fronts, two (2) car operating panels and durable finishes.

6.14.1.2(1)(f) Configure elevators as conventional overhead traction machine type. Locate the machine room directly above the elevator hoistway. Machine room-less type elevators are not acceptable. In addition to the entry/exit door for the machine room, a service access opening with two side by side fire rated doors will be included into the machine room design to facilitate the removal of machines and other machine room equipment from the Facility. Minimum size for such openings will be 1830 mm (72”) wide x 2032 mm (80”) high.

6.14.1.2(2) Cancer Centre Public Passenger Elevators

6.14.1.2(2)(a) Provide, as a minimum, a group of three (3) overhead traction type passenger elevators serving levels of the Facility which contain Cancer Centre Components requiring access by the Public or vendors; refer to Appendix 1A [Clinical Specifications and Functional Space Requirements].

6.14.1.2(2)(b) Elevators will have rated capacity of 1820 kg (4000 lb), minimum rated speed of 1.78 mps (350 fpm).

6.14.1.2(2)(c) Provide entrances at each floor served, with 1220 mm (48”) wide x 2135 mm (7’-0”) high clear horizontal sliding, centre-opening doors and finished in stainless steel.

6.14.1.2(2)(d) Provide cab configuration to accommodate front openings only. Configurations using both front and rear openings can be confusing to the public and

will not be used. All elevators in this group will have stops at the same levels. Car enclosure will have nominal clear inside dimensions of 2340 mm (7’-8”) wide, 1650 mm (5’-5”) deep and a minimum overall height of 2745 mm (9’-0”), with 2590 mm (8’-6”) to underside of suspended ceiling.

6.14.1.2(2)(e) Provide car enclosure with stainless steel fronts, two (2) car operating panels and durable finishes.

6.14.1.2(2)(f) Configure elevators as conventional overhead traction machine type. Locate the machine room directly above the elevator hoistway. Machine room-less type elevators are not acceptable. In addition to the entry/exit door for the machine room, a Utility access opening with two side by side fire rated doors will be included into the machine room design to facilitate the removal of machines and other machine room equipment from the Facility. Minimum size for such openings will be 1830 mm (72”) wide x 2032 mm (80”) high.

6.14.1.2(3) Staff and Patient Service Elevators

6.14.1.2(3)(a) Provide a group of six (6) overhead traction type service elevators serving all occupied levels containing program space; refer to Appendix 1A [Clinical Specifications and Functional Space Requirements]. Two (2) of the elevators will serve all levels containing Major Electrical Equipment and Major Mechanical Equipment (e.g., electrical motors over 7.5 HP rating, equipment too heavy to carry downstairs, etc.).

6.14.1.2(3)(b) Elevators will have rated capacity of 3640 kg (8000 lb.), rated speed of 2.54 mps (500 fpm). Elevators will be engineered to accommodate Class C3 concentrated loads equivalent to the rated capacity with nickel silver sills.

6.14.1.2(3)(c) Provide entrances at each floor served with 1830 mm (72”) wide x 2440 mm (8’-0”) high horizontal sliding, two speed, centre-opening doors and finished in stainless steel.

6.14.1.2(3)(d) Provide car enclosure with minimum nominal clear inside (finished panel to panel) dimensions of 2134 mm (7’-0”) wide, 3050 mm (10’-0”) deep, minimum overall height of 3050 mm (10’-0”), with 2896 mm

(9’-6”) to underside of suspended ceiling or lighting coves.

6.14.1.2(3)(e) Provide car enclosure with stainless steel fronts, a minimum of two (2) car operating panels and durable finishes appropriate to the Facility. Provide nominal 100 mm wide stainless steel hand rail and 155 mm wide stainless-steel crash or bumper rail, bar type, with turned back ends.

6.14.1.2(3)(f) Configure elevators as conventional overhead traction machine type. Locate the machine room directly above the elevator hoistway. Machine room-less type elevators are not acceptable. In addition to the entry/exit door for the machine room, a Utility access opening with two side by side fire rated doors will be included into the machine room design to facilitate the removal of machines and other machine room equipment from the Facility. Minimum size for such openings will be 1830 mm (72”) wide x 2032 mm (80”) high.

6.14.1.2(3)(g) Provide a priority access key switch to be located at the hall entrance on the level containing the cyclotron. This key switch will be used to facilitate the transport of radioactive material. When a priority call is placed an empty elevator will be called to the level where the call was initiated, the elevator will be temporarily removed from the group, and will complete a trip before being returned to group operation.

6.14.1.2(4) Parking Shuttle Passenger Elevators

6.14.1.2(4)(a) Provide, as a minimum, two (2) Parking Shuttle Passenger Elevators servicing levels as required by the Facility.

6.14.1.2(4)(b) The Parking Shuttle Passenger Elevators will have capacity of 1588 kg (3500 lbs), minimum rated speed of 0.76 mps (150 fpm).

6.14.1.2(4)(c) Provide entrances at each floor served, with 1067 mm (42”) wide x 2135 mm (7’-0”) high clear horizontal sliding, centre-opening doors and finished in stainless steel. Elevator cabs will be provided so that the specified door type and cab finishes do not inhibit conformance to stretcher accessibility requirements.

6.14.1.2(4)(d) Provide cab configuration to accommodate front openings only. Configurations using both front and rear openings can be confusing to the public and will not be used. Car enclosure will have nominal clear inside dimensions of 2032 mm (6’-8”) wide, 1650 mm (5’-5”) deep and a minimum overall height of 2745 mm (9’-0”), with 2590 mm (8’-6”) to underside of suspended ceiling.

6.14.1.2(4)(e) Provide car enclosure with stainless steel fronts, two (2) car operating panels and durable finishes.

6.14.1.2(5) Clean and Soiled MDR Elevators

6.14.1.2(5)(a) Provide, as a minimum, two (2) dedicated MDR holeless hydraulic type elevators at the speed specified herein. Front and rear openings may be acceptable to the Authority on a case-by-case basis.

6.14.1.2(5)(b) The MDR elevator groups will be configured to function as simplex groups. The MDR elevators will be configured to arrive at designated floors, hold doors open until cart is removed and the car call is registered.

6.14.1.2(5)(c) The Clean and Soiled elevator groups will be in completely isolated hoistways from each other and any other elevators, and not share any common space.

6.14.1.2(5)(d) Clean and Soiled MDR Elevators will be dedicated and serve all levels required by the Facility. Front and rear openings may be permitted for these elevators as determined with the Authority.

6.14.1.2(5)(e) Clean and Soiled MDR Elevators will have rated capacity of 2045 kg (4500 lb.) and a minimum rated speed of 0.76 mps (150 fpm).

6.14.1.2(5)(f) Car enclosure will have minimum nominal clear inside dimensions of 1730 mm (5’-8”) wide, 2440 mm (8’-0”) deep and a minimum overall height of 2745 mm (9’-0”), with 2590 mm (8’-6”) clear to underside of ceiling. The cabs will be provided with flat handrails and crash or bumper rails.

6.14.1.2(5)(g) Provide entrances at each floor served with 1220 mm (4’-0”) wide x 2135 mm (7’-0”) high heavy-duty,

horizontally-sliding, two-speed side-opening doors and finished in stainless steel.

6.14.1.2(5)(h) Provide each car enclosure with stainless steel finish on the access wall elevations. Elevators with a single opening are to be provided with one (1) car operating panel while elevators with front and rear openings are to be provided with two (2) car operating panels. Provide 100 mm high stainless steel hand rail and 155 mm high stainless steel foot / crash or bumper rail, flat type, with turned back ends.

6.14.1.2(5)(i) Provide visual and audible indicator to notify Staff that the elevator car has arrived.

6.14.1.2(5)(j) In conformance with the latest version of the LMFM Technical Guidelines Division 14 – Vertical Transportation, ensure that pit floors and interior wall surfaces for the height of the respective Clean and Soiled MDR Elevator hoistways are treated with a white high-gloss, anti-microbial, durable paint.

6.14.1.2(6) Energy Centre Freight Elevator

6.14.1.2(6)(a) As a minimum, provide one (1) holeless hydraulic type freight elevator for the Energy Centre.

6.14.1.2(6)(b) The Energy Centre Freight Elevator will be dedicated and serve all levels required by the Facility. Front and rear openings may be acceptable to the Authority on a case-by-case basis.

6.14.1.2(6)(c) The Energy Centre Freight Elevator will have minimum rated capacity of 3630 kg (8000 lbs), minimum rated speed of 0.76 mps (150 fpm). The elevator will be engineered to accommodate Class C3 concentrated loads equivalent to the rated capacity.

6.14.1.2(6)(d) Car enclosure will have minimum nominal clear inside dimensions of 3050 mm (10’-0”) wide, 3530 mm (11’-7”) deep and a minimum overall height of 2438 mm (8’-0”) clear to underside of ceiling. The cabs will be provided with flat handrails and crash or bumper rails.

6.14.1.2(6)(e) Provide entrances at each floor served with nominal 3050 mm (10’-0”) wide and 2438 mm (8’-0”) high heavy-duty vertical bi-parting doors. Entrance frames and door panels finished in stainless steel.

6.14.1.2(6)(f) Provide car enclosure with stainless steel fronts, a minimum of one (1) car operating panels and durable finishes appropriate to the Facility.

6.14.1.2(7) Traction Elevator Equipment

6.14.1.2(7)(a) All equipment supplied will include a design and supply life of a minimum of 25 years.

6.14.1.2(7)(b) Gearless traction equipment will be provided. Geared traction machines are not acceptable.

6.14.1.2(7)(c) Provide sound and vibration isolation pads such that there is no direct contact between the machine and the Facility structure.

6.14.1.2(7)(d) Elevators and related systems will be adequately isolated from the Facility structure to prevent noise intrusion into Noise Sensitive Spaces (as defined in Schedule 1, Appendix 1D, Section 3.j.) that are not directly serviced by the elevators. Elevator noise in Noise Sensitive Spaces will be inaudible or measured to not increase any of the 1/3rd octave bands by more than 2 dB LSmax between 50 and 8000 Hz above measured background sound levels during any point in elevator operations.

6.14.1.2(7)(e) Provide an emergency brake to stop the elevator if it overspeeds or if unintended motion is detected in accordance with CSA B44.

6.14.1.2(7)(f) Provide a fully regenerative solid state AC motor drive complete with isolation transformers and filters to meet IEEE Standard 519.

6.14.1.2(7)(g) Provide digital encoders to provide closed loop feedback to the controller on car speed and position.

6.14.1.2(7)(h) All major components, including controllers, door operators, drives and machines will be non-proprietary to allow for comprehensive maintenance, diagnostics and On-Site programming without the use of special tools or proprietary software. Acceptable controller

manufacturers are MCE or equivalent manufacturer as approved by the Authority. Elevator contractor should select the appropriate product from the manufacturer range to suit the features required for each elevator.

6.14.1.2(7)(i) Provide a microprocessor-based controller consisting of relays, contactors, switches, capacitors, resistors, fuses, circuit breakers, overload relays, power supplies, circuit boards, static drive units, wiring terminal strips, and related components all enclosed in a cabinet with hinged door panels.

6.14.1.2(7)(j) Equipment will be rated for high usage, based on 240 starts per hour.

6.14.1.2(7)(k) Including for guarding of equipment consistent with requirements of CSA B44 and local standards and regulations.

6.14.1.2(8) Hydraulic Elevator Equipment

6.14.1.2(8)(a) All equipment supplied will include a design and supply life of a minimum of 25 years.

6.14.1.2(8)(b) Provide sound and vibration isolation pads such that there is no direct contact between the power unit and the structure.

6.14.1.2(8)(c) All major components, including controllers, door operators, valves and pumps will be non-proprietary to allow for comprehensive maintenance, diagnostics and On-Site programming without the use of special tools or proprietary software. Acceptable controller manufacturers are MCE 2000 or equivalent MCE manufactured equipment as approved by the Authority.

6.14.1.2(8)(d) Provide a microprocessor-based controller consisting of relays, contactors, switches, capacitors, resistors, fuses, circuit breakers, overload relays, power supplies, circuit boards, wiring terminal strips, and related components all enclosed in a cabinet with hinged door panels.

6.14.1.2(8)(e) For hydraulic elevators not equipped with safeties, a pipe rupture down overspeed pit valve will be provided at the input to the cylinder(s), to stop the elevator in the event of an overspeed condition

caused by a broken supply line or an abnormally high rate of flow from cylinder to tank.

6.14.1.2(8)(f) Provide heat exchangers as follows:

6.14.1.2.8.(f).1 The heat exchanger will be sized to accommodate constant use of the elevator while maintaining a maximum oil temperature of 40°C.

6.14.1.2.8.(f).2 The heat exchanger will include a temperature-controlled pump and fan.

6.14.1.2.8.(f).3 The heat exchanger will be mounted outside of the machine room unless site constraints require installation in the machine room.

6.14.1.2(9) Hoistway Equipment

6.14.1.2(9)(a) Provide entrances consisting of heavy-duty commercial-grade doors, frames, sills, sight guards, door hangers, tracks, interlocks, door closers, gibs, and all other equipment required for a complete installation. Provide entrance doors and frames finished in brushed stainless steel.

6.14.1.2(9)(b) Provide standard ‘T’-section steel guide rails for the car and counterweight. Install guide rails using brackets fastened to the Facility structure. Clamp the guide rails to the bracket with clips arranged to prevent any horizontal movement of the rail. Join the rail sections using steel backing plates.

6.14.1.2(9)(c) For traction-type elevators, provide hoist ropes/belts of sufficient size and number to lift the load and ensure proper wearing qualities. Provide steel ropes consisting of at least six strands wound around a hemp core centre. Ensure that all the ropes for a particular elevator are from the same manufacturing run.

6.14.1.2(9)(d) For traction-type elevators, provide a counterweight to counterbalance the elevator for smooth and economical operation with cast iron or steel plate weights contained in a structural steel frame. Provide a counterweight equal to the weight of the elevator car plus between 45 and 50% of the rated capacity.

6.14.1.2(9)(e) For hydraulic type elevators, provide jack and cylinder as follows:

6.14.1.2.9.(e).1	Hole-less single-stage and two-stage telescopic hydraulic elevators are acceptable. Holed hydraulic elevators and roped hydraulic elevators are not acceptable.
6.14.1.2.9.(e).2	Supply will include a complete twin jack unit consisting of cylinders, pistons, piston stop rings, guide bearings and packing, all designed to suit the service, the speed, and the rated capacity.
6.14.1.2.9.(e).3	Means will be provided to automatically maintain the synchronization between the twin jacks (e.g. lower elevators to bottom landing and synchronize jacks, once daily).
6.14.1.2.9.(e).4	The Design-Builder will coordinate with the elevator contractor to assume responsibility for all hydraulic equipment, including the cylinders, under the terms of both the guaranteed and full-service maintenance agreements.
6.14.1.2.9.(e).5	The pistons will be sized to suit the travel without requiring intermediate support.
6.14.1.2.9.(e).6	Supporting machine beams will be included as required.
6.14.1.2.9.(e).7	Hydraulic jacks will be installed plumb to within 1/32 inch (0.8 mm) over the length of the cylinder casing and will be parallel with the guiderails to within 1/16 inch (1.6 mm) over the length of the fully extended pistons.

6.14.1.2(9)(f)	Provide for the car, and counterweight, spring mounted roller guides located at the top and the bottom of the car, and counterweight frame if applicable.
6.14.1.2(9)(g)	Provide fascias from each hall sill to the entrance header below. Include express zones. Extend the fascias into the pit and the overhead. Alternatively provide a CSA B44-certified car door interlock if fascias are not provided.
6.14.1.2(9)(h)	Provide sound-isolated car platform.
6.14.1.2(9)(i)	Provide a car frame constructed of steel channels and a platform constructed of steel channels with a metal sub-floor. Isolate the frame and platform from one another so that there is no metal-to-metal contact in order to prevent the transmission of noise and vibration. Mount the elevator cab shell on the

platform in alignment with the hoistway entrances. Isolate the cab from the car frame and platform.

6.14.1.2(9)(j) Install the elevator cabs with a running clearance of 3/4” to 1” maximum between the car sill and hall sills to allow for smoother movement of wheeled equipment in and out of the elevators.

6.14.1.2(9)(k) Details of vibration isolation will show the method of isolation as well as isolation material proposed and will meet the requirements as set out in Appendix 1D [Acoustic, Vibration and Noise Control Measures].

6.14.1.2(9)(l) Paint all elevator pits up to the sill. Paint Clean and Soiled MDR Elevator hoistways in their entirety.

6.14.1.2(10) Cab Equipment

6.14.1.2(10)(a) Provide a heavy-duty closed-loop door operator to open and close the car and hoistway doors simultaneously. The door operator will be manufactured by GAL or alternative as approved by the Authority. For all elevators provide the Unitec model ABA6940CD folding door restrictor or alternative as approved by the Authority.

6.14.1.2(10)(b) Provide an infra-red multiple beam door protective device, Panachrome 3d door detector, that protects the full width and up to 1830 mm (6’-0”) from the floor of the door opening.

6.14.1.2(10)(c) Provide durable cab finishes which are consistent with other Facility components, or as specified elsewhere. All finishes and cab design will be reviewed with and accepted by the Authority prior to manufacturing. Design will limit reveals, ledges, or gaps that are difficult to clean. All surfaces will be able to withstand disinfection chemicals used by housekeeping.

6.14.1.2(10)(d) The Staff and Patient Service Elevators and MDR Elevators will be equipped with a durable rubber flooring surface suitable for health care facilities, including a minimum thickness of 3 mm. Products will be slip-resistant, resilient flooring with anti-microbial properties and installed without joints. Flooring installation will permit the complete flooring

to be removed independently of other elevator components.

6.14.1.2(10)(e) The public passenger elevators will be equipped with a durable flooring surface suitable for healthcare facilities and approved by the Authority.

6.14.1.2(10)(f) For each elevator with centre-opening doors provide two (2) car operating panels. Otherwise, provide one (1) car operating panel per elevator.

6.14.1.2(10)(g) For front and rear opening elevators, car operating panels will be provided at both ends of the cab.

6.14.1.2(10)(h) Include, as part of the car equipment, the following:

- 6.14.1.2.10.(h).1 Stainless steel car fronts, including doors, return panels, transom panels;
- 6.14.1.2.10.(h).2 For passenger elevators, provide ceiling, lighting and durable cab interior finishes consistent with requirements of the LMFM Technical Guidelines Division 14 – Vertical Transportation. Provide cylindrical type, stainless steel handrails (38 – 50 mm in diameter) that are easily grasped. All Public Passenger Elevators will have Ligature Resistant and Tamper Resistant finishes, including handrails;
- 6.14.1.2.10.(h).3 For all Staff and Patient service elevators, provide ceilings and indirect LED cab interior lighting consistent with the LMFM Technical Guidelines Division 14 – Vertical Transportation. Include raised panels with 5WL textured stainless steel cladding on all non-access walls. Provide a 120 V duplex receptacle in all cabs. Provide flat-type 6 mm thick solid stainless steel hand (100 mm) and bumper (155 mm) rails with turned back ends;
- 6.14.1.2.10.(h).4 For all Clean and Soiled MDR Elevators, provide ceilings and cab interior lighting consistent with the LMFM Technical Guidelines Division 14 – Vertical Transportation. Include raised panels with 5WL textured stainless steel cladding on all non-access walls. Provide flat-type 6 mm thick solid stainless steel hand (100 mm) and bumper (155 mm) rails with turned back ends;
- 6.14.1.2.10.(h).5 Car operating panel(s), including LED illuminating floor buttons with audible call registration tone;

6.14.1.2.10.(h).6	In each car operating panel provide a digital (dot matrix or segmented) car position indicator with a minimum 50 mm (2") high display that will show the current elevator location and direction of travel. Additional display panels are to be provided in the car operating panel; the position indicator will be integrated into the programming of the display panel. Display screen will be capable of displaying emergency messages such as medical emergency, fire recall, wandering Patient, out of service, under maintenance as required by the Facility. Provide a locally or remotely programmable 15” (381 mm) LCD monitor inside each public passenger elevator as part of the car operating panel;
6.14.1.2.10.(h).7	Jumbo car operating panel buttons are to be provided for all elevators. The elevator contractor will submit details of these fixtures to the Authority for approval;
6.14.1.2.10.(h).8	Voice synthesizer with automatic verbal announcement of each floor;
6.14.1.2.10.(h).9	Emergency battery-powered lighting;
6.14.1.2.10.(h).10	Variable speed ventilation fan complete with HEPA air filtration system to ensure that air distributed through the elevator cabs has first passed through a filter. Filter will be configured to permit access and replacement from inside the elevator cab by non-elevator personnel, yet not be visible at other times;
6.14.1.2.10.(h).11	Advanced elevator cleaning devices (e.g. UV Scrubbing technology) to minimize transmission of bacteria and viruses within the elevator cabs;
6.14.1.2.10.(h).12	Firefighters' emergency operation panel;
6.14.1.2.10.(h).13	Service cabinet and switches;
6.14.1.2.10.(h).14	Provision for Wi-Fi access point installation within each elevator cab; and
6.14.1.2.10.(h).15	Other features required for normal operation.

6.14.1.2(10)(i)	Do not install any certificates or licences in the cab. Arrange and pay for a variance from the Authority, if required.
6.14.1.2(10)(j)	Provide one set of cab protective pads for each group of elevators that cover all walls and the cab front return panel along with pad hooks. Provide pad hooks in all elevators.

6.14.1.2(10)(k) Provide heavy duty folding door restrictor.

6.14.1.2(10)(l) Elevators will be constructed with provisions for MEO operation.

6.14.1.2(10)(m) All elevators will be equipped with voice communication system as follows:

- 6.14.1.2.10.(m).1 Hands-free, one button, two-way voice intercommunication / telephone system with a lobby station and remote handset;
- 6.14.1.2.10.(m).2 One (1) dedicated phone line will be provided for each elevator cab. Coupling or combination of phone lines is not acceptable;
- 6.14.1.2.10.(m).3 CPC-1 Return to Dial Relay on all elevator phones is preferred to allow the phone to immediately disconnect when the operator hangs up, permitting the cab occupants to place an additional call. The CPC-1 will be installed directly on the elevator phone or in the communication/telecom area. Alternatives to a CPC-1 may be installed if approved by the Authority;
- 6.14.1.2.10.(m).4 Provide communication from each car enclosure to designated CACF in the Facility and to a remote Off-Site monitoring station;
- 6.14.1.2.10.(m).5 Elevator phones will have the capability of being programmed to auto-dial to an internal number or outside monitoring station. The phone will attempt to redial appropriate numbers within 15 second intervals if a call is not answered or if a call is dropped without receiving a hang up signal; and
- 6.14.1.2.10.(m).6 Provide electromagnetic interference (EMI) filter for each elevator phone.

6.14.1.2(11) Hall Signals and Equipment

6.14.1.2(11)(a) Provide hoistway access switches located in the entrance frame or in the hall door sight guard at the top and bottom landing for each elevator regardless of the car speed or floor-to-floor height for safe access to the car top and pit areas.

6.14.1.2(11)(b) Provide hoistway doors on all levels served by the elevators, with standard landing door unlocking devices.

6.14.1.2(11)(c) For elevator groups with three (3) cars or more, provide a minimum of two hall stations on each

level, centrally located between the elevator entrances.

6.14.1.2(11)(d) For single car or two (2)-car elevator groups, provide one riser of hall stations, locating the fixtures between adjacent elevators in two (2)-car groups.

6.14.1.2(11)(e) Provide in each hall station illuminating up and down oversized push buttons (at terminal floors, provide only one button located with their centreline 1070 mm ± 25 mm (42" ± 1") above the floor.

6.14.1.2(11)(f) Hall call buttons to be selected from manufacturer top of line or third-party series and confirmed with the Authority. All car and hall call button illuminations to be LED type with oversized button style and stainless steel finish.

6.14.1.2(11)(g) For each elevator, provide a digital (dot matrix or segmented) hall position indicator located above all elevator entrances with a minimum 50 mm (2") high display. Position indicators will indicate at a minimum, MEO, Independent Service, Out of Service, and Fire Recall.

6.14.1.2(11)(h) Provide hall lanterns with dual stroke electronic arrival chime and adjustable volume control above all elevator entrances. Hall lanterns will be designed to allow 180 degree viewing of direction indicators.

6.14.1.2(11)(i) For each group of elevators, provide a properly labelled fire recall keyswitch and keybox in one hall station at the main lobby level. Activation of the keyswitch will initiate phase one of firefighters' operation.

6.14.1.2(11)(j) For each group of elevators, provide an emergency power selection switch and LED indicator, labelled "Elevator Emergency Power", in a separate emergency feature hall fixture at the main floor. Indicator will illuminate when elevators are operating on emergency power.

6.14.1.2(11)(k) For each elevator group, with the exception of the MDR elevators, the parking shuttle elevators, and the Energy Centre Freight elevator, provide one covered hall button at each hall station for "MEO"

operation. Pressing the button will initiate stage 1 of “MEO” and illuminate an LED to confirm that demand is registered.

6.14.1.2(11)(l) For the MDR Elevators, provide each elevator with a remote combination type fixture containing a directional arrow, position indicator and electronic arrival chime (complete with adjustable volume control). Fixture faceplate will be finished in stainless steel and configured as either a surface or flush mounted fixture to suit the mounting location. Display characters for the directional arrow and position indicator will have a minimum height of 60 mm. Provide hardware, conduit and conductors required to support the remote mounting of each fixture allowing for these fixtures to be up to 25 metres from the associated elevator hoistway.

6.14.1.2(11)(m) Provide elevator control panels within the Facility CACF and provide a lobby panel for the elevators including car position indicators, elevator lobby telephone handset and remote firefighter’s emergency operation key switch and indicators, and any other elements required by the specification or governing codes and regulations. For each elevator, provide an electronic indicator to indicate when the elevator is out of service.

6.14.1.2(11)(n) Unless noted otherwise, all stainless steel finishes will be manufacturer’s standard ASTM type 304, brushed #4 finish.

6.14.1.2(11)(o) Provide wrap-around stainless steel door jamb protection up to 1350 mm above finish floor for all elevators.

6.14.1.2(12) Electric Wiring

6.14.1.2(12)(a) Provide copper wiring to connect the equipment.

6.14.1.2(12)(b) Run all wire in metal conduit, duct or electrical metallic tubing.

6.14.1.2(12)(c) Run travelling cable between car stations and the controller in the machine room, without use of mid-way junction boxes. All travelling cables will be round, as flat travelling cables are not permitted.

6.14.1.2(12)(d) In addition to the wiring required for elevator operations, provide special wiring to support

installation of two-way voice communication, wireless access points, security card readers, security IPVS camera, and video display screen within each car enclosure. If not used at the time of initial installation, label the unused special wires and provide a neat coil of at least five (5) feet of cable within an interface box mounted on side of each controller.

6.14.1.2(12)(e) Design-Builder will coordinate with the elevator contractor to ensure that wireless access points mounted in the elevator cabs will not interfere with the operation of the elevator. See LMFM Technical Guidelines Division 14 – Vertical Transportation, part 18 travelling cables, for identification of minimum spare cabling required and further requirements.

6.14.1.2(12)(f) Provide at least ten percent (10%) spare of each wire type in each travelling cable.

6.14.1.2(12)(g) Provide adjacent each controller a separate junction box or boxes for non-elevator devices such as telephones, cameras, wireless access points, video display screens and security systems.

6.14.1.2(13) Accessory Systems

6.14.1.2(13)(a) Provide a hands-free, two-way voice communication system in each elevator, with a central CACF lobby rescue station and remote handset located in Facilities Management Office. One (1) dedicated phone line per elevator car. Provide system that will permit two-way communication between any station location and each car enclosure, remote CACF, the Authority's remote 24/7 switchboard, and control/machine room(s).

6.14.1.2(13)(b) Stations inside each machine room will be configured to communicate with master stations, remote stations, other machine room stations and as a minimum with elevators with equipment contained inside the respective room. System features will include a CPC-1 Return to Dial Relay at the lobby phone if not available on the elevator phone to allow the phone to immediately disconnect when the operator hangs up, permitting the cab occupants to place an additional call. Refer to

Section 7.8 Communications (Division 27) for elevator phone wiring requirements.

6.14.1.2(14) Operational Features

6.14.1.2(14)(a) For all elevators provide:

6.14.1.2.14.(a).1 Group supervisory, full selective collective operation;

6.14.1.2.14.(a).2 AC VVVF motion control (traction elevators only);

6.14.1.2.14.(a).3 Independent service operation (green collar);

6.14.1.2.14.(a).4 Firefighters' emergency operation phase 1 and 2;

6.14.1.2.14.(a).5 Emergency power operation;

6.14.1.2.14.(a).6 Inspection operation; and

6.14.1.2.14.(a).7 Hoistway access operation.

6.14.1.2(14)(b) For all elevators, provide a personnel card reader in each car operating panel. For Staff and Patient Service elevators, MDR Elevators, and the Energy Centre Freight Elevator, the personnel card will be used to activate the elevator to go to that floor. For public passenger elevators, no personnel card reader will be required during normal hours of operation other than to restrict access to mechanical or other non-public levels. After-hours access to any of the floors will require personnel card reader to activate the elevator.

6.14.1.2(14)(c) Provide restricted access to all mechanical levels. Both key and card reader access will be provided.

6.14.1.2(14)(d) Key switches will be keyed and colour coded in accordance with requirements of LMFM Technical Guidelines or as otherwise directed.

6.14.1.2(14)(e) Provide Patient Wandering System operation for elevators providing access to inpatient levels, which lock-down the elevators when activated.

6.14.1.2(14)(f) Horizontal threshold gap between car and landing sills will be set between ¾" and 1" to mitigate risk of wheeled equipment from getting stuck between the sills.

6.14.1.2(15) Medical Emergency Operation (MEO) features

6.14.1.2(15)(a) Provide "MEO" feature for all elevators with the exception of the MDR Elevators, parking shuttle elevators, and the Energy Centre Freight Elevator.

Provide stage 1 push button and indicator in hall stations at each floor level and stage 2 push button and indicator in each elevator car operating panel.

6.14.1.2(15)(b) Definitions

6.14.1.2.15.(b).1 MEO stage 1 operation occurs when an elevator is recalled directly to the level requested by Staff.

6.14.1.2.15.(b).2 MEO stage 2 operation occurs once stage 1 is complete and MEO has been initiated from inside the elevator, and the elevator travels non-stop to the designated stop.

6.14.1.2(15)(c) MEO will be pre-wired and fully installed on all elevators which require priority access by medical emergency Staff. Controller platforms will be configured to permit this feature to be activated.

6.14.1.2(15)(d) MEO will be installed to enable medical Staff to provide the most rapid care possible in an event or urgent transfer of materials on as near to all elevators as possible to account for elevator use changing over time.

6.14.1.2(15)(e) MEO stage 1 will be initiated by a hall push button and stage 2 will be initiated by an in-car push button in all instances. MEO buttons will have a blue collar, and a blue cover (to be provided by the Authority).

6.14.1.2(15)(f) MEO Stage 1 will be initiated at all hall entrances.

6.14.1.2(15)(g) During stage 1, an illuminating indicator and voice synthesizer will indicate that passengers will exit the cab at the floor at which MEO was initiated.

6.14.1.2(15)(h) During stage 1 and 2, the hall MEO button will illuminate and flash to indicate when an elevator has been called for a MEO.

6.14.1.2(15)(i) During stage 1 and 2, all position indicators in the car and hall will indicate that the elevator has been called for a MEO.

6.14.1.2(15)(j) Remote call locations will be enabled to initiate MEO for the convenience of emergency Staff.

6.14.1.2.15.(j).1 Other locations that potentially expedite MEO operation to ensure faster elevator response times will be considered with the Authority;

6.14.1.2.15.(j).2 Design considerations will be included to prevent false MEO initiations from these remote locations.

6.14.1.2(15)(k) MEO operation will be terminated automatically after a pre-determined amount, field programmable between 0 and 60 seconds of time following the elevator arriving at its designated stop.

6.14.1.2(15)(l) If firefighter's emergency operation (FFEO) is initiated when MEO stage 2 is in effect, the elevator effected will not respond to the FFEO signal until MEO stage 2 has terminated.

6.14.1.2(16) Elevator Management System

6.14.1.2(16)(a) Provide an interactive, network based, non-proprietary EMS consistent with requirements of the LMFM Technical Guidelines Division 14 – Vertical Transportation. System will be MCE iMonitor or alternative as approved by the Authority. This single system will be interfaced with all elevators and will be capable of sending data through the Facility BMS or alternative cabling system provided by others.

6.14.1.2(16)(b) If BMS terminations are not available in the machine room or within an acceptable distance, include one (1) campus area network (CAN) Ethernet data ports inside each elevator machine room and a single CAN Ethernet data port in the final mounting location for both EMS terminals.

6.14.1.2(16)(c) As part of EMS, provide two dedicated terminals including one in the Energy Centre control room. Final mounting location of the remaining terminal will be confirmed during the Design.

6.14.1.2(16)(d) Provide complete training of EMS features to Staff and demonstrate operation of the system for all elevators and associated monitoring points.

6.14.1.2(16)(e) Configure system to automatically trigger fault alarms at the EMS terminals when an elevator shuts down.

6.14.1.2(17) Cabinets and Spare Parts

6.14.1.2(17)(a) Refer to Appendix 1Y [Spare Parts and Extra Stock Materials].

6.14.1.3 Execution

6.14.1.3(1) Performance

6.14.1.3(1)(a) Levelling: Arrange that the car stops within 3 mm (1/8") of the floor level. Ensure that levelling accuracy is not influenced by load inside the car with the same levelling accuracy achieved at no load and full load and any load in between.

6.14.1.3(1)(b) Adjust the door equipment so that the noise level is less than 62 decibels during a full door open and door close operation. Measure the noise levels using a sound level meter set to the "A" scale for a fast response.

6.14.1.3(1)(c) Arrange the machine room equipment so that the noise level with the elevator running is less than 80 decibels. Measure the noise levels using a sound level meter set to the "A" scale for a fast response.

6.14.2 Section 14 92 00 – Pneumatic Tube System

6.14.2.1 Part 1 General

6.14.2.1(1) Performance Requirements

6.14.2.1(1)(a) Provide a computerized PTS that interconnects and serves the areas described in Appendix 1A [Clinical Specifications and Functional Space Requirements] with automated secure on-demand transport of light materials and health care products.

6.14.2.1(1)(b) Provide pneumatic tube stations in all locations noted in Appendix 1A [Clinical Specifications and Functional Space Requirements]. All pneumatic tube stations will be equipped with a control panel that includes a touch-screen display allowing carrier dispatch requests.

6.14.2.1(1)(c) The location of the PTS head end will either be located within the FMO/AM component or the Energy Centre as determined in consultation with the Authority.

6.14.2.1(1)(d) Provide ten (10) leak-resistant carriers for every new station with replicable rubbing bands and foam liners with a secure, lockable integral seal to transport fluid containers, including IV bags, blood products, bodily fluid samples, some small medical

equipment and pharmaceutical products. Provide ten (10) tube cleaning devices / carriers for the Facility.

6.14.2.1(1)(e) Provide a pneumatic tube station study that outlines the capacity, anticipated wait times, anticipated transit times, and anticipated daily transactions of the PTS. Pneumatic tube station will include speed and temperature evaluations and audits.

6.14.2.1(1)(f) The placement of each of the pneumatic tube stations will allow Convenient Access for Staff, have adequate counter space and storage for preparing and receiving material, and proper lighting for all times of day. Pneumatic tube stations are not permitted in public areas or to have public access.

6.14.2.1(1)(g) Pneumatic tube system (PTS) to meet the following criteria:

- 6.14.2.1.1.(g).1 Be designed and constructed such that it can be expanded in the future to allow the Authority to install additional pneumatic tube stations, diverters and blowers with minimal disruption, and connect to pneumatic tube stations located within the Facility. Provide PTS connection points at all Future Expansion links including the below grade connection described in Section 4.4.3.4 such that the Authority can easily expand the Facility's PTS to serve the Future Expansion;
- 6.14.2.1.1.(g).2 Be a 150 mm diameter tube send/down receive system;
- 6.14.2.1.1.(g).3 Provide a receiving and management area to support the functional requirements and volumes in the Laboratory component;
- 6.14.2.1.1.(g).4 Be capable of collecting a minimum of 30 days of historical traffic data to include source station address, destination station address, send request time, carrier dispatch time, carrier wait time (the time it takes for the carrier to leave the source station after the send button is pressed), carrier transit time and the time the carrier reached its destination station;
- 6.14.2.1.1.(g).5 Never be installed directly above, in or through Communications Rooms or Electrical

Rooms. This includes the adjoining walls and the floor and ceiling slab:

(g).5.1 Be designed to accommodate the requirements of the Facility in a manner that contributes to the overall efficiency and effectiveness of the Authority's 24/7 operations;

(g).5.2 Be capable of slower delivery speed for gentle handling and soft delivery of sensitive items, such as blood products and glass containers, while increasing the speed of empty carriers;

(g).5.3 Will have control wiring run in conduit only;

(g).5.4 Be a computer-controlled pneumatic tube materials distribution system with RFID technology for tracking and status updates, consisting of tubing, stations, transfer units, blower packages, carriers, and a control system;

(g).5.5 Be integrated into the BMS with wireless mobile technology for demand maintenance;

(g).5.6 Utilize Ethernet data communications between pneumatic tube stations and controllers;

(g).5.7 Include all necessary transfer units, user stations and carriers through a strategically designed tubing network in a configuration that is optimized for overall PTS performance;

(g).5.8 Have transaction times supported through a pre-installation virtual system simulation conducted by the Design-Builder;

(g).5.9 Allow the dispatching, routing and storage of carriers to be directed by a system control centre to provide automatic unattended transmission of carriers between two stations;

(g).5.10 Have recessed type stations; no virtual stations will be allowed;

(g).5.11 Have stations located to minimize Staff travel distance;

(g).5.12 Include no more than ten (10) stations per zone;

(g).5.13 Provide each zone with its own blower and to allow it to function independently;

(g).5.14 Include a minimum one (1) spare port at each transfer unit;

(g).5.15 Contain receiving bin liners at each station to contain any spills;

(g).5.16 Have a modular design of system components that will permit changes in the number of stations and/or zones as Authority requirements change in the future;

(g).5.17 Locate transfer stations to be accessible for maintenance purposes in areas where Patients are not receiving care or treatment;

(g).5.18 Have directly adjacent a dedicated, standing-height Millwork countertop with two deep drawers below for storage;

(g).5.19 Provide remote arrival indication through a system of audio and visual devices that notify users that a carrier has arrived at the station. Locate the arrival indicator adjacent to a station or in a remote location as determined with the Authority;

(g).5.20 Be designed in accordance with Appendix 1D [Acoustic, Vibration, and Noise Control Measures] and include noise reduction features such as:

(g).5.20.1 Energy-absorbing carrier-receiving ramps consisting of padded, liquid-resistant nylon; and

(g).5.20.2 Impact-absorbing receiving cushions made of similar material to absorb the shock of the carrier arrival in the station bins.

(g).5.21 Be designed and constructed for a Design Life as set out in Section 3.8, and for resilience to routine and accident cleaning and disinfection with equipment and tested cleaning agents recommended by the Authority's Infection Control Practitioner.

6.14.2.2 Part 2 Products

6.14.2.2(1) Materials

6.14.2.2(1)(a) Materials, General

6.14.2.2.1.(a).1 Provide reinforcing and anchorage for built-in products.

6.14.2.2.1.(a).2 Equipment to include all electrical components required by jurisdictional authorities, and to protect the equipment from damage during operation.

6.14.2.2.1.(a).3 Equipment to include all components, connections, devices, and controls required to make it fully and safely operable.

6.14.2.3 Part 3 Execution

6.14.2.3(1) Not applicable.

6.15 Material Processing and Handling Equipment (Division 41)

6.15.1 Section 41 22 23 – Manual and Electric Hoist Trolley Equipment Lifts

6.15.1.1 Part 1 General

6.15.1.1(1) References

6.15.1.1(1)(a) ASME B30.16, Overhead Underhung and Stationary Hoists.

6.15.1.1(1)(b) ASME HST-1, Standard for Electric Chain Hoists.

6.15.1.1(1)(c) ASME HST-2, Performance Standard for Hand Chain Manually Operated Chain Hoists.

6.15.1.1(1)(d) CSA C22 No. 14, Industrial Control Equipment.

6.15.1.1(2) Performance Requirements

6.15.1.1(2)(a) Perform work in accordance with AHJ and as outlined herein.

6.15.1.1(2)(b) Manual hoists:

6.15.1.1.2.(b).1 Provide heavy duty, industrial grade, overhead or ceiling-mounted manual hoist trolley from a reputable manufacturer, in the following areas:

(b).1.1 Loading Dock for unloading of large deliveries;

(b).1.2 Treatment Bunkers;

(b).1.3 Energy Centre;

(b).1.4 ATS Room;
(b).1.5 Electrical Distribution areas with HV transformers;
(b).1.6 BER Rooms;
(b).1.7 Mechanical spaces as described in this Schedule;
(b).1.8 Workshop - Main;
(b).1.9 Workshop – Carpentry;
(b).1.10 Workshop - Metal/Welding/Plumbing
(b).1.11 Machine Shop;
(b).1.12 Workroom - Physics Lab;
(b).1.13 Workroom - Bench-top Research/Development Lab; and
(b).1.14 All other areas where listed as Category C in Appendix 1H [Equipment and Furniture].

6.15.1.1.2.(b).2 Manual hoist trolleys will have a minimum load bearing capacity of 454 kg / 1000 lbs, load-tested to 150%.

6.15.1.1.2.(b).3 The Design-Builder will be responsible for the installation and certification of the manual hoist trolleys.

6.15.1.1.2.(b).4 The manual hoist trolleys will comply with the latest edition of the following reference documents:
(b).4.1 Certified CSA C22 No. 14.
(b).4.2 ASME B30.16.
(b).4.3 ASME HST-2.

6.15.1.1.2.(b).5 Provide manual hoist trolleys complete with a suitable steel beam track and any associated structural support fastened to Facility structure above, design and installed by the manufacturer, complete with seismic design in compliance with the BCBC and other local codes.

6.15.1.1.2.(b).6 Provide a lifting height above finished floor level equal to the available Ceiling Height of the room it is installed.

6.15.1.1(2)(c) Electric hoists:

6.15.1.1.2.(c).1 Provide heavy duty, industrial grade, ceiling-mounted electric hoist trolley from a reputable manufacturer, in the following areas:
(c).1.1 Workroom - Morgue, and
(c).1.2 All other areas where listed as Category C in Appendix 1H [Equipment and Furniture].

6.15.1.1.2.(c).2 Electric hoist trolleys will have a minimum load bearing capacity of 454 kg / 1000 lbs, load-tested to 150%.

6.15.1.1.2.(c).3 The Design-Builder will be responsible for the installation and certification of the electric hoist trolleys.

6.15.1.1.2.(c).4 The electric hoist trolleys will comply with the latest edition of the following reference documents:

(c).4.1 Certified CSA C22 No. 14.

(c).4.2 ASME B30.16.

(c).4.3 ASME HST-1.

6.15.1.1.2.(c).5 Provide electric hoist trolleys complete with a motor, hand controls, suitable steel beam track and any associated structural support fastened to Facility structure above, design and installed by the manufacturer, complete with seismic design in compliance with the BCBC and other local codes.

6.15.1.1.2.(c).6 Provide a lifting height above finished floor level equal to the available Ceiling Height of the room it is installed.

6.15.1.1(3) Quality Assurance

6.15.1.1(3)(a) Retain a Professional Engineer, registered in the Province of British Columbia, to design manual and electric hoists, and verify that the following will comply with the requirements of the BCBC:

6.15.1.1.3.(a).1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience; and

6.15.1.1.3.(a).2 Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

6.15.1.2 Part 2 Products

6.15.1.2(1) Manual Hoists

6.15.1.2(1)(a) Provide hoists conforming to CSA C22 No.14, ASME B30.16 and ASME HST-2.

6.15.1.2(1)(b) Acceptable Products: Model SHB020-20 by Acklands Grainger or alternative as approved by the Authority.

6.15.1.2(2) Electric Hoists

6.15.1.2(2)(a) Provide hoists conforming to CSA C22 No.14, ASME B30.16 and ASME HST-1.

6.15.1.2(2)(b) Approved Products: Electric Ceiling Mounted Lift with Straps, Model M675 by Mortech Manufacturing or alternative as approved by the Authority.

6.15.1.3 Part 3 Execution

6.15.1.3(1) Not applicable.

PART 7. FACILITIES SERVICES SUBGROUP SPECIFICATIONS

7.1 Mechanical Systems Design Principles

7.1.1 This section is accompanied and will be read in conjunction with all Appendices to this Schedule; refer to Section 2.3.2.

7.1.2 Design-Builder will provide HVAC, Plumbing, Fire Protection, Specialty and Medical Gas Systems that:

7.1.2.1 Comply with the latest version of the applicable clauses of ASHRAE, ASTM, ASPE, ASME, AWWA, CSA, NECB, NFPA, NSF, all local, provincial, and national codes and standards. Comply also with Authority and Lower Mainland Pharmacy Services standards and guidelines. Where a conflict exists between any codes, standards or guidelines, the most stringent applies.

7.1.2.2 Engage Technical Safety BC during the design phase and comply with all Technical Safety BC requirements unless more stringent requirements are set out in this Schedule.

7.1.2.3 Are designed to provide a healing, comfortable and productive environment for the Facility Users, meet the required environmental conditions for all equipment and the requirements set out in the Agreement. Building Systems will meet the initial Facility requirements in accordance with this Schedule. Provide Building Systems and building equipment spare capacity in accordance with the requirements of this Schedule.

7.1.2.3(1) For the purposes of designing for the peak cooling and heating conditions, as well as allowance for future provisions, the following 2050 (Day 1) and 2080 design temperatures will be used:

7.1.2.3(1)(a) 2050 Summer 5%: 29.1°C DB and 23.66°C WB;

7.1.2.3(1)(b) 2050 Summer 2.5%: 33.5°C DB and 24.3°C WB;

7.1.2.3(1)(c) 2050 Summer 1%: 33.4°C DB and 25.36°C WB;

7.1.2.3(1)(d) 2080 Summer 5%: 32.5°C DW and 26.54°C WB;

7.1.2.3(1)(e) 2080 Summer 2.5%: 36.6°C DB and 27.2°C WB;

7.1.2.3(1)(f) 2080 Summer 1%: 36.8°C DB and 27.97°C WB;

7.1.2.3(1)(g) Day 1 Winter 1%: -10°C DB;

7.1.2.3(1)(h) Day 1 Winter 2.5%: -8°C DB; and

7.1.2.3(1)(i) Day 1 Winter 5%: -7 °C DB.

7.1.2.3(2) Equipment and plant(s) sizing for catastrophic event management mode, CSA Z317.2 Section 6.16 applies. Use Figure 2 “Airflow and design parameters for catastrophic event management” for Class A-2 Health Care Facilities with the following exception(s):

7.1.2.3(2)(a) Type I areas to maintain 100% of the airflow;

7.1.2.3(2)(b) Type 2 and Type 3 areas are operating at 70% airflow; and

7.1.2.3(2)(c) Catastrophic event management mode applies to the entire Facility. That is, if a portion of the Facility needs to initiate internal catastrophic event ventilation mode, the entire Facility will operate under internal catastrophic event mode.

7.1.2.4 Systems are developed to provide reliability of continual operation. Adequate standby capacity and redundancy will be included in system design. Unless noted otherwise, Major Mechanical Equipment redundancy will be minimum N+1 with each piece of equipment at maximum 50% of required capacity (unless noted otherwise) to prevent short cycling during low load conditions. Where redundancy is applied to packaged systems including domestic water booster pumps, sump pumps, fuel oil transfer pumps, medical gas compressors and vacuum pumps and similar systems, provide redundant controllers and power feeds;

7.1.2.4(1) All Major Mechanical Equipment will be located at or above minimum elevation of 6.0 m including at minimum: domestic water booster pumps, fire pumps, and other equipment as determined by the Authority to be critical to Facility operation.

7.1.2.4(1)(a) Provide redundant PRVs installed horizontally at the same elevation at each water entry location, designed to accommodate low and high flow conditions for all main domestic water (in domestic water; each PRV will have a fully open hydraulically controlled back up valve in series capable of communicating to the BMS system installed before the PRV. If failure of the main PRV occurs, the hydraulically controlled back up PRV will activate maintaining a safe constant water pressure downstream while sending an alarm signal to BMS system), steam and natural gas services, and in other locations, as determined by the Authority, such that critical Facility functions are uninterrupted during PRV maintenance or failure. Coordinate with Utility providers as required.

7.1.2.4(2) Despite the redundancy and standby capacity of the various mechanical components, should the Facility experience a shortage of heating or cooling capacity during an Extreme Heat event, include controls to prioritize heating and cooling for Type I vs Type III spaces.

7.1.2.4(3) Further to the point above, in order to assist the Authority in decision making and prioritizing mitigation options during Extreme Heat conditions, provide matrixes showing control system actions that are to be considered. Rank options in order of priority including the option's relative impact on a scale of 1 to 10. The following options are example measures to illustrate what is expected to be included in these matrixes:

7.1.2.4(3)(a) Facility ventilation reduction by incrementally reducing outside air fraction from 100% to a predetermined minimum;

7.1.2.4(3)(b) Reduce space air change rate to catastrophic operating mode values;

7.1.2.4(3)(c) Reset space room temperature set points incrementally to the upper limit of the range in CSA Z317.2;

7.1.2.4(3)(d) Activate the domestic water back-up cooling for the process cooling loads to liberate chilled water for the air handling units;

7.1.2.4(3)(e) Heat rejection thru exhaust coils prior to reaching to cooling towers; and

7.1.2.4(3)(f) Other.

7.1.2.5 Comply with standard acoustical requirements of CSA or current ASHRAE applicable handbooks and all acoustical requirements in Appendix 1D [Acoustic, Vibration, and Noise Control Measures]. Provide silencers in HVAC air driven systems design to meet the acoustical criteria;

7.1.2.6 Are designed to meet the Facility's Design and Construction energy targets as required in Schedule 5 [Energy Guarantee];

7.1.2.7 Are located to be hidden or blend into the overall Facility and are located and designed to be sound attenuated for outdoor spaces, places of respite for Patient and Staff use and from adjacent residential properties surrounding the Facility, as required in Appendix 1D [Acoustic, Vibration, and Noise Control Measures]. Comply with Surrey Noise Control Bylaw 7044;

7.1.2.8 Are vibration isolated to minimize noise and vibration through the structure and other components of the Facility;

7.1.2.9 Minimize impact on the natural and physical environment, through energy efficiency, optimization of resource use, and simplification of the systems;

7.1.2.10 Are configured and located in such a way that maintenance and repair can be performed with minimal impact to areas where Patients are receiving care or treatment as follows:

7.1.2.10(1) Piping distribution, valves, and HVAC terminal units will be located above Type III spaces such as Soiled Utility rooms and Housekeeping Rooms wherever possible and will not be located above Type I and II spaces as defined in CSA Z317.2. Service routing and equipment placement in ceiling spaces above corridors will enable access with a control cube without blocking any doorway or interrupting clinical workflow as per Section 5.1.2.1(13).

7.1.2.10(1)(a) For all Patient rooms including those described as inpatient bedrooms, exam rooms, exam/treatment rooms, consult rooms, stretcher and/or chair bays as set out in Appendix 1A [Clinical Specifications and Functional Space Requirements], the dedicated terminal units such as VAV boxes with reheat coils are permitted to be located within the Patient room, provided the dedicated terminal units are located away from the Patient zone and not blocking the path of entry into the room or the Patient's access to the bed/stretcher or washroom. The placement of dedicated terminal units will take into account that any work on these units will require the use of a mobile containment cube (approx. 1.2m x 1.2m) with required 1m clearance on the service side of the containment cube. All valves including balancing and control valves, strainers and isolation valves will be located immediately outside each room in the corridor. For the Systemic Therapy Component, do not locate VAV boxes or other components requiring maintenance over or near the Patient chairs.

7.1.2.10(2) Pressure reducing valves, backflow prevention devices, and other similar equipment requiring maintenance or servicing will be centralized and located in mechanical spaces or Type III spaces without public access whenever possible. When located at equipment or in any finished space (including Type III spaces), these devices will be installed behind fully recessed, lockable access panels.

7.1.2.11 Are configured and located such that all components that require maintenance, service and inspection are accessible from a standing position on the floor or

when using a maximum 2 m height platform ladder with railings. When use of a ladder is not acceptable or practical, provide access by means of a fixed access system such as overhead maintenance walkways (or catwalk) and/or allocate sufficient open space, free of obstruction from other equipment and services for the use of a scissor lift. Stairs will be installed to access maintenance walkways; ladder access is not acceptable. Provide maintenance walkways for access to the following systems and components, including: steam headers, all steam and hot water boiler safety valves, and other spaces as determined by the Authority such that frequently accessed components can be properly inspected, maintained and serviced. All system components within the Energy Centre and mechanical spaces that are subject to regular inspection and/or will accommodate awkward or heavy equipment replacement will be accessed without the use of ladder(s). Where maintenance or component equipment replacement, such as safety relief valves, motors or pumps, within the Energy Centre or mechanical spaces requires lifting in excess of 50 lbs, provide connections and/or space for suitable removal equipment (i.e. lever block chain hoists).

7.1.2.12 Are designed such that rooftop items will be serviceable and located a minimum of 2 meters away from an unprotected building edge, so they can be accessed without requiring fall protection equipment. Coordinate equipment placement with high parapets and railings as called for in Section 5.7.2.3. Ladder access to equipment will not be required (excludes a fixed ladder as part of the cooling towers).

7.1.2.13 Are configured and located to provide sufficient clearance around equipment and components for servicing and replacement including:

7.1.2.13(1) Compliance with manufacturers service clearance requirements;

7.1.2.13(2) Minimum of 1.5 m clear floor space clearance at all locations where maintenance will be performed;

7.1.2.13(3) Ability for Staff to perform work without removing other services or building finishes other than ceiling tiles. Where insulation needs to be removed to perform maintenance on a component the insulation will be a high-quality removable factory fabricated insulation jacket. Components include steam traps, steam meters, valves, strainers, PRVs, flanges and blanks; pathways for service personnel and maintenance carts, equipment removal and replacement sized to accommodate the largest piece of equipment that will be moved along the pathway with a clear space not less than 2.5 m wide and 2.5 m high;

7.1.2.13(4) Provide proper pipe, fitting spacing and clearance for removal of valves and fittings without affecting the operation of the adjacent system; and

7.1.2.13(5) Provide minimum unobstructed clearance between equipment as follows:

7.1.2.13(5)(a) Pumps, one meter;

7.1.2.13(5)(b) Boilers, three meters;

7.1.2.13(5)(c) Chillers, three meters; and

7.1.2.13(5)(d) Cooling towers, as required by manufacturer for unobstructed air flow and to maintain access.

7.1.2.14 Incorporate access doors and panels as follows:

7.1.2.14(1) Every 12 m (40 ft) on all ductwork;

7.1.2.14(2) At the base of each duct riser;

7.1.2.14(3) Both sides of equipment blocking the duct:

7.1.2.14(3)(a) Air flow measuring stations;

7.1.2.14(3)(b) Coils;

7.1.2.14(3)(c) Silencers;

7.1.2.14(4) At or to one side of other equipment in duct:

7.1.2.14(4)(a) Backdraft dampers (counterweight side);

7.1.2.14(4)(b) Balance dampers serving multiple outlets/inlets;

7.1.2.14(4)(c) Bearings (fans/motors);

7.1.2.14(4)(d) Control dampers;

7.1.2.14(4)(e) Control sensors;

7.1.2.14(4)(f) Fire dampers (rectangular ducts and round ducts 330 mm (13") dia. and larger - latch side);

7.1.2.14(4)(g) Heat detectors (upstream from device);

7.1.2.14(4)(h) Smoke dampers (operator side);

7.1.2.14(4)(i) Smoke detectors (upstream from device);

7.1.2.14(5) As required by governing standards including CSA Z317.2;

7.1.2.14(6) Panels need not be provided where access is available through a door or a register mounted on the side of the duct; and

7.1.2.14(7) For kitchen exhaust access, provide access doors for duct cleaning at every change of direction and every 6 m (20’) of duct run in accordance with the latest NFPA 96.

7.1.2.15 Incorporate flexibility and adaptability for Future Expansion without major disruption or alteration to the Facility operations and infrastructure. Where possible, locate risers close to columns, exterior walls or other permanent features to accommodate future modification to floor plate. All Building Systems will be designed and sized to suit the consumption and discharge needs of the Facility at peak operational requirements, including the anticipated year 2050 cooling requirements, as described in this Schedule, with the ability to further increase the flow or capacity as follows:

7.1.2.15(1) Size branch piping and ducting to meet the initial Facility requirements. For perimeter zones, size the ventilation system based on CSA Z317.2 air change rates or the air change rates to meet the 2080 cooling requirement, whichever is greater;

7.1.2.15(2) Size distribution piping and ducting systems including air terminal boxes, for 15% additional capacity; in addition:

7.1.2.15(2)(a) Size all VAV box reheat coils with an additional 15% heating capacity to provide flexibility to heat spaces over the highest room temperature indicated by CSA Z317.2. Provide reheat coils serving the Operating Rooms with the capability to heat the rooms to 26 °C or 15% additional heating capacity, whichever is greater.

7.1.2.15(3) Pipe Riser, Pipe Shaft and Duct Shaft Requirements:

7.1.2.15(3)(a) Design pipe risers to include 15% additional capacity.

7.1.2.15(3)(b) Provide pipe riser shafts with additional area for future services equal to 15% of the shaft area, not including access platforms.

7.1.2.15(3)(c) Provide duct shafts with 15% additional area for future services.

7.1.2.15(3)(d) Where pipes and ducts are combined in the same shaft, the area for future services will be equal to 15% of the shaft area, not including access platforms.

7.1.2.15(3)(e) Where dedicated duct shafts are required by this Agreement (including kitchen or cyclotron exhaust), equivalent area for future services may be provided in a non-dedicated duct shaft located on the same floor.

7.1.2.15(3)(f) Shaft space for future services will be vertically continuous (from top of shaft to bottom of shaft) without offset or impedance by other services.

7.1.2.15(3)(g) Shaft space for future services will be easily accessible at each floor level.

7.1.2.15(3)(h) Provide platforms to cover the full area of openings within the shaft to meet all WorkSafe BC requirements and to permit access to all pipe joints and valves.

7.1.2.15(3)(i) Provide personnel access doors and continuous ladders within shafts such that all pipe joints and valves are accessible to FMO.

7.1.2.15(3)(j) Wall mounted ladders will extend to each platform. Ladders will be offset from one another with a platform at the base of each ladder.

7.1.2.15(3)(k) Access doors will be a minimum 1.8 m high and 750 mm wide.

7.1.2.15(3)(l) Access doors will be located at the top and bottom of all shafts and on all floors in-between.

7.1.2.15(4) Air handling equipment, exhaust fans, and pumps will be sized for additional capacity. Provide fans and pumps sized with the capacity to deliver 10% additional flow through the distribution systems without changing motors. The system will be capable of delivering 15% additional capacity through existing distribution system by changing motors.

7.1.2.15(5) Air handling and chilled water plant equipment will meet initial Facility requirements and anticipated year 2050 cooling capacity requirements, in addition to the requirements as set out in this Schedule.

7.1.2.15(6) Should the anticipated year 2080 cooling requirement, when compared to the year 2050 cooling requirement, trigger need for additional equipment or equipment upsizing, the following will apply as minimum:

7.1.2.15(6)(a) All ductwork and piping infrastructure, including terminal units are sized/installed to meet 2080 cooling requirements, as part of initial Facility requirements;

7.1.2.15(6)(b) Demonstrate that an upgrade to Air Handling Units capacity for future 2080 year loads is minimal

disruption (by upsizing motors only) while preventing the need for installation of additional air handling units systems; and

7.1.2.15(6)(c) Provide valved and capped (c/w drain valve) pipe connections and space for future equipment (such as chillers, pumps and cooling towers) and ensure appropriate space and routing is available for all components of such equipment.

7.1.2.15(7) Design-Builder will demonstrate to the Authority, that an upgrade to air handling unit capacity for future loads through upsizing of motors or similar, will be minimally disruptive.

7.1.2.15(8) Within mechanical rooms, provide spare floor area space for Future Expansion of the following systems:

7.1.2.15(8)(a) Medical gas systems;

7.1.2.15(8)(b) Medical vacuum systems;

7.1.2.15(8)(c) AGSS vacuum systems;

7.1.2.15(8)(d) RO system(s);

7.1.2.15(8)(e) Lab instrumentation air systems;

7.1.2.15(8)(f) Compressed air systems;

7.1.2.15(8)(g) CO2; and

7.1.2.15(8)(h) Other similar systems.

7.1.2.15(9) The spare floor area described above, will allow for the future equipment capacity equal to that installed to meet the initial Facility requirements. Spare space floor area will be located adjacent to respective type of system.

7.1.2.15(10) Make all provisions necessary to accommodate space and Equipment requirements including all related capped ductwork and piping for Future Expansion spaces as described in Appendix 1A [Clinical Specifications and Functional Space Requirements] and Section 5.1 Adaptability, Flexibility and Maintainability.

7.1.2.15(11) Medical gas air compressor, vacuum pump and AGSS vacuum pump systems will be designed to accommodate an additional 15% capacity. Control panels for this equipment will be sized to accommodate the current demand plus the additional 15% control and power requirements.

7.1.2.15(12) Design piping, ductwork, heating, cooling, heat recovery coils, control valves, air filters, and louvres to meet the following minimum parameters, while accounting for the required spare/additional capacities:

7.1.2.15(12)(a) Hydronic pressure drop – maximum piping friction loss of 4 m/100 m;

7.1.2.15(12)(b) Hydronic velocity – maximum velocity based on pipe manufacturer's recommendations;

7.1.2.15(12)(c) Supply and return ductwork will be sized within the ASHRAE Fundamentals upper and lower limits for duct air velocities and pressure drop, with upper limit capped at 7.6 m/s [1500 fpm] at Substantial Completion. Duct velocity will be limited to not exceed a level of 5 dB less than the maximum allowable noise levels within the space where the ductwork is located;

7.1.2.15(12)(d) Heating/cooling/heat recovery coil face velocity of a maximum velocity of 2.0 m/s;

7.1.2.15(12)(e) Heating/cooling/heat recovery coil minimum hydronic temperature differential of 8.5°C;

7.1.2.15(12)(f) Heat recovery coil maximum leaving air temperature of 7°C;

7.1.2.15(12)(g) Control valve and hydronic coil pressure drop of a maximum 21 kPa each;

7.1.2.15(12)(h) Air filter face velocity of a maximum velocity 2.0 m/s; and

7.1.2.15(12)(i) Ventilation system air intake louvre free area face velocity of a maximum velocity 2.5 m/s.

7.1.2.15(13) The following will apply to specific piping joint method, as a minimum:

7.1.2.15(13)(a) Victaulic Vic press piping joint method is allowed on stainless steel piping used for hydronic systems, domestic cold water, domestic hot water, domestic hot water recirculation lines, process water lines, and utility/compressed air up to and including 50 mm diameter. Provide the correct seal material for all applications. Stainless steel piping joint method for RO water systems are to be fully

welded. Vic Press will fall under Design-Builder certification program;

7.1.2.15(13)(b) T-drill piping joint method is not permitted for any pipe material or system;

7.1.2.15(13)(c) Victaulic mechanical/grooved piping joint method is acceptable for all domestic water, fire protection, hydronic, process water and compressed/utility air applications,12 mm and above. Following are minimum requirements for mechanical/-grooved piping installation:

7.1.2.15.13.(c).1 All grooved/mechanical joint products will be from Victaulic including couplings, fittings, valves, specialties and accessories, etc. as set out in Appendix 1Q [Acceptable Manufacturers List] or alternative as approved by the Authority. Mechanical/grooved products will be of a single ISO certified manufacturer. Rigid couplings will be installation-ready complete with pre-lubricated centre leg gaskets DN15 to DN300. Rigid couplings 50mm to 300mm will have shift limiting slant pad design, with torque absorber, one-touch bolt tightening and bolt-pad-to-bolt-pad assembly. Couplings will have wide width Flush Seal Gaskets DN350 to DN1250 with coupling housings that have lead-in chamfer on housing key section to mate with wedge-shaped grooves. Couplings will have two (2) symmetrical halves from DN 15 DN 1250 with no other loose parts. Couplings will have bolts of equal length and diameter, and multi-segmented couplings will not be accepted at any size. Where grooved or pressed components are used, they will be by the same manufacturer. Where grooved or pressed piping is used in an application, all couplings, fittings, valves, specialties, and accessories will be from the same grooved or pressed manufacturer unless a required valve, specialty or accessory is not manufactured as part of their offering.

7.1.2.15.13.(c).2 Include gaskets that are engineered, blended, and extruded in-house by the coupling housing manufacturer, assuring system integrity. For hydronic systems, include gaskets that feature an integral centre/flush

	seal leg DN 15 to DN 300 to ensure correct alignment of the coupling key with the prepared pipe end, and wide width Flush Seal Gaskets DN 350 to DN 1250, and that are suited for vacuum up to 29.9 in Hg/760 mm Hg. Feature a centre leg gasket suited to systems that may cycle within the operating temperature range of –30ºF to +250ºF/–34ºC to +121ºC or a flush seal gasket DN 20 to DN 1250 suited to systems that may cycle within the operating temperature range of 30ºF to +230F/–34ºC to +110ºC as well as DN 250 to DN300 for flexible couplings where required by design, for the entire life of the pipe system without the application of supplementary protective lubricants or gasket treatments to achieve this service range. For compressed or utility air, provide Nitrile gaskets with a temperature range –20°F to +180°F/–29°C to +82°C. For domestic water, provide Fluoroelastomer blend featuring a centre leg, with a temperature range +0°F to +180°F/-18°C to +82°C. Systems will be UL Classified in accordance with NSF/ANSI/CAN 61 for cold +73°F/+23°C and hot +180°F/+82°C potable water service and NSF/ANSI/CAN 372. For fire protection, provide EPDM (Type A) pre-lubricated gasket (violet colour code). Applicable for wet and dry (oil-free air) fire protection systems only. Listed/approved for continuous use in wet and dry systems. Listed/approved for dry systems at -40°F/-40°C and above.
7.1.2.15.13.(c).3	Be manufactured or produced along with grooved end fittings, valves, strainers, specialties, and accessories at facilities certified under ISO standards. All gaskets, coupling housings, fittings, valve bodies and discs will be date stamped for quality assurance and traceability. Butterfly valves to have offset disc, for 360-degree sealing against valve seat. Butterfly valves with rubber encapsulated disc or body will not be accepted for use on any hydronic or domestic water pipe systems.
7.1.2.15.13.(c).4	Use only the specified (Victaulic) butterfly valves with appropriate disc for application: stainless steel disc for stainless pipe

	applications, electroless nickel coated ductile iron disc for carbon steel applications and aluminum bronze casting disc if copper pipe is approved for use. Accommodates pressures ranging from full vacuum (29.9 in Hg/760 mm Hg) up to 300 psi/2100 kPa/21 bar. Full working pressure for bi-directional, dead end services to 300psi. Where grooved end balance and control valves are used in the hydronic system, the 12 mm to 50 mm balance/control valves and/or pressure independent balance/control valves will be by the same grooved manufacture.
7.1.2.15.13.(c).5	Join pipe ends that are prepared (grooved) by tooling that is manufactured by the same manufacturer as the mechanical couplings, fitting, valves, and specialties. Must be able to supply correct rolls for material being grooved. Gaskets that require special lubricant to meet performance criteria will not be accepted.
7.1.2.15.13.(c).6	Grooved piping system manufacturer will employ a thermal & stress analysis piping designer who is a Professional Engineer registered in the Province of British Columbia to support design and installation applications. Provide product data points for independent third-party to confirm stress analysis. On domestic hot water and hydronic piping applications the Design-Builder and grooved piping system manufacturer will ensure all stress (if applicable), thermal, and pressure expansion requirements are calculated and adhered to and will supply an annotated piping layout drawing complete with thermal movement calculations, anchor locations and force loads, and flexible coupling and/or expansion joint locations, for review by the Authority and for coordination with the seismic engineer.
7.1.2.15.13.(c).7	Feature seismic, vibration attenuation and differential settlement accommodation properties that are validated by industry-recognized third-party tests (i.e. institutional or government testing facilities).
7.1.2.15.13.(c).8	The mechanical couplings, grooved end fittings, valves and accessories will be installed exclusively by installers who have

	completed a grooved piping system manufacturer certification program within 24 months of the Effective Date, direct from an ISO certified grooved piping system manufacturer who holds a IACET Accredited Provider accreditation in good standing and follows the ANSI/IACET Standard for Continuing Education and Training.
7.1.2.15.13.(c).9	100% of the installed grooved mechanical couplings will be inspected by the grooved piping system manufacturer's inspection services representative. A Tamper Resistant sticker will be affixed to the inspected passed joint. The trained representative will report any deficiency to the installing contractor, Design-Builder, consultant and Authority's representative. All identified deficiencies will be resolved prior to Commissioning, at Design-Builder cost. Manufacturer or Authority may request at their discretion any field grooved and installed joints be dissembled for verification of pipe groove dimensions.
7.1.2.15.13.(c).10	At the end of the project, confirmation and inspection reports are to be submitted indicating that 100% of couplings have been inspected and approved by an authorized inspector from grooved piping system manufacturer. All test information and data to be provided by Design-Builder and reviewed by the CxA.
7.1.2.15.13.(c).11	Design-Builder will adhere to the Inspection services specification of the manufacturer. Inspections will be by a factory trained inspector from an ISO certified grooved piping system manufacturer who holds an IACET Accredited Provider accreditation in good standing and follows the ANSI/IACET Standard for Continuing Education and Training.
7.1.2.15.13.(c).12	The grooved pipe system manufacturer will provide a warranty in accordance with Appendix 1X [Warranty Requirements], inclusive of parts and labour for all grooved mechanical connections.
7.1.2.15.13.(c).13	Design-Builder will ensure that the grooved manufacturer authorize the scope of the work to be covered by the warranty. The Design-

Builder will provide a detailed system scope letter from the manufacturer and include a project specific draft version from the manufacturer of the final warranty document at 70% submission.

7.1.2.15.13.(c).14 Mechanical Plant/Energy Centre Design Conditions:

(c).14.1 If grooved mechanical joints are used for the hydronic piping in the Energy Centre and/or mechanical rooms, the following criteria will be followed: All grooved components used will be from the same manufacturer. Where grooved end products are used, the primary construction method for this warranted system will include grooved balancing, isolation, pressure reducing valves, control valves, check valves, strainers and engineered vibration isolation pump drops. Where welded or threaded joints are used in conjunction with a grooved system, the Design-Builder will confirm that all plain/grooved pipe or equipment ends are within Victaulic specifications. The grooved piping system manufacturer or Design-Builder Virtual Design & Construction group will produce a hydronic piping layout model in accordance with Appendix 1U [BIM Requirements] and provide pad and equipment layout, hanger and supports locations, as well as isometric spool drawings to fabrication-level detail. Ensuring that all stress (where required), seismic and thermal accommodations have been coordinated with the seismic engineer such that local codes and standards are met. Provide the Authority the Information Model in accordance with Appendix 1U [BIM Requirements] and fabrication spool maps, along with valve and accessory shop drawings.

(c).14.2 The requirement for Virtual Design & Construction group to produce a hydronic piping layout model in

accordance with Appendix 1U [BIM Requirements] and provide pad and equipment layout, hanger and supports locations, as well as isometric spool drawings to fabrication-level detail is to be provided regardless of pipe type and joint method. Ensuring that all stress (where required), seismic and thermal accommodations have been coordinated with the seismic Professional Engineer such that local codes and standards are met. Provide the Authority the Information Model in accordance with Appendix 1U [BIM Requirements] and fabrication spool maps, along with valve and accessory shop drawings as per Section 2.5.3.3(2).

7.1.2.15(13)(d) All fuel oil piping will be fully welded.

7.1.2.15(14) Cast iron valves are not acceptable for any application.

7.1.3 Equipment, pipes, ducts and fittings will be insulated as necessary to conserve energy, prevent condensation, attenuate noise and prevent accidental burns. For valves, strainers, flanges and grooved fittings, insulate with pre-manufactured insulation blocks all to the thickness of the adjacent pipe insulation. All insulation will have coverings that are appropriate for the location and service involved. Provision of insulation will be in accordance with BCBC requirements, BCICA and ASHRAE 90.1 standards. All services within pipe shafts will be appropriately insulated such that they do not radiate heat to the shaft/building or that they do not absorb heat from the shaft/building. To prevent condensation on cold fluid piping applications, ensure a proper vapour barrier is applied to all components including pipe, fittings, valves, and accessories. Ensure vapour dams are used as specified by the manufacturer or the most stringent standards. All services including those requiring insulation that are exposed on the exterior of the Facility are to be jacketed, covered, painted or finished in a manner appropriate with the façade and building envelope design. All services located at or below 3 m AFF in the Energy Centre and mechanical rooms, including tunnels, will be painted and finished. In addition, the condenser water system within the Energy Centre will be insulated.

7.1.4 Provide proper pipe, fitting, and duct spacing with clearances for installation of insulation and access for maintenance of equipment, valves, and fittings as demonstrated on Design-Builder’s sample boards. At a minimum provide 50 mm clearance between insulated piping, including valve bodies, flanges and other piping, walls, structural members or other obstructions.

7.1.5 Coordinate all mechanical systems with the Equipment requirements and provide all required connections to mechanical systems to allow for a fully functioning system that

meets the applicable codes, standards and Equipment manufacturer's requirements, refer to Appendix 1H [Equipment and Furniture] and Future Expansion as described in Appendix 1A [Clinical Specifications and Functional Space Requirements]. Make allowances within the mechanical systems' designs so all Equipment can be removed or replaced without disrupting the operation of any other Equipment, systems or finishes except ceiling tiles. Coordinate with Appendix 1H [Equipment and Furniture] and Appendix 1A [Clinical Specifications and Functional Space Requirements] to ensure that all Equipment, rough-in for Equipment and support systems have been provided. Design-Builder will include for procurement, design integration, storage, delivery to Site, setting in place, making mechanical service connections, providing mechanical service connections for future Equipment, installation, Commissioning, etc. as indicated.

7.1.6 Provide required conduit tubing to protect bundled detergent/chemical dispensing lines associated with Equipment including instrument washers, cart washers, and chemical dispensing units used in MDR Detergent Dispensing Room. Conduit tubing will house single or multiple detergent/chemical dispensing lines as necessary and will enclose the entire run of dispensing lines or as required by the equipment manufacturer. Provide containment grate to capture any spilled detergent or chemicals.

7.1.7 Provide rough-in for all Equipment noted as future Equipment in Category F requiring mechanical services.

7.1.8 Size water, sanitary, storm and gas Utilities as required to suit the consumption and discharge needs of the Facility, based on Schedule 1 requirements, plus an additional 15% spare capacity to allow for future flexibility.

7.1.9 The design of the roof drainage and rainwater leaders will account for the future climate change data. Capacity of design will be increased by an additional 15% above current BCBC requirements for future adaptation.

7.1.10 The Facility will undergo a Future Expansion as described in Section 4.4 and the Energy Centre will be expanded at that time. Demonstrate that the heating water, steam, chilled water and condenser water systems installed in the Facility can be interconnected with the future expanded systems that will be installed in the expanded Energy Centre without disruption to the operation of the systems. Valved and capped connection points will be provided to connect future equipment to the associated systems. All caps, for future interconnection to respective heating water, chilled water and condenser water systems, will have tapping complete with nipple and valve for relief of any liquid or pressure that may have built up behind the cap. For interconnecting the steam supply header with the future header, provide double block and bleed arrangement at the capped connection point.

7.1.11 Systems will be developed to provide reliability of uninterrupted continual operation. Redundancy will be included in Facility systems design to ensure uninterrupted service and maintain all spaces in accordance with CSA Z317.2 Table 1 parameters in the case of a source equipment or component failure while under normal operating conditions. Refer to Section 7.1.30.2(2) for specific air-handling redundancy requirements. Specialty areas such as laboratories and pharmacies will be designed in accordance with industry standards for these speciality areas. Where a conflict exists between any of the applicable

standards, the most stringent applies. Redundancy and spare capacity will be demonstrated in real-time to the Authority after the Facility is Commissioned and balanced.

7.1.12 All mechanical piping systems including heating, cooling, domestic water, sewer storm, plumbing vents, medical gas and natural gas will have 15% additional capacity, above the initial Facility requirements at Substantial Completion, built into all main piping distribution systems sizing.

7.1.13 Provide isolation valves at the top and bottom of all risers including one (1) at the mid-point. Isolation valves will be located such that they are fully accessible to the Authority with ease of access. Location of the mid-point isolation valves will be at a mechanical floor or similar interstitial floor).

7.1.14 Provide specialty systems as required by the Authority to meet Functional Space Requirements. Specialty systems may include acid waste and vent, grease waste and vent, solids waste and vent, contaminated waste and vent, radioactive waste and vent, reverse osmosis water, laboratory air, laboratory vacuum, shop compressed air, utility compressed air, instrument compressed air, oncology pharmaceutical preparations, natural gas, laser cooling water, and dialysate solutions. Refer to Appendix 1B [Minimum Room Requirements] and Appendix 1H [Equipment and Furniture].

7.1.15 Medical gas compressors and pumps will be located in a designated clean area of the mechanical room away from or physically separated from spaces that house Equipment such as boilers and chillers.

7.1.16 Provide premium efficiency motors for all mechanical equipment. Where motors are controlled by VFD, provide motors with shaft grounding measure, filters and/or reactors to meet the power quality requirements of Division 26. VFDs will control no more than one motor. On all VFD driven motors, safely dissipate common-mode electrical charge on the rotor and prevent electrically-induced bearing damage with shaft grounding, filters, insulating components, or other means demonstrated to be effective.

7.1.17 Mechanical services such as dedicated ducts and pipe branches within Electrical, UPS and Communications Rooms will be limited to minor intrusions to allow mechanical cooling, ventilation and sprinklers where permitted. No pipe or duct mains are permitted over the rooms and pipes and ducts will not be installed within walls and floor slabs shared with these rooms. Refer also to the FHA Technical Guidelines for further restrictions. Mechanical services installed within Communications Rooms will maintain a minimum clear height of 3.0 m AFF. Any Equipment requiring a water connection, plumbing, drain pipes or hydronic distribution piping will not be installed through the ceiling space of Electrical or Communications Rooms.

7.1.18 Coordinate with all Electrical and Communications requirements for all mechanical systems that will maintain operation during planned or unexpected shutdown of the Facility's main electrical service. UPS power provided to mechanical equipment will originate from the central UPS system. Where mechanical equipment and devices are required to be served by emergency power, provide UPS, vital, or delayed vital power. Determine requirements for redundancy of power sources for maintenance purposes in consultation with the Authority.

7.1.19 Equipment, pipes and ducts will be clearly labelled with information such as flow direction, temperature, pressure and or anything relevant to the fluid or gas moving in the service.

7.1.20 Integrate requirements for energy incentive programs into the mechanical systems. Apply for relevant Provincial and Federal incentives, including BCH Power Smart and FortisBC incentives. Refer to Schedule 5 [Energy Guarantee] for details.

7.1.21 Coordinate all mechanical systems with requirements of all Equipment, and provide all connections required to mechanical systems. Provide dielectric isolation between pipes and between pipes and hangers of dissimilar metals.

7.1.22 For spaces designated for Commercial Opportunity and Retail, as described in Section 5.13, design all mechanical systems so that the work required to modify the systems for the fit-out of these spaces will not disrupt the operation of the Facility's systems. Allow for mechanical infrastructure for each kiosk/vendor, including floor drains, grease interceptor, and valved and capped domestic cold water connections. Natural gas service is not required for these areas. Design-Builder is not required to provide NFPA-96 compliant commercial kitchen exhaust as it will be provided and installed by the future tenants/licensed vendors. The Commercial and Retail Opportunity spaces will be located in proximity to the building exterior with consideration for placement of exhaust and make-up air louvers and adequate pathway for all vendor supplied ducting.

7.1.23 For rooms listed Appendix 1A [Clinical Specifications and Functional Space Requirements] that require a differential pressure monitor and/or rooms that require a specific differential pressure by the applicable standards including CSA Z317.2, NAPRA and USP 797 and 800, Design-Builder will construct the rooms to be airtight. Construction features for Divisions 21, 22, 23 and 25 include gasketed sprinkler escutcheons and gaskets around diffusers, grilles and radiant panels (where applicable). Provide seals around medical gas outlets, headwalls, valve boxes, extinguisher cabinets, sensor junction boxes, fixture drains and water supply piping and other components that are recessed within walls and form part of the air seal. Seal ends of controls conduits that terminate within pressurized rooms. Refer to other Sections for sealing required by other Divisions.

7.1.23.1 When there are multiple options for room relative pressurization or room classification is unclear in CSA Z317.2 Table 1, Design-Builder will consult the Authority for input during design.

7.1.23.2 For all special precautions rooms as defined in CSA Z317.2 Table 1, consult with the Authority for input during HVAC design. Consult with the Authority for the location of local differential pressure displays.

7.1.23.3 The Decontamination Room will be negatively pressurized relative to adjacent spaces/rooms.

7.1.24 Provide adequate expansion compensation for piping systems that experience thermal expansion and contraction including heating water, steam, chilled water and domestic hot water. Locate anchors and guides, design expansion compensators or loops and select expansion compensation devices based on a thorough review of piping layout and engineered piping stress analysis for steam and thermal analysis for hydronic and

domestic. Stress analysis will include equipment nozzle/connection point load evaluation. Provide annotated piping drawings showing expected expansion/compensation by system, and force load calculations for anchors where required.

7.1.25 “Drop in anchors” may be used to support, hang, or brace piping, ductwork, or other equipment, provided that the anchor manufacturer trains the installers on correct installation procedure. The manufacturer will provide an inspection of the drop in anchor installations and will report any deficiency to the installing contractor, Design-Builder, Design-Builder's Consultant and the Authority.

7.1.26 Where unavoidable, all equipment located on the roof will be approved by the Authority and will be constructed to withstand the wind loads as per Section 5.12.7.1(5). To facilitate servicing, provide a davit and walkable platform around roof mounted equipment including cooling towers and lab exhaust fans so that ladders will not be required for equipment maintenance. For cooling towers provide three levels of walkable platform so that cooling towers can be fully accessed and serviced. No supply air ducting will be installed outside of the Facility.

7.1.27 Refer to Section 3.6 for LEED requirements.

7.1.28 Facility Heating and Cooling Services

7.1.28.1 The Facility’s heating and cooling services will be supplied from the Energy Centre.

7.1.28.2 Manual valves larger than 150 mm [6"] will be gear operated type.

7.1.28.3 Major Mechanical Equipment such as air handlers, chillers (excluding screw compressor type), cooling towers, hot water boilers, and steam boilers will be certified per ICC-ES AC156 – Seismic Certification by Shake-table Testing of Non-structural Components or meet the requirements detailed in ANSI 1270 Requirements for Seismic Qualification of HVACR Equipment.

7.1.29 All computer based systems required to operate or monitor mechanical systems will be in accordance with vendor specifications and Section 7.6 Integrated Automation (Division 25).

7.1.29.1 All control panels which contain control equipment, whether packaged with equipment or provided by the controls contractor, will be fully waterproof with liquid-tight conduit connections and sealed wiring at entry to control panels (where NEMA 3R enclosures are not available option by supplier, Design Builder will provide on-site waterproof solution for control panels). For sections of conduits above control panels with nearby wet piping, liquid-tight fittings are required. Set-screw type fittings are not permitted. NEMA 1 Top cover is acceptable in areas where VFDs are located in clean and dry areas with no overhead risk of water ingress. Drip trays located above control panels and components complete with a NEMA 3R enclosure with an O-ring sealed conduit feed may be acceptable to the Authority on a case-by-case basis.

7.1.30 Post-disaster Design

7.1.30.1 Design all mechanical piping, ductwork, Equipment, and system seismic restraints in accordance with the requirements of post-disaster buildings, as outlined in Section 5.2. The requirements set out in this Schedule are in addition to the requirements of the BCBC.

7.1.30.2 In addition to Section 5.2 5.1.7Post-disaster and the minimums of the referenced standards and regulations:

7.1.30.2(1) Equipment will have sufficient redundancy, structural integrity, and seismic protection to ensure the Facility remains operational in accordance with Section 5.2 Post-disaster and other sections of this Schedule;

7.1.30.2(2) Air-handling systems will be provided with sufficient redundancy at all times to ensure no disruptions in Facility operation. Type I spaces will maintain 100% redundancy. CSA Type II and Type III spaces will maintain 70% redundancy. The Emergency Operations Centre will be treated as a Type I space. Refer to CSA Z317.2 for space Type definitions;

7.1.30.2(3) The heating plant (hot water and steam) will have two (2) sources of energy; primary and secondary. Secondary energy from On-Site generators will allow continued operation of the heating plant for a minimum of 72 hours;

7.1.30.2(4) The fuel storage system will also have sufficient capacity to supply fuel to the emergency generators for a minimum period of 72 hours; and

7.1.30.2(5) Boilers and pumping equipment will have sufficient redundancy to ensure the Facility continues to be operational after an event in accordance with Section 5.2 Post-disaster and other sections of this Schedule.

7.1.30.3 Water Storage System Requirements

7.1.30.3(1) Provide process water storage with sufficient capacity to supply the Facility’s requirements for a minimum period of 72 hours. This includes all process loads and make-up water for heating and cooling systems and excludes landscaping irrigation systems.

7.1.30.4 Provide a minimum sanitary storage capacity of 37,000 gal (140,000L). Storage may consist of a single, or multiple, interconnected tanks piped in a manner that allows for the complete emptying of the tank or tanks from one (1) emergency pump out location directly adjacent to the layby designated for the sewage pump truck.

7.1.30.5 The tank(s) will have drain valves to ensure that the tank will drain completely, and liquid level sensors that will initiate alarm conditions to a local alarm panel to the BMS at 50% full condition.

7.1.30.6 The storm water drainage system will be capable of handling flow from a 100-year storm event.

7.1.30.7 The medical gas systems will be capable of maintaining a sufficient supply of medical gases to meet the requirements of the Facility's post-disaster operational areas as specified in this Schedule. Where reserve for medical gases is compressed gas bottle/cylinder-based reserve, provide a means to automatically switch from the primary source to the reserve supply.

7.1.30.8 Provide emergency service connections on the exterior of the Facility as per Section 5.2.6. Further details are as follows:

7.1.30.8(1) Process Water System

7.1.30.8(1)(a) The inlet connection for the process water system will allow for supply of water to the process water tank from an external tanker truck. The water will be circulated from the tank via the process water pumping system to feed the Facility system. The process water pumping system will be sized for an N +1 condition and will address partial and full load conditions. The water pumping systems will be connected to the Facility's emergency electrical system.

7.1.30.8(2) Domestic Water

7.1.30.8(2)(a) Provide a minimum 100 mm diameter Kamlock connection on the exterior of the Facility to allow for a water tanker to connect to the Facility services. The connection will be valved and capped and be provided in a locked, secure noncorrosive cabinet adjacent to the layby parking location for a water tanker. The domestic water inlet connection from the exterior will need to be connected to the domestic water booster pumps complete with appropriate valves and safety controls;

7.1.30.8(3) Sanitary Sewer Pump-Out

7.1.30.8(3)(a) Sanitary sewer pump-out connection will be provided from the sanitary storage tank system for complete evacuation of the storage tank. If the design includes more than one tank, each of the tanks will be interconnected to allow for one pump out connection.

7.1.30.8(3)(b) The connection will be located directly adjacent to the layby designated for the sewage pump truck. The sanitary pump out connection will be located in

a free-standing heavy duty, non-corrosive kiosk and will have permanent signage affixed to the kiosk to identify the service and function.

7.1.30.8(4) Medical Oxygen

7.1.30.8(4)(a) Provide a medical oxygen connection on the exterior of the Facility for supplying oxygen to the Facility from external bulk storage tanks or truck. The emergency oxygen inlet will be mounted in a Tamper Resistant and weatherproof, lockable recessed wall mounted enclosure complete with regulator valves in an area accessible to supply vehicles but not in the vicinity of the designated bulk oxygen site. The exterior of the enclosure door will be factory labelled to indicate emergency oxygen inlet. The interior of the enclosure will be clearly labelled with instructions for the connection to and operation of the emergency oxygen inlet. The connection to the oxygen pipeline system will be downstream of the designated bulk oxygen site shut-off valve inside the Facility.

7.1.30.8(5) Decontamination Tank

7.1.30.8(5)(a) A pump-out connection will be provided from the decontamination storage tank for complete evacuation of the storage tank.

7.1.30.9 Unless otherwise stated, all connections will be secure terminations which are valved, capped and locked such that they are Tamper Resistant to protect from vandalism and prevent water ingress.

7.1.30.10 All external connections will be located in service areas away from Public Circulation routes, where readily accessible by individual service vehicles. The Design will take into account the size of the service vehicles while maintaining clear access for all vehicles.

7.1.30.11 Select all preliminary connections (size, fittings, pressure, etc.) in consultation with the Authority.

7.1.31 Decontamination Room

7.1.31.1 The Decontamination room and associated adjacent rooms will be designed to comply with governing codes and standards and incorporate requirements included in Fraser Health Emergency Department Decontamination and Isolation Suite Design Standard.

7.1.31.2 The Decontamination room located adjacent to the Emergency Department will include following services:

7.1.31.2(1) Provide two surface mounted shower assemblies containing a handheld shower with minimum 1500 mm long hose and a pressure balanced mixing valve to provide individual temperature control to each shower. One shower will be mounted at the head end of the designated stretcher location and one will be mounted at the foot end. Provide an ANSI Z358.1 compliant ceiling mounted emergency shower over the stretcher location. Provide trench drains to service the shower areas to ensure that water is contained within the area. All water from the shower trench drains will be directed to the Facility sanitary drainage system or to the decontamination water storage tank as noted below.

7.1.31.2(2) Provide a ceiling mounted shower over the stretcher area designed in accordance with ANSI Z358.1 and incorporating a pressure balanced mixing valve to provide temperature control.

7.1.31.2(3) Provide additional floor drains in the general area of the Decontamination Room.

7.1.31.2(4) Provide an emergency eyewash station complete with mixing valve and drainage.

7.1.31.2(5) Provide a hose bibb and hose reel for cleaning the room after use.

7.1.31.2(6) Provide a separate decontamination waste storage system to serve the Decontamination Room. Decontamination water storage tank will be minimum 45,000 L.

7.1.31.2(7) Design the dedicated decontamination waste storage system as a sanitary system complete with p-traps, trap primer, and vents such that noxious fumes will not return into the Facility.

7.1.31.2(8) Install a bypass / diverter complete with full port plug valves that will permit waste to be diverted to the decontamination storage tank. On a day to day basis, flow will normally be to the Facility sanitary drainage system.

7.1.31.2(9) Diverter valve(s) will be located to allow quick and easy access without having to remove Equipment or having to dig up the location to operate or replace the valves.

7.1.31.2(10) The decontamination tank will either be buried or concealed in an accessible location; complete with ULC listings and equipped with inlet port(s), vent(s) and suction outlet port(s) for pumper truck connection to fully evacuate the system. Only the remote suction outlet port will be located on the Facility’s exterior. Tank design and access will comply with WorkSafe BC regulations for confined space entry. That is, tank design will permit

implementation of a safety plan including provision of temporary ventilation, temporary lighting and extraction equipment.

7.1.31.2(11) The decontamination water storage tank will have drain valves, and liquid level sensors that will initiate alarm conditions to a local alarm panel to the BMS at 50% full condition.

7.1.31.2(12) Ventilate the Decontamination room with a minimum 15 air changes per hour. Ventilate the associated ante room with a minimum of 9 air changes per hour. Provide a room differential pressure monitor configured in the same manner as for an isolation room. Differential pressure monitoring points to include room-to-corridor and anteroom-to-room. Audible and visual alarming will be provided inside the Decontamination room, in the corridor just outside the ante room and at the nearby nurse's station.

7.1.32 Provide a QR code on a label for each pressurized piping system. The QR code will provide the Authority with information including the name of the system (e.g. heating water, chilled water, etc.), the system operating pressure, the code/standard that the system was designed and built to and the safety relief valve set point.

7.2 Energy Centre Mechanical Requirements

7.2.1 The Energy Centre will be sized to serve the initial Facility requirements with heating hot water, domestic hot water, steam, chilled water and electrical infrastructure as described in Sections 7.1 and 7.7. The Energy Centre will also house the heat recovery chiller plant including pumps and associated equipment. Refer to Sections 5.4 and 7.5 for more detailed information on systems housed within Energy Centre.

7.2.2 The Energy Centre systems will facilitate the installation of future equipment, with installed tie ins complete with isolation valves and similar isolation accessories, without disruption to the ongoing operations of the Facility. All supporting services will accommodate the Energy Centre Future Expansion requirements. Supporting systems include incoming services, space heating, cooling and ventilation systems, interconnecting piping and control systems.

7.2.3 Hot water heating plant will be designed to meet the initial Facility requirements. Provide redundancy such that the plant capacity is continuously maintained with the largest boiler out of service and the largest heat recovery system or component out of service. Hydronic heating boiler plant peak capacity will be based on the Facility's heating needs and domestic hot water needs. Boiler plant will be sized with following allowances:

7.2.3.1 Catastrophic mode as described in Section 7.1.2.3(2);

7.2.4 Steam boiler plant will be designed to meet the initial Facility requirements. Provide redundancy such that the required plant capacity maintains the MDR loads with one (1) boiler out of service. The requirements for N+1 redundancy for MDR steam load will be in accordance with the requirements described in Section 7.5.3.1. Provide space for future

equipment including a steam boiler to accommodate the Future Expansion. Refer to Section 4.2.1.2.

7.2.5 Primary chilled water cooling plant will be designed to meet the initial Facility requirements. Initial plant capacity will serve the year 2050 cooling requirements as described in Section 7.1. Provide redundancy such that the design load and required plant capacity is continuously maintained with one (1) chiller compressor module or cooling tower out of service as per CSA Z317.2. If utilizing large dual compressor chillers to meet plant redundancy requirement, each compressor will be provided with a VFD and disconnect. In addition, the dual compressor chiller will be provided with a means of bypassing the single touch screen controller in the event of a controller failure. Bypass device will be provided and configured by the manufacturer with appropriate training for FMO.

7.2.6 Chilled water cooling plant will be designed to meet the initial Facility requirements. Provide redundancy such that the plant capacity is continuously maintained with one (1) chiller module out of service.

7.2.7 Provide a containment curb around and under the emergency generator fuel oil tanks to capture fuel spills. The drain for the containment area will incorporate an oil interceptor. Provide clearance of 1 m or more if required to access the containment area to permit fuel tank inspection. Refer to Section 5.5 for further mechanical requirements for the emergency generators.

7.2.8 Each generator will be complete with a fuel polishing system to ensure the stored fuel remains clean and available for its intended use at any time.

7.2.8.1 Provide a fuel polishing system that meets SAE J1488 201010 filtration specifications. The system will include a minimum of 2-stages. The first stage will be coarse water fuel separator with a 30 micron pre-screen plus conditioning with a ULC or FM listed coalescent type filter. Second stage filtration will be 1 - 3 micron maximum that removes solids and emulsified water. The system will incorporate an interconnection to pump from tank to tank in a multiple tank systems. Provide stand-alone control system with BMS alarm output for filter blockage monitoring, and automatic programmable timer function for pump control.

7.2.8.1(1) Pump sizing will meet the following requirements:

7.2.8.1(1)(a) All tanks will be polished once a month. The polishing flowrate will be selected to achieve three (3) turnovers of each tank volume;

7.2.8.1(1)(b) Polishing flowrate will be selected to enable completion of a polishing sequence during FMO normal daytime operations M-F 7am - 3pm; and

7.2.8.1(1)(c) Pumping demands to be completely separate from generator fuel system supply pumps.

7.2.9 Boilers and pumping equipment will have sufficient redundancy to ensure the Facility continues to be operational in accordance with Section 5.2 Post-disaster and other sections of this Schedule.

7.2.10 Energy Centre design will accommodate seasonal part load demands to prevent frequent cycling of equipment or forced shutdown of equipment due to light loads.

7.2.11 Install services that will be routed to and from the Energy Centre and the Facility in a location such that maintenance of the service runs can be conducted without impacting adjacent clinical spaces. Services between the main Facility and the Energy Centre will initially include steam, condensate, chilled water (supply and return), and heating hot water (supply and return), domestic hot, domestic cold, and fire suppression. Design-Builder will provide 15% spare capacity within the service route for future services.

7.2.12 All service links will be constructed to meet post-disaster standards and will be seismically independent of any other structures.

7.2.13 Provide a central Control Room for the Energy Centre that allows unobstructed observation through angled glazing for views of the steam plant. Control room design to meet ISO 11064 standard. Where hydronic plant and chiller plants are not visible through viewing windows, provide dedicated screens in control room locations, as determined by the Authority, with IPVS System camera views monitoring these plants. The Control Room will be fully ventilated and air conditioned, complying with standards for typical meeting room spaces in accordance with ASHRAE 55 Thermal Comfort Standard. Refer to Section 5.4 for further requirements.

7.3 Fire Suppression (Division 21)

7.3.1 Fire Protection

7.3.1.1 Basic Requirements

7.3.1.1(1) Provide all required fire protection for the Facility.

7.3.1.1(2) The Facility will be provided with a fire protection standpipe system and will be fully sprinklered throughout with wet, dry, double interlocked cross zoned pre-action sprinkler systems, and/or Vortex as required to suit the area being protected. The source of water for the fire protection systems will be provided from two (2) sets of two (2) isolatable incoming water services connected to the Site water main supply loop with each set of two (2) incoming water services piped to a separate water entry room. Each water service entering the Facility will be capable of supplying the fire protection and peak domestic water demands. Each service will have a flexible connection at the exterior face of the Facility to allow for vertical and horizontal movement in a seismic event.

7.3.1.1(3) The fire protection sprinkler and standpipe systems will be combined systems with 65 mm fire department hose connections

for the standpipes located in exits in accordance with BCBC and NFPA 14 Installation of Standpipe and Hose Systems. If required, additional hose connections will be provided to meet the area limitations as indicated by NFPA 14. Sprinkler systems will be installed in accordance with BCBC and NFPA 13 Installation of Sprinkler Systems. All systems will be designed to the occupancy classification that they protect. Provide additional capacity as required by NFPA 13 and 14. Seismic bracing will be provided for all fire protection systems in compliance with BCBC and NFPA requirements.

7.3.1.1(4) 65 mm fire department hose connections will also be at the highest landing of stairways with stairway access to a roof or on roofs with a slope of less than 4 in 12 where stairways do not access the roof.

7.3.1.1(5) Provide on each fire protection systems take-off from the water supply an approved detector type double check valve assembly with approved listed OS&Y gate valves on both sides complete with electrically supervised tamper switches.

7.3.1.1(6) All sprinkler systems will be zoned in compliance with the BCBC and NFPA 13. Sprinkler zoning in areas of the Facility containing Patient or resident sleeping rooms will be divided into not less than two (2) fire compartments with an area of not more than 1,000 m2 each.

7.3.1.1(7) Provide two fire pumps with N+1 redundancy. The fire pumps will be packaged assemblies with electrical supply in accordance with NPFA 20 and CSA C22.1. Carry full load of fire pumps in the generator calculation with no diversity. The fire pumps assembly will be complete with pressure maintenance (jockey) pumps and controllers installed in compliance with NFPA 20. The fire pump room will be free of storage, equipment and penetrations not essential to the operation of the pumps and related components in compliance with NFPA 20 Installation of Stationary Pumps for Fire Protection. Domestic water distribution equipment including domestic water booster pumps may share the room with the fire pumps in accordance with NFPA 20. Direct access from the exterior to the fire pump room will be provided via double doors. The fire pump room will be sized to accommodate all equipment, components and accessories, and provide all necessary clearances for servicing, maintenance and testing as well as space for sprinkler zone valves, as required. Provisions for fire pump testing will be provided in compliance with NFPA 25 Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems.

7.3.1.1(8) Sprinklers subject to freezing temperatures such as interior parking levels and exterior overhangs will be supplied by a dry system except where dimensions and construction methods of exterior overhangs allow for the use of dry horizontal sidewall heads connected to the interior sprinkler system in compliance with NFPA 13. A system design utilizing the heat tracing of branch lines is not permitted.

7.3.1.1(9) Provide different types of quick response pendant sprinkler heads in the finished areas throughout the Facility. The type of heads will depend on the function of the spaces/s in which they are installed. The type of sprinkler heads include concealed quick response sprinklers, exposed quick response pendant, and Ligature Resistant/Tamper Resistant quick response heads. Provide Ligature Resistant/Tamper Resistant sprinklers for Consult Room – ED, Secure Room and Anteroom – Secure Room.

7.3.1.1(10) Ligature Resistant Tamper Resistant sprinkler heads will be ULC Listed quick response Tyco “Raven” or an acceptable alternative as reviewed by the Authority. Institutional escutcheons will be of zinc or aluminum construction with zinc ring plate and Tamper Resistant screws.

7.3.1.1(11) Multi-use flexible sprinkler fittings may be used in lieu of rigid pipe offsets or return bends for sprinkler drops. They will be UL, cUL, and FM listed and flexible hose will consist of a true 1” ID corrugated braided type 304/316 stainless steel UL listed per UL-2443 to 175psi with a 2” minimum bend radius and FM approved per FM-1637 to 200psi with a 7” minimum bend radius.

7.3.1.1(12) Brackets will be of same manufacturer as flexible fitting; can be used on grid, hard lid, and open ceiling applications by attaching to framing, concrete deck or walls, as recommended by manufacturer.

7.3.1.1(13) All sprinkler system piping, hangers, sprinkler heads and accessories installed in MRI spaces will be non-ferrous. Sprinkler heads will be listed and approved for installation in MRI spaces.

7.3.1.1(14) Rooms that will incorporate a differential pressure monitor and/or rooms that require a specific differential pressure such as Operating Rooms, Laboratories and Clean Rooms will be provided with an air and dust seal as provided by the sprinkler head manufacturer.

7.3.1.1(15) The Design-Builder will provide a double interlocked, cross zoned pre-action sprinkler system(s) complete with detection devices, release panels that are compatible with the Facility fire alarm

panel, and all necessary components and accessories for the following rooms:

7.3.1.1(15)(a) All Medical Imaging Rooms and rooms with fixed medical imaging equipment such as:

- 7.3.1.1.15.(a).1 Imaging Room – Bone Density;
- 7.3.1.1.15.(a).2 Imaging Room - CT;
- 7.3.1.1.15.(a).3 Imaging Room - CT – Simulation;
- 7.3.1.1.15.(a).4 Imaging Room - Gen Rad;
- 7.3.1.1.15.(a).5 Imaging Room - MRI;
- 7.3.1.1.15.(a).6 Screening Mammography Room;
- 7.3.1.1.15.(a).7 Diagnostic Mammography Room;
- 7.3.1.1.15.(a).8 Procedure Room – Fluoro;
- 7.3.1.1.15.(a).9 Guided Interventional Room – CT;
- 7.3.1.1.15.(a).10 Ultrasound Procedure Room;
- 7.3.1.1.15.(a).11 Echo Room;
- 7.3.1.1.15.(a).12 Imaging Room - PETCT Scanner;
- 7.3.1.1.15.(a).13 Imaging Room – SPECT Camera;
- 7.3.1.1.15.(a).14 Imaging Room – MRI – Simulation;
- 7.3.1.1.15.(a).15 Treatment Bunker Interior;
- 7.3.1.1.15.(a).16 Operating Room - HDR;
- 7.3.1.1.15.(a).17 Operating Room; and
- 7.3.1.1.15.(a).18 Operating Room – Isolation.

7.3.1.1(15)(b) Automated High Volume Analyzers; and

7.3.1.1(15)(c) Server Room – OR Integration System.

7.3.1.1(16) Requirements for the double interlocked cross zoned pre-action sprinkler system include:

7.3.1.1(16)(a) Sprinkler heads will be mechanically protected in all cases;

7.3.1.1(16)(b) In order to prevent the placement of sprinkler heads above equipment racks or server cabinets, additional sprinkler heads will be supplied and installed to provide the required coverage in the room;

7.3.1.1(16)(c) If there are no alternatives other than to place a sprinkler head above an equipment rack or a server cabinet, then it is the responsibility of the Design-Builder to identify all instances of this situation for the Authority’s review and approval. Upon receipt of the Authority’s approval, the Design-Builder will supply and install drip trays under the sprinkler head(s) that are appropriately drained and supplied with a complete leak detection system that can be

monitored through the BMS system by the Authority; and

7.3.1.1(16)(d) If an inspector's test connection is required, it will be located outside the room being served. This includes all additional drains, valves, piping, maintenance space and accessories required.

7.3.1.1(17) Design-Builder will provide a suitable sized clean agent fire protection system for the Cyclotron Vault, Orthovoltage/ Superficial and Control Room - Orthovoltage in compliance with the requirements of NFPA 2001. Vortex may be used instead of a clean agent system provided that the Vortex system is acceptable to the Cyclotron manufacturer. The systems will include all clean agent, clean agent cylinders, release panel/s, discharge nozzles, all interconnecting piping, all detection, actuation, alarm and control systems and all components and accessories necessary for a complete and operable system. Release panels will be compatible with the Facility fire alarm panel. The use of Halon is not permitted. Additionally, the following requirements apply:

7.3.1.1(17)(a) All openings in rooms and spaces protected by the clean agent system will be sealed so the required minimum design concentration levels are maintained; and

7.3.1.1(17)(b) Upon completion of the installation of the systems, the Design-Builder will conduct a room integrity test to ensure that minimum design concentrations of clean agent can be maintained within the protected space for the minimum amount of time in compliance with NFPA 2001. If a room integrity test results are unsatisfactory, the reason for the failure of the test will be determined and rectified. Room integrity tests will be performed until the test results are satisfactory.

7.3.1.1(18) For the remaining spaces in the Cyclotron area, provide a double interlocked, cross zoned pre-action sprinkler system complete with detection devices, release panels that are compatible with the Facility fire alarm panel, and all necessary components and accessories.

7.3.1.1(19) Provide dedicated rooms with waterproof floors and floor drains.

7.3.1.1(20) Provide wire cage guards, as provided by the sprinkler head manufacturer, over sprinkler heads in areas where they may be subject to damage.

7.3.1.1(21) Provide all fire extinguishers as required under NFPA 10 and any additional as required by local government authorities. Fire extinguishers will be selected and installed based on the hazard classification of the space it serves.

7.3.1.1(22) All fire extinguishers in finished spaces will be fully recessed.

7.3.1.1(23) There will be no wet sprinkler system in the UPS Rooms, BER, FERs, Communications Rooms, or any rooms containing 25kV or 12.47kV equipment. If dielectric filled equipment will be installed in a room, the room is to be constructed as an electrical vault as defined in the BCBC. All other Electrical Rooms, (except sub-electrical rooms (SERs)) and Communications Rooms are to be considered service rooms, and wet sprinkler systems will be omitted as permitted under NFPA 13. Wet sprinkler system will be provided in SERs. Provide a stand-alone Vortex fire extinguishing system that will extinguish a fire while allowing the electrical equipment to remain in operation in all Electrical Rooms and Communications Rooms.

7.3.1.1(24) Provide fully recessed sprinkler zone control cabinets with shut off valves, flow switches and flow switch test connections that are readily identifiable and accessible from the floor level. Cabinets will have recessed hinges and latches. Zone control valves will not be located in ceiling spaces.

7.3.1.1(25) Siamese connections will be provided on the exterior wall of the Facility for use by the Surrey Fire Department and will incorporate either threaded or Storz connections as required. The mounting height will be between 457 mm and 1219 mm above finished grade level. The location will be approved by the City fire department and the Authority.

7.3.1.1(26) Provide water curtain sprinklers or other fire protection measures necessary to maintain fire ratings along paths of egress and/or as required for any BC Building Code equivalencies.

7.3.1.1(27) Refer to Appendix 1Y [Spare Parts and Extra Stock Materials] for spare sprinkler head and accessory requirements.

7.3.1.1(28) Provide fire suppression systems for all commercial kitchen NFPA 96 range hoods. Each individual hood will be served by a separate system.

7.3.1.1(29) All fire extinguishers in the MRI rooms or other such areas as required by the Equipment manufacturer will be non-ferrous; refer to Appendix 1H [Equipment and Furniture].

7.3.1.1(30) Provide a valved and capped fire main branch located near the loading dock. The branch will be suitable for extension by the

Authority under the Future Expansion for use as a standpipe. All caps will have tapping complete with nipple and valve for relief of any liquid or pressure that may have built up behind the cap.

7.3.1.2 Performance Criteria

7.3.1.2(1) All fire protection systems will be hydraulically sized to NFPA standards. Hydraulic calculations will include the applicable inside/outside hose stream allowance for the hazard served.

7.3.1.2(2) All equipment and installation will be in accordance with manufacturers' requirements and in accordance with all BCBC and NFPA requirements.

7.3.1.2(3) All fire protection equipment will be ULC approved.

7.3.1.2(4) Qualified contractor licensed and regularly engaged in such installations will install all fire protection systems and equipment. Design-Builder fire protection systems installer will install, test, Commission and certify all fire protection systems and equipment.

7.3.1.2(5) Provide backflow protection devices on all fire protection systems in accordance with CSA and NFPA requirements. All backflow prevention devices will be listed for fire protection use.

7.3.1.2(6) Fire department connection(s) will be installed at a location approved by the relevant AHJ.

7.3.1.3 Vortex Fire Extinguishing System Requirements

7.3.1.3(1) The Vortex fire protection system will be designed and installed in accordance with NFPA 770 and manufacturer's recommendations.

7.3.1.3(2) The NFPA 770 hybrid-fire extinguishing system will utilize UL Listed and manufacture approved design software for all system installations.

7.3.1.3(3) The Vortex fire protection system will be designed for a minimum three minutes of discharge.

7.3.1.3(4) The design will be such that an alarm condition in any zone will activate the hybrid-fire extinguishing system in that zone only. There will be no cross ties between zones regarding application of fire protection media.

7.3.1.3(5) The installing contractor will be a certified designer and installer of the hybrid-fire extinguishing system per NFPA 770. All on-site subcontractors and their employees will have received the most recent version of the required training per NFPA 770.

7.3.1.3(6) The critical nature of the equipment being protected and its susceptibility to damage from thermal shock and from water intrusion requires that the fire protection system will be designed towards the goal of minimizing the exposure of the equipment to the quantity of water and size of water droplets.

7.3.1.3(7) Provide all design, engineering, conceptual drawings, and detail documents for the fire protection system. All design criteria for each compartment including number of nozzles/emitters, quantity of water, quantity of inert gas, and total duration of the discharge.

7.3.1.3(8) Provide equipment information/product data submittals including water container(s), inert gas storage, fire suppression control panel, and fire detection system components.

7.3.1.3(9) Provide fire protection system details including piping/plumbing materials and miscellaneous devices including the nozzles/emitters, solenoid valves, water valves, filters/strainers, pressure switches etc.

7.3.1.3(10) Provide system acceptance and testing information/procedures per NFPA 770 and the manufacturer.

7.3.1.3(11) Provide the Authority with the type and quantity of spare parts as recommended by the manufacturer.

7.3.1.3(12) Provide detailed information regarding project material procurement dates and on-site delivery dates.

7.3.1.3(13) An engineer from the hybrid-fire extinguishing manufacturer will:

7.3.1.3(13)(a) Review the final design of the system and will provide a letter stating the design meets the intent of the manufacturer’s equipment, design criteria and NFPA 770 criteria;

7.3.1.3(13)(b) Review the final installed piping and manufacturer’s equipment and will provide a letter stating equipment and piping has been installed per the design, as per the manufacturer’s submittals, manuals and as per NFPA 770; and

7.3.1.3(13)(c) Review the system components for functionality, integration with the fire alarm system and intended equipment discharge design.

7.3.2 Structural Moat Wall and Future Underground Parking

7.3.2.1 Structural Moat Wall

7.3.2.1(1) Provide fire protection system/infrastructure (sprinklers) in the spaces between the structural moat wall and the exterior wall of the underground parking and similar such spaces, voids or gaps as required by BCBC and AHJ, including local Fire Department.

7.3.2.1(2) The spaces between the structural moat wall and the exterior wall of the underground parking will be considered a service space and as such, the Design-Builder will provide adequate coverage with fire extinguishers.

7.3.2.2 Future Underground Parking

7.3.2.2(1) Provide means of fire protection (sprinklers/standpipe hoses) as required by BCBC and AHJ. Ensure that parking space fire protection system and infrastructure is designed to support the Authority's use as future parking stalls.

7.3.2.2(2) Provide adequate coverage with fire extinguishers in accordance with NFPA 10.

7.4 Plumbing (Division 22)

7.4.1 Connection to Site Services

7.4.1.1 Basic Requirements

7.4.1.1(1) Provide municipal water service for domestic water and fire protection use, sanitary, and storm services as required and sized to suit the usage needs of the Facility, plus an additional future capacity of 15% in each service above Facility requirements based on Schedule 1 – Statement of Requirements, Appendix 1B [Minimum Room Requirements], Appendix 1H [Equipment and Furniture], Appendix 1I [Food Services Equipment List]. and Appendix 1S [Child Care Centre Requirements]. All incoming water services and Facility sanitary and storm building drains will be provided with flexible connections at the exterior face of the Facility to allow for vertical and horizontal movement in a seismic event. No service is permitted to be buried in concrete.

7.4.1.1(2) Provide one (1) set of incoming water service connections to each of two (2) Facility Water Entry Rooms. Each service will provide the peak domestic water and fire protection requirements and at entry to the Facility will be complete with a shut off valve with electrically supervised tamper switch. Within each Water Entry Room, the water services will be interconnected and supply both domestic water and fire protection systems requirements. Arrange the interconnection such that flow will be maintained through it and that the interconnection will not be a dead leg. The supply serving the domestic water will be provided with reduced

pressure principle backflow preventers on an N+1 redundancy basis. Each supply to the fire protection system will be provided with a detector type double check valve assembly.

7.4.1.1(3) Provide inlet connections from the exterior of the Facility as described in Section 5.1.7 and Section 7.2.

7.4.1.1(4) Provide medical oxygen services from the designated bulk oxygen tank location to the Facility. Coordinate with the Authority's medical gas supplier all potential gas tank and services and all work such as enclosure, seismic concrete pad base, connection point, routing and tie in locations. Provide flexible connections between the Facility and the designated bulk oxygen site. In addition, provide medical oxygen manifolded reserve system sized to provide the Facility's required volume of reserve capacity with interchangeable duty/standby sources.

7.4.1.1(5) Provide flexible pipe connections on all water, sanitary, storm and medical gas services at the exterior face of the Facility. Connectors will be specifically designed to allow for vertical and horizontal movement in the event of a seismic event.

7.4.1.1(6) Provide On-Site rainwater harvesting. Water discharged from the rainwater harvesting system within the Facility will be designated "Process Water".

7.4.1.1(7) Natural gas service will be piped to the Energy Centre and roughed in for the usage needs of the Facility, plus for the needs of the Future Expansion. The service size will be based on the full load of the Facility as if it were not fully electrified, plus an additional 70% of the Facility full capacity heating/steam/domestic hot water loads to account for Future Expansion. The natural gas service will be delivered to the Site by the local gas service provider. Design-Builder will be responsible for providing all On-Site civil, architectural and ancillary infrastructure required by natural gas supplier to accommodate the service connection. All infrastructure and equipment for the incoming service will be in conformance with the requirements of natural gas supplier. Coordinate the location of the gas service On-Site and ensure that protected gas meter location is established complete with all necessary architectural screens, access to the meter and proper service clearances in accordance with CSA B149.1, NFPA requirements and the local natural gas service provider. Piping from the meter location to the Facility will include all necessary flexibility and seismic requirements. Piping will rise above grade and be complete with shut off valve and pressure regulator prior to entry to the Facility.

7.4.1.1(8) Should the natural gas service capacity described in Section 7.4.1.1(7) require an upgrade (upsizing) of the Off-Site Utility infrastructure, the Authority will be responsible for all the design and construction costs associated with the Off-Site portion of the natural gas service upgrade.

7.4.1.2 Sub Surface Drainage

7.4.1.2(1) The Geotechnical Report will be used to determine the extent and scope of ground water subsurface drainage requirements.

7.4.1.2(2) The ground water subsurface drainage requirements will be confirmed in consultation with the Geotechnical Consultant and Structural Engineer-of-Record. Coordinate with the Geotechnical Consultant the anticipated ground water flow to ensure sump pumps and drainage piping are of adequate capacity.

7.4.1.2(3) All perimeter drainage will be collected in appropriately sized sediment sump and pump chambers to accommodate the maximum sub surface design flow rate. At the base of foundation walls, sleeves will be provided through walls with diameter of sleeves and spacing of sleeves as recommended by the Geotechnical Report. Extensions from the sleeves will be piped from the discharge end of each sleeve and connect to the perimeter drainage system. All sub surface system discharge piping will be discharged to the Facility storm water drainage system.

7.4.1.2(4) All interior drainage for underground parking will be incorporated into a drain/sediment collection system and pump chamber that is fully integrated into the structural system. All waste pumped from the lowest parking level will be pumped to a gravity drain line.

7.4.1.2(5) Provide oil/grit separator/s as required by The City of Surrey Design Criteria for the Facility parking structure drainage system. All necessary pump/s, motors, accessories, electrical components and connections associated with the oil interceptor system will be intrinsically safe.

7.4.1.2(6) All elements of the subsurface drainage systems will be coordinated with the structural design. If pile foundations are used to support the structure, all piping will be supported (hung) from the concrete slab above. Hangers and rods will be of sufficient strength and be installed at intervals to carry the pipe, the contents, the backfill above the pipe and maintain the required slope. All metal components of the hanger system will be stainless steel. Trim off excess hangers and rods so that only the required amount remains. Install light-weight fill over the pipe

where practical and use a material that is acceptable to the AHJ to minimize the pipe deflection between supports.

7.4.1.2(7) For minimum site metering requirements refer to Appendix 1P (Metering Matrix)

7.4.1.3 Performance Criteria

7.4.1.3(1) Municipal water services provided to the Facility will meet the water quality requirements in accordance with CSA Z317.1 and the British Columbia Drinking Water Protection Regulation.

7.4.1.3(2) Installation of all new water services to the Facility will meet the requirements of NFPA 13 and NFPA 14 for all fire services supply mains.

7.4.1.3(3) Installation will provide redundancy to maintain uninterrupted Facility operation while cleaning, repairing or replacing devices.

7.4.1.3(4) Domestic water pressure serving the Facility will be as provided by the City of Surrey and will be considered constant under all normal operating and seasonal conditions.

7.4.1.3(5) If the delivery pressure in the water service for the domestic water system exceeds 550 kPa (80 psi), two (2) high/low flow pressure reducing valve stations, installed horizontally at the same elevation, will be provided with 100% redundancy. Each PRV will have a fully open hydraulically controlled back up valve capable of communicating to the BMS system installed before the PRV. If failure of the main PRV occurs, the hydraulically controlled back up PRV will activate maintaining a safe constant water pressure downstream while sending an alarm signal to BMS system. PRVs will be sized at 8'/sec unless the AHJ lists a different flow rate in the building by-laws. Pressure reducing valve stations will be located in accessible locations in each Water Entry Room.

7.4.1.3(6) Water service entry locations servicing fire protection systems will be provided with shut off valves complete with electrically supervised tamper switches. Premise isolation redundant in parallel reduced pressure backflow preventers will be provided in Water Entry Rooms on all incoming water supplies serving the domestic water system.

7.4.1.3(7) All service piping within the Facility will be accessible. Except for piping serving floor drain trap primer connections, no service piping inside the Facility will be run in concrete slabs.

7.4.2 Plumbing System Distribution Systems

7.4.2.1 Basic Requirements

7.4.2.1(1) Design the plumbing distribution systems to prevent disruption to the operation of the Facility during maintenance or repairs. Locate all isolation, balancing, and other service valves in the corridor ceiling spaces, such that they are accessible in accordance with the requirements of Section 7.1 or locate valves behind lockable security access panels outside the rooms or within the room in a location acceptable to the Authority and ensure they are accessible to Staff. Access panels to be large enough to allow for full removal of any pieces of equipment.

7.4.2.1(2) Provide isolation valves for all plumbing services and fixtures and clearly identify the location of all valves On-Site in Facility Operation and Maintenance Manuals and on the Record drawings. All valves will be listed and certified to ANSI/NSF/CAN61 and ANSI/NSF 372.

7.4.2.1(3) At a minimum, provide isolation valves at the following locations:

7.4.2.1(3)(a) at each set of piping branches from the main distribution line;

7.4.2.1(3)(b) at all locations where the branches serve groups of rooms with similar uses;

7.4.2.1(3)(c) to each Patient washroom group on branches serving individual speciality equipment and fixtures;

7.4.2.1(3)(d) on all branch lines to hose bibbs; and

7.4.2.1(3)(e) other locations as required for maintenance or emergency shut-off.

7.4.2.1(4) For Patient washrooms, provide shut-offs valves on water supply lines serving a maximum of four (4) grouped washrooms. For Inpatient Units as described in Appendix 1A [Clinical Specification and Function Space Requirements] provide shutoff valves for a maximum of two (2) private rooms or one (1) double room. Provide shut-off valves for domestic cold, hot and hot recirculation water on the same floor as fixtures served. All shut-off valves serving patient washrooms will be housed in a fully recessed valve box in an accessible location immediately outside the room in the corridor (or on other location as determined in consultation with the Authority) at 1.5 m AFF and be key locked to FMO master.

7.4.2.1(5) In addition to shut-off valves for grouped fixtures, each fixture will be supplied with a local shut-off valve at the fixture.

7.4.2.1(6) For the Secure Room, provide shut-off valves on each of the hot, cold, and recirculation water services serving the room. The isolation valves will be located within the adjacent Anteroom – Secure Room in a fully recess, locked access panel located 1.5 m AFF.

7.4.2.1(7) Cross-connect all incoming water service mains within the Facility to allow for seamless Facility operation from any water service and meet redundancy requirements as set out in this Schedule.

7.4.2.1(8) All backflow preventers will be installed and located in CSA Type III areas where maintenance and testing of the devices can be properly and easily addressed. The Design-Builder will work in consultation with the AHJ for selection of the required type of backflow preventer for each required device. Advise the Authority of the selections.

7.4.2.1(9) Drainage for all backflow preventers will be provided in the immediate vicinity of the backflow prevention stations and will be sized to manage flow rates from the backflow preventers in full operational mode. They will not drain directly on to the floor but to a properly sized funnel drain.

7.4.2.1(10) In locations throughout the Facility where backflow preventers are required to serve Equipment in finished areas, the entire assembly will be installed in a locked stainless steel cabinet incorporating a door with clear laminated glass. Door will be labeled Backflow Preventer. The cabinet will have a drain connection adequately sized to accommodate the discharge from the backflow preventer relief ports. All downstream drainage piping will be sized to accommodate the relief port flow. Back flow preventer assemblies will not be installed in sterile or CSA Type I areas.

7.4.2.1(11) Where failure or maintenance of a backflow preventer would disrupt normal operation on an entire floor, Component or Sub-Component, provide N+1 backflow preventers.

7.4.2.1(12) Distribute domestic water and recirculation systems by means of risers to each floor area to a maximum of 33% of the total floor area with a minimum of three (3) risers per floor plate. For inpatient floors, provide a minimum of two (2) risers and loop all services on each floor. Provide isolation valves to limit on-floor areas served by each zone valve from the riser to a maximum of 18% of the total floor area in each zone. Provide isolation valves in the riser up and downstream of all branch lines serving floor zones. Each of the vertical domestic water risers will be interconnected at the top and bottom of the risers with 32 mm diameter connections complete with isolation valves in

serviceable locations as set out in Section 7.1. All RO systems, MDR, Patient Food Services, Laboratory, steam boilers and cooling towers will be fed from two (2) risers to provide the required level of redundancy. Domestic water/RO system serving the MDR area will have, in addition to the above requirements, a looped system.

7.4.2.1(13) Provide Utility meter for domestic water services to the Facility. The location of the water meter will be coordinated with the Utility provider. Each meter will have the ability to connect to the Facility BMS and will have remote readers compatible with the City of Surrey water meter program.

7.4.2.1(14) Provide a self-cleaning strainer, turbine style water meter with remote readers, meeting City requirements with connection to the Facility BMS including:

7.4.2.1(14)(a) a minimum of two (2) reduced pressure backflow preventers,

7.4.2.1(14)(b) a minimum of two (2) sets of self-cleaning filters. The first filter in each set will provide 100 micron filtration and the second filter in each set will provide 25 micron filtration; and

7.4.2.1(14)(c) supply two (2) sets of high/low flow PRVs or two (2) PRVs with built in low flow bypass valves. Each valve will have a fully open hydraulically controlled back up valve capable of communicating to the BMS system installed before the PRV. If failure of the main PRV occurs, the hydraulically controlled back up PRV will activate maintaining a safe constant water pressure downstream while sending an alarm signal to the BMS system. PRVs will be sized on 8’/sec unless local authority or jurisdiction lists a different flow rate in the building by-laws on the domestic water supply downstream of the domestic water meter where the incoming water system pressure exceeds the acceptable delivery pressure of 550 kPa (80 psi) noted in the BCBC.

7.4.2.1(15) The incoming water stations will incorporate 100% redundancy to maintain uninterrupted Facility operation while cleaning, repairing, or replacing devices including PRVs within the water station.

7.4.2.1(16) Place the valves stations in accessible locations within the Water Entry Rooms with provisions for adequate drainage of all components in the immediate vicinity of the stations.

7.4.2.1(17) PRV's dedicated to specific Equipment throughout the Facility may be mounted beside Equipment served and do not require redundancy unless the specific piece of Equipment is essential as determined by the Authority. Make-up water to cooling towers and RO systems are essential and require redundant PRV's. PRVs in finished spaces will be provided in nearby service rooms or housekeeping rooms where available. Where no such rooms are nearby, provide PRVs in fully recessed stainless steel lockable cabinets incorporating a door with clear laminated glass.

7.4.2.1(18) Provide a domestic water booster pump system, in an N+1 configuration, to serve the Facility, if the lowest expected Municipal service pressure is insufficient to meet the worst-case pressure requirements.

7.4.2.1(19) Provide the domestic water booster pumping system per the requirements of CSA Z317.1. Base the design on the lowest incoming pressure of the incoming water mains during peak summer operation. The number and arrangement of pumps will be such that peak demand will be met in the event of failure of any one pump. The number of pumps in the pump package will address both high and low flow conditions and the associated issues related to variable speed capabilities. If all conditions cannot be met, then additional pumps will be added to the package.

7.4.2.1(20) Pumps will be connected to emergency power as described in Section 7.7 and provide minimum pressure requirements on the highest floor level. Include the domestic water pumping system in the emergency generator calculations. The system will provide uninterrupted water service and constant pressure under all conditions including during the post-disaster period.

7.4.2.1(21) The domestic water booster pump system serving the Facility will be capable of operating during post-disaster conditions. Supply will be from a tanker truck only, with gravity feed. Booster pumps for the post-disaster mode will be a separate pump package unit and will be capable of supplying a maximum flow rate of 10% of the Facility normal demand with 100% of the required pressure. The post-disaster pump package unit will be connected to delayed vital power and will connect into the main water distribution system downstream of the Facility’s main domestic water pump system. Refer to Section 5.2 and Section 7.1.30 for post-disaster requirements.

7.4.2.1(22) Domestic water service, to point-of-use filtration such as water/ice dispenser units, will utilize filters with 0.2 micron cartridges and will be designed with redundancy to allow for filter replacement without affecting water flow to Equipment.

7.4.2.1(23) For specialized equipment such as scope washers requiring finer level of filtration, review all filtration requirements with final equipment selection in Appendix 1H (Equipment and Furniture), and provide a redundant onboard equipment filter or alternative as approved by the Authority. In addition, provide 5 micron pre-filters upstream of specialized equipment's external filter. Pre-filters and final filters will have pressure gauges on both sides and bypasses to allow to allow for filter replacement without affecting water flow to the equipment.

7.4.2.1(23)(a) Provide three (3) sets of 0.2 micron filter assemblies, each with quick connect fittings, mounted in an accessible location to serve Heater Cooler Equipment in Soiled Utility Perfusion rooms and other areas as indicated in Appendix 1H [Equipment and Furniture]. Provide upstream and downstream pressure gauges, bypasses, and isolation valves to enable monitoring and maintenance.

7.4.2.1(24) Filter housings will be:

7.4.2.1(24)(a) transparent styrene acrylonitrile or similar meeting NSF 42; and

7.4.2.1(24)(b) have pressure gauges before and after filters.

7.4.2.1(25) The plumbing system designs will incorporate flexibility to accommodate future alterations and allow for expansion capacity in the systems.

7.4.2.1(26) All systems will be clearly labeled, and colour coded in accordance with industry standards including painting and labelling of all pipes, ceiling identification dots, valve tagging, flow directions and emergency valve identification signage. Sanitary drainage stacks will be labelled at slab penetrations stating to which room above they are connected.

7.4.2.1(27) Provide water systems within the Facility which supply water at the required pressures for optimal fixture operation to all water outlets. Minimum water pressure will be maintained at 40 PSI to the most remote fixture and will be demonstrated during Commissioning.

7.4.2.1(28) Durable piping materials will allow for 24 hour a day operation with minimal downtime and ensure an operational life of at least 30 years. Stainless steel will be used in domestic water piping applications and will be roll grooved or pressed Schedule 10 type 304/304L to ASTM A312 sized at velocities in compliance with

the BCBC. Provide pipe materials in accordance with the BCBC and LMFM requirements for above ground potable and non-potable water distribution systems. The use of copper piping will not be permitted. The use of PEX piping is only permitted as per Section 7.4.2.1(39). Piping running through high risk critical areas will be continuously welded.

7.4.2.1(29) All products including pipe, valves, fittings, accessories, factory supplied, OEM, as well as fabricated assemblies/spools that will come in contact with domestic (potable) water will be tested and certified to NSF/ANSI/CAN 61 and 372 for commercial hot and cold water ratings (as applicable). Before any work commences On-Site, the Design-Builder will provide evidence of agency certification to the afore-mentioned standards through official certification documents and/or online certification Listings including tested and Approved water contact temperature(s). Any products found to be non-compliant with these requirements will be replaced at the Design-Builder's expense.

7.4.2.1(30) All grooved/mechanical joint products to be from Victaulic or alternative as approved by the Authority. All grooved/mechanical joint products to be from of a single ISO certified manufacturer.

7.4.2.1(31) Connections utilizing compression will not be used.

7.4.2.1(32) Only the following pipe materials are acceptable for above ground potable and non-potable water distribution systems. Excluding RO systems:

7.4.2.1(32)(a) 12 mm (NPS ½") to 50 mm (NPS 2") Victaulic Vic Press Stainless Steel fittings and valves c/w HNBR gaskets, including P569 3-Piece Lockable Ball Valves and Thermostatic Domestic Hot Recirculation Balance Valves. Stainless tubing is not acceptable.

7.4.2.1(32)(b) 40 mm (NPS1 ½") to 300 mm (NPS 12") Victaulic Stainless Steel grooved end fittings, 800 series couplings (#807 50 mm to 150 mm, #889 50 mm to 300 mm. #877 50 mm to 100 mm on Sch 10 and 50 mm to 200 mm on Sch 40), 445SS flange adapters, isolation and check valves, Victaulic/Bermad 900/700 Series strainers, check valves & PRV's.

7.4.2.1(33) For isolation of the stainless steel potable water systems, use P569 Ball Valves and/or the 861 BFVs.

7.4.2.1(34) All components will form a complete system by the same manufacture unless a required product is not manufactured as part of their offering.

7.4.2.1(35) Victaulic grooving tools with RX Rolls for SS will be used for all pipe end preparation of Stainless-Steel Schedule 10 pipe. The Vic- Press PFT510 tool will be used for all pressed joints.

7.4.2.1(36) All materials, methods, fabricated assemblies, OEM products or spools and products that contact domestic water are listed and certified to NSF/ANSI/CAN61 for domestic hot and cold water, as well as NSF/ANSI372.

7.4.2.1(37) At time of system turn over the Design-Builder will provide the owner a brand new Vic-Press PFT510 tool (complete with all jaws, batteries, charger and cases), as well as a Victaulic grooving tool c/w all roll sets including RX rolls for SS, for any future in-house additions, alterations or upgrades.

7.4.2.1(38) The warranty on Victaulic products, or alternative as approved by the Authority, will be provided in accordance with Appendix 1X [Warranty Requirements].

7.4.2.1(39) PEX piping will only be accepted for plumbing branch lines to fixtures that are located within the wall systems within the room.

7.4.2.1(39)(a) For isolation of the Uponor PEX-a water systems, use Uponor ProPEX lead-free brass commercial brass ball valves.

7.4.2.1(39)(b) For fixture valve stops when PEX is used for pipe drop in walls, install valve outlet plate at rough-in. It will incorporate valve, escutcheon, brass stub out, and bracket. Plate will be supplied with ¼-turn supply valve, having ¼" & ⅜" compression connection or ¾" male hose connection. Valve will be plated and replaceable with any common ⅝" compression valve. Outlet connections should generally be provided with a test/Tamper Resistant cap. Plate allows debris cover to thread in for protection during rough-in.

7.4.2.1(40) Provide flushing and disinfection of domestic water systems in accordance with LMFM Flushing and Sanitation of Potable Water Systems. Provide independent testing of piping systems once flushing and cleaning has been completed and provide documentation of testing to the CxA.

7.4.2.1(41) Provide appropriately sized domestic water supply connections for equipment and fixtures throughout the Facility. All branch lines

to fixtures and the supply lines to individual fixtures will be in accordance with the BC Plumbing Code.

7.4.2.1(42) Provide all accessories required for connection to fixtures and Equipment suitable for the intended use, in accordance with applicable standards, and manufacturer's requirements for any connected Equipment. This includes shut-off valves, point-of-use micron filtration, PRVs, thermostatic mixing valves and backflow preventers.

7.4.2.1(43) Provide plumbing connections to all Equipment. Refer to Appendix 1H [Equipment and Furniture] and Appendix 1I [Food Services Equipment List].

7.4.2.1(44) Design plumbing systems to accommodate the requirements of commercial spaces. Make allowance within the Facility systems described in Section 5.13 for any future plumbing systems required for Pharmacy and Food Retail Spaces.

7.4.2.1(45) Ensure the domestic cold water and domestic hot water quality complies with the applicable codes, standards, and manufacturer's recommendations for all Equipment.

7.4.2.1(46) Plumbing system design, fixtures and values will comply with requirements of CSA Z8000, CSA Z317.1, and the BCBC.

7.4.2.1(47) On the exterior wall of the Facility provide self draining, non freeze, fully recessed cold water hose bibbs spaced as required by the Authority and as per Section 7.4.2.14(7)(a). Hose bibbs will be contained within fully recessed boxes with lockable access doors. For each hose bibb provide backflow/ back siphonage prevention device as required by the BCBC and an upstream shut off valve located in accessible non-Patient areas.

7.4.2.1(48) On the exterior wall of the Facility provide a self draining non freeze fully recessed cold water hose bibb for dedicated connection to the Mobile Medical Unit (MMU). Locate the hose bibb near the designated parking spot for the MMU.

7.4.2.1(49) Provide the Cyclotron Lab area (excluding changerooms and washrooms) with a dedicated non-potable domestic water system with N+1 zone isolation incorporating RPBA backflow preventers and additional equipment backflow preventers as required by the AHJ.

7.4.2.1(50) The Cyclotron will be complete with a packaged deionized (DI) water system from the vendor. Provide feed water system including drainage and install the packaged deionized (DI) water system, complete with required controls and accessories to serve

the Cyclotron Equipment and beam line cooling system. Refer to Section 7.5.10.1(25).

7.4.2.2 Performance Criteria

7.4.2.2(1) Provide two (2) sets of self cleaning backwashable filters on an N+1 redundancy basis complete with automatic time and pressure differential activation Facility incoming domestic water services. The first filter in each set will provide 100 micron filtration and the second filter in each set will provide 25 micron filtration. The filter backwash process will not result in any interruption of the water supply or filtration process. Drains of suitable sized will be provided to accommodate filter backwash flows.

7.4.2.2(2) Provide isolation valves for all plumbing services and clearly identify the location of all valves.

7.4.2.2(3) Valves will be located at a minimum, at each set of piping branches from the main distribution line, and at all locations where the branches serve a group of rooms as described in Section 7.4.2.1(4).

7.4.2.2(4) Isolation valves for piping 50 mm and smaller will be ball valves with lever handles. Stainless steel systems will have stainless steel ball or butterfly valves.

7.4.2.2(5) All isolation valves 65 mm and larger will be of a butterfly style with gear operators on valves 150 mm and larger. All butterfly valves will be Victaulic or alternative as approved by the Authority.

7.4.2.2(6) Ensure that the design of the incoming domestic water station provides for adequate drainage systems designed to accommodate both the maintenance and operational flow rates from the strainer discharge and the backflow preventers in full operational mode.

7.4.2.2(7) Incorporate flexibility in the system designs to accommodate future alterations. Label all systems clearly, including painting and labelling of all pipes, ceiling identification dots, valve tagging, and emergency valve identification signage. Pipe labels will be installed every 8 m, each side of every wall penetration, and beside service valves. Pipe and equipment labels will match existing site Pipe Identification standard.

7.4.2.2(8) Provide Avery dots to identify access points for valves, dampers, control devices, and cleanouts. Provide Avery dot colour matrix to the Authority for review before installing. Avery dots will be provided on ceiling grids and access panels.

7.4.2.2(9) Provide brass valve identification tags on all valves. Schedule valve numbers using sequential numbering system. Provide valve tag list indicating valve number, system, location, normal operating position, and area served. Confirm starting number and tagging convention with the Authority.

7.4.2.2(10) Provide and install all domestic water connections to fixtures and equipment in accordance with manufacturer's specifications, standards, and installation instructions.

7.4.2.2(11) Provide services for easy access and serviceability while preventing interference with other services during operation and maintenance activities. All equipment, valves, and cleanouts will be Operable, Serviceable and removable, if required, without adapting wall/ceiling finishes or structure. No plumbing piping (sanitary, storm, or domestic water) will pass through electrical, server, communication, generator, or UPS rooms.

7.4.2.3 RO Water Systems – Non-Dialysis

7.4.2.3(1) Provide separate and individual central RO filtered water systems except as permitted in Section 7.4.2.3(16). All RO water systems will be chemically disinfected prior to Substantial Completion. RO water systems will be used in following non-dialysis areas of the Facility:

7.4.2.3(1)(a) Laboratory – serving laboratory Equipment and two (2) faucet stations;

7.4.2.3(1)(b) MDR – serving MDR cleaning systems and final rinse cycle for MDR sterilizers. Feed water quality will comply with CSA Z317.2 and all manufacturer requirements;

7.4.2.3(1)(c) Energy Centre – feed water for clean steam boilers serving sterilizers. Clean steam feed water quality and steam condensate quality will meet or exceed CSA Z314- 18 Canadian Medical Device Reprocessing standard; and

7.4.2.3(1)(d) Supply Air Handling Units – adiabatic humidification system.

7.4.2.3(2) Each system will be sized for the current system demands plus an additional 15% future demand.

7.4.2.3(3) Each system will be complete with redundant components that will allow for the systems to maintain full capacity during all maintenance, cleaning and disinfection.

7.4.2.3(4) Each system will be separate and not interconnected to any other system.

7.4.2.3(5) Install distribution piping in accessible locations to allow replacement with minimal disruption of Patient Care Areas.

7.4.2.3(6) All piping for the entire system will either be schedule 10 type 316 L stainless steel with orbital welded joints or will be high purity PEX piping.

7.4.2.3(7) All welding of the stainless steel piping will include for pickling and passivation after the welding process.

7.4.2.3(8) Stainless steel piping installation will make allowances for expansion and contraction of the piping system when the piping is subjected to a maximum disinfection cycle temperature of 90ºC. The RO water generation packaged system/skid and the associated RO water distribution systems (SDS), including as a minimum tanks, pumps and piping loop, require supply with packaged automatic electrical heat disinfection systems. In addition, both the skid and the distribution systems require a means of conducting chemical disinfection.

7.4.2.3(9) Provide RO water connections for portable deionized water packaged systems within labs.

7.4.2.3(10) For polishing of the RO permeate for laboratory use provide On-Site mixed bed ion exchange polishers with the effluent being deionized water as indicated by:

- 7.4.2.3(10)(a) Bacteria: <10 CFU/ml;
- 7.4.2.3(10)(b) Resistivity: >10 megaohm.cm;
- 7.4.2.3(10)(c) TOC: <500 ppb; and
- 7.4.2.3(10)(d) Particles: 0.2 um filtration or better.

7.4.2.3(11) Each system will include the following minimum components:

- 7.4.2.3(11)(a) Backflow prevention;
- 7.4.2.3(11)(b) Tempered water supply;
- 7.4.2.3(11)(c) Particulate filtration;
- 7.4.2.3(11)(d) Dechlorination systems;
- 7.4.2.3(11)(e) Pumps;
- 7.4.2.3(11)(f) UV Sterilizers;

7.4.2.3(11)(g) Bacterial Traps;

7.4.2.3(11)(h) Storage tanks;

7.4.2.3(11)(i) De-ionation filter beds;

7.4.2.3(11)(j) RO filtration; and

7.4.2.3(11)(k) All necessary valves and fittings.

7.4.2.3(12) Base-building drainage will be required to be provided to meet all the drainage needs of the entire RO water assembly.

7.4.2.3(13) All drain piping systems will be of the appropriate material for the quality of water discharged and will be sized to handle the maximum flow that would be anticipated from the system.

7.4.2.3(14) Each RO system will have N+1 redundancy in RO water generation and associated components, including tanks.

7.4.2.3(15) Each RO system will have N+1 redundancy in risers and loops to allow for disinfection and sterilization of one (1) riser and loop at a time, while the other riser and loop remain active. This applies to the MDRD, Laboratory, and the adiabatic humidification system.

7.4.2.3(16) As an alternative to the separate and individual RO filtered water systems identified in Section 7.4.2.3(1), the RO water systems for the central Lab and for the MDR may be combined provided that the RO water for the lab is provided with additional polishing as per Section 7.4.2.3(10). The RO water systems for the Energy Centre steam and adiabatic humidification may be combined provided that the water is polished to the most stringent requirements of the department or system served.

7.4.2.4 Process Water System

7.4.2.4(1) Distribution of process water, meaning the non-potable water system, will be independent and separated from the domestic water system and be completely isolated from any portion of the domestic water system.

7.4.2.4(2) Non-potable process water systems will be designed, fabricated and installed in compliance with CSA-B128.1, Design and Installation of Non-Potable Water Systems. Process water piping will be Schedule 10 type 304 stainless steel with markings and identification as required by CSA-B128.1.

7.4.2.4(3) Provide shut-off valves and backflow prevention on all make-up connections from the domestic water system to the process water system.

7.4.2.4(4) Provide a full sized DCW connection for cooling tower make-up water to serve as back-up to the normal make-up supply from the process water system. The back-up DCW connection will be located at or above a minimum elevation of 6.0 m and automatically supply cooling tower make-up water during failure or maintenance of the process water system and pumps.

7.4.2.5 Process Water Storage System

7.4.2.5(1) Provide a below grade process water storage tank system in conformance with City requirements for reuse water and CSA B128.1/2.

7.4.2.5(2) Process water storage tank system will provide 165 cubic metres volume. Water storage tank will have minimum of either three (3) independent, equal size compartments or three (3) tanks of 55 cubic metres each, that can be connected to allow safe cleaning of one (1) tank while the other two (2) tanks remain in full operation. Maintain a minimum 1/3 or 55 cubic metre capacity volume at all times for process water. Process water will be used as make-up water for cooling towers. Provide double isolation valves on connections between tanks/compartments. Tank interior will be smooth without obstructions and all corners will be rounded. Tank will be covered and vents will be filtered.

7.4.2.5(3) Process water will be gathered from the On-Site rainwater harvesting system and piped directly to the process water storage tank system.

7.4.2.5(4) Provide a process water storage tank system which includes:

7.4.2.5(4)(a) A water treatment system to maintain water quality which includes a circulation system to promote mixing and ensure stagnation does not occur. The system will also include a disinfection system complete with BMS monitoring to ensure that the system remains biologically inactive;

7.4.2.5(4)(b) The water treatment system will include a jellyfish type filtration system with diameter of manhole, quantity of hi-flo cartridges and draindown cartridges sized to suit the treatment flow rate, double wall containment of hydrocarbons, automatic backwashing of the hi-flo rate cartridges and allowance for the manual backwashing or filtration membrane rinsing;

7.4.2.5(4)(c) Pump suction for process water complete with an anti-vortex inlet including a suction strainer to

minimize ingestion of sediment from the bottom of the tank system; Pump suction will be located no lower than 305 mm from bottom of tank;

7.4.2.5(4)(d) External still tube for level transmitter/switch and alarms (Low, Low/Low, High, High/High). Connect all alarms to Facility BMS; and

7.4.2.5(4)(e) Safe access on both inside and outside of the tank for maintenance and cleaning. Tank configuration will permit WorkSafe BC confined space entry procedures to be implemented. That is, tank design will permit implementation of a safety plan including provision of temporary ventilation, temporary lighting and extraction equipment.

7.4.2.6 Domestic Hot Water Systems

7.4.2.6(1) Basic Requirements

7.4.2.6(1)(a) Provide a domestic hot water system with sufficient capacity and recovery rate for the hot water requirements of the Facility. Allow for 15% expansion capacity within each system for future flexibility.

7.4.2.6(1)(b) Provide domestic hot water calculated to meet the demand in accordance with ASPE Plumbing Engineering Design Handbook and CSA Z317.1.

7.4.2.6(1)(c) All domestic hot water and hot water recirculation piping will be stainless steel schedule 10 type 304/304L to ASTM A312 piping as per Section 7.4.2.1(32).

7.4.2.6(1)(d) Domestic hot water supply will be of adequate temperature to serve the needs of the Facility and will be stored and circulated at temperatures noted in CSA Z317.1 Table 1.

7.4.2.6(1)(e) Provide a central mixing valve, in N + 1 configuration, to reduce the distributed temperature from stored tank temperature to distribution temperature.

7.4.2.6(1)(f) Provide pressure / balance, thermostatic mixing valves, where water temperatures are required to be less than 60 ºC at point-of-use.

7.4.2.6(1)(g)	Provide fail-safe bypass for over temperature water after central mixing valve.
7.4.2.6(1)(h)	Provide alarm to BMS for over temperature conditions.
7.4.2.6(1)(i)	To permit uninterrupted service, provide normally closed bypass around the mixing and diverting valves complete with lockable valve.
7.4.2.6(1)(j)	Bypass will connect to piping upstream of over temperature monitoring sensor to permit continuous monitoring of domestic hot water system supply temperature.
7.4.2.6(1)(k)	The domestic hot water heating system will be configured to provide N+1 redundancy and will meet or exceed the energy efficiency requirements of ASHRAE 90.1.
7.4.2.6(1)(l)	The domestic hot water system will contain storage tanks and double wall water to water heat exchangers both in an N +1 configuration. The quantity and capacity of the storage tanks and heat exchangers will be determined during the detailed design.
7.4.2.6(1)(m)	Each pressure zone will have a separate domestic hot water recirculation system complete with reheat capability to maintain the pressure and temperature integrity of each zone.
7.4.2.6(1)(n)	Calculate and submit an electronic spreadsheet calculation to the Authority of the estimated maximum flow requirement for the domestic hot water supply, refer to Section 2.5 for Submittal requirements.
7.4.2.6(1)(o)	Ensure that the domestic hot water system is designed to deliver hot water to all fixtures with no dead legs. Provide a recirculation system between the distribution system and the hot water generation equipment.
7.4.2.6(1)(p)	Locate pressure balance, thermostatic mixing valves serving plumbing fixtures as close as possible to the fixture it serves.

7.4.2.6(1)(q) Provide tempered water, set for 42 ºC, through local under counter mixing valves when serving individual plumbing fixtures.

7.4.2.6(1)(r) Domestic hot water master mixing valves and hot water mixing valves used for temperature sensitive locations within the Facility (including MDRD, feeds to RO systems), will be required to have visual temperature gauges accessible at the point of-use or local installation and are to have a high temperature alarm that will be both local and on the BMS.

7.4.2.6(1)(s) Design the domestic hot water system to prevent growth and spread of Legionella bacteria. Design strategies may include heat-based control, active treatment systems, eliminating dead-leg piping, flush to drain valves, and minimizing stagnant water by connecting the domestic hot water circulation system as close as possible to fixtures, including drops in a wall as described in this Schedule. Design will conform to the latest ASPE standards on Legionella Design for Healthcare Facilities, ASHRAE Standard 188, and ASHRAE Guideline 12.

7.4.2.6(2) Performance Criteria

7.4.2.6(2)(a) Provide a domestic hot water generating plant and hot water storage equipment to meet the requirements of CSA Z317.1 and the requirements set out in this Schedule.

7.4.2.6(2)(b) Recirculate domestic hot water from the distribution system(s) back to the generating Equipment within each appropriate pressure zone. For domestic hot water recirculation, provide thermostatic valve for automatic balancing on each recirculation branch. Thermostatic balancing valve will have ability for manual temperature adjustment, c/w lock out feature, built in temperature display and shut off function.

7.4.2.6(2)(c) Piping and valves will be appropriately sized to ensure adequate flow that prevents stagnation or accelerated pipe erosion.

7.4.2.6(2)(d) Monitor hot water temperatures, at the storage tank, in the supply and return piping, and at the

ends of each piping loop on each floor, on the BMS and provide alarm outputs when the temperature exceeds or drops below the design set point range.

7.4.2.7 Plumbing Fixtures

7.4.2.7(1) Basic Requirements

7.4.2.7(1)(a) Provide fixtures as indicated and as necessary to achieve the functionality described in Appendix 1A [Clinical Specification and Function Space Requirements] and as needed to comply with all applicable codes and regulations.

7.4.2.7(1)(b) Comply with the performance requirements outlined in CSA Z317.1 and CSA Z8000.

7.4.2.7(1)(c) Plumbing fixtures will be selected in consultation with the Authority.

7.4.2.7(2) Performance Criteria

7.4.2.7(2)(a) Electronic sensor activated fixtures will meet the following requirements:

7.4.2.7.2.(a).1 All sensors will be hard-wired and served by the vital electrical system so water is available during a power outage;

7.4.2.7.2.(a).2 The duration of sensor faucet flow will be adjustable. All sensors will be set at 10 seconds but will be able to operate for a minimum of 45 seconds without interruption of flow, to facilitate proper hand washing. Faucets will have user adjustable temperature range adjustment as part of the faucet.

7.4.2.7.2.(a).3 Sensors will retain the ability to turn off automatically when hands are no longer in the sensor range.

7.4.2.7.2.(a).4 The domestic hot water recirculation system will be connected to the fixture’s hot water supply immediately next to the fixture shut-off at the wall.

7.4.2.7.2.(a).5 Provide water hammer arresters on the cold water and hot water supply to each fixture or bank of fixtures served by a single branch in accordance with PDI Standards.

7.4.2.7.2.(a).6 Ensure fixtures with electronic flush valves also have a manual flush operator. Pressure assist flush valves will not be used.

7.4.2.7.2.(a).7 If system pressure exceeds the acceptable delivery pressure, then provide PRV with 100% redundancy. Place the valves in accessible locations.

7.4.2.7.2.(a).8 Where possible, provide fixtures with antimicrobial coatings.

7.4.2.7(3) Provide plumbing fixtures that comply with the following maximum water consumption requirements:

7.4.2.7(3)(a) Toilets (Patient) - 4.8 L/flush (1.2 gpf);

7.4.2.7(3)(b) Toilets (public) - 4.8 L/flush (1.2 gpf);

7.4.2.7(3)(c) Urinals – 1.9 L/flush (0.5 gpf);

7.4.2.7(3)(d) Staff showers – 7.8 L/min (2.0 gpm);

7.4.2.7(3)(e) Patient showers – 7.8 L/min (2.0 gpm);

7.4.2.7(3)(f) Hand hygiene sinks – 5.7 L/min (1.5 gpm);

7.4.2.7(3)(g) Sinks and lavatories – 5.7 L/min (1.5 gpm); and

7.4.2.7(3)(h) Metering faucets – 0.95 L/cycle (0.25 gallons/cycle)

7.4.2.7(4) Sinks will be required to meet the specific requirement of ASTM A112.19.3-2017/CSA B45.4-17 for construction materials and methods of fabrication.

7.4.2.7(5) Sinks will meet the requirements of CSA Z317.1 and CSA Z8000 including materials, size, performance, construction, installation, location, controls, operation, including items such as backsplash, soap and lotion dispensers, and accessibility. In addition, lavatories will meet all BCBC requirements.

7.4.2.7(6) All plumbing fixtures will be impervious, durable materials suitable for the Facility. Fixtures selected will have proven acceptable healthcare performance, from similar previous installations.

7.4.2.7(7) All plumbing fixtures will be supplied complete with all hangers, accessories for mounting, water supplies and shutoffs, flexible connectors, drain waste and vent connections, water hammer arrestors, all low voltage wiring supplies, wall boxes and access panels.

7.4.2.7(8) Provide frames for Authority supplied Equipment. Refer to Appendix 1H [Equipment and Furniture].

7.4.2.7(9) Provide solid water supply tubing to sinks and lavatories for ease of cleaning. No braided flex supplies are permitted in areas where

Patients are receiving care or treatment, unless covered with a skirt or shroud.

7.4.2.7(10) All low voltage wiring and cables will be mounted in accessible junction boxes located within the wall below the fixture and will include stainless steel face plates with Tamper Resistant screws.

7.4.2.7(11) All line voltage plugs to low voltage wiring connections will be concealed in access boxes that are not accessible to the public or in concealed ceiling locations that are not visible without removal of an access panel.

7.4.2.7(12) Provide fixtures with antimicrobial coatings in CSA Type I areas.

7.4.2.7(13) Cup or bar sinks will not be permitted.

7.4.2.7(14) Lavatory and hand hygiene sinks will be shaped to prevent splash-back from the basin.

7.4.2.7(15) All sinks will be equipped with a drain and waste piping that can accommodate the intended basin discharge.

7.4.2.7(16) Overflows will not be used, unless the risk of flooding in the space is greater than the risk of infection transmission, as determined by the Authority.

7.4.2.7(17) Provide gooseneck faucet fittings; low-profile gooseneck faucet fittings are not acceptable;

7.4.2.7(17)(a) Spouts will not discharge water directly into the drain.

7.4.2.7(18) Faucets will be laminar flow and free of aerators, modulators and rose-sprays. Faucets will not swivel. Strainers and anti-splash fittings at outlets will not be used. Additional requirements for faucets and sinks include:

7.4.2.7(18)(a) All openings required for the faucet installation will be factory installed;

7.4.2.7(18)(b) The outside rim will be of minimal width and have the surface angled down towards the inside to prevent pooling of water and placement of objects on the rim;

7.4.2.7(18)(c) Select all sink basin and faucet combinations and adjust flow rates to minimize the potential for splash-back from the basin;

7.4.2.7(18)(d) Provide multiple basin and or bowl sinks where required. Trap materials in conformance with CSA

Z317.1. Supply traps with antimicrobial coatings in all CSA Type I spaces;

7.4.2.7(18)(e) Gaskets at the sink/drain connection will be plastic or neoprene. Rubber gaskets are not acceptable;

7.4.2.7(18)(f) Trap size will be 40 mm diameter for sink waste; and

7.4.2.7(18)(g) Adequate flow rate will be provided to ensure the removal of soap residue.

7.4.2.7(19) Provide lavatories and faucets for the Facility to meet the following requirements:

7.4.2.7(19)(a) The lavatory fixtures will be wall hung style fixture unless otherwise required to be solid surface integral fixture that is molded into a countertop; refer to Section 6.6.2.

7.4.2.7(19)(b) Wall hung fixtures will be complete with floor mounted lavatory carrier, hanger plate and support arms;

7.4.2.7(19)(c) All openings required for the faucet installation will be factory installed;

7.4.2.7(19)(d) Faucets will have laminar flow;

7.4.2.7(19)(e) Will be hands-free design;

7.4.2.7(19)(f) Will have high profile gooseneck lavatory faucet fittings faucets will have anti-splash, anti-aerosolizing, faucet fittings (e.g. laminar flow) that do not retain air;

7.4.2.7(19)(g) Traps will be 40 mm and have an internal antimicrobial coating in all CSA Type I spaces. All traps and waste arm will be removable for maintenance and replacement (welded not permitted);

7.4.2.7(19)(h) Lavatory basins will not have an overflow opening installed in the body of the basin. Lavatories with overflow outlets that are plugged with aftermarket plugs will not be accepted;

7.4.2.7(19)(i) All public washroom lavatory basins will be installed complete with PO perforated drain openings. Removable drain plugs will not be accepted;

7.4.2.7(19)(j) All lavatory basins will have the water and waste fittings below the fixture protected with a skirt or shroud, provided by the manufacturer with Tamper Resistant fasteners to hide the plumbing components and to address infection control requirements. The design of the skirt or shroud will be accessible to Persons with Disabilities;

7.4.2.7(19)(k) Public washroom lavatory fixtures will have electronic hands-free type faucets with single temperature discharge that can be adjusted and set to the desired temperature, at the mixing valve, located below the fixture. Initial temperature setting will be 42° Celsius;

7.4.2.7.19.(k).1 Electronic faucets will be connected to the base-building power source with hard wired vital power source, concealed power boxes and transformers;

7.4.2.7.19.(k).2 Access for the plumbing and electrical to these fixtures will be provided external to the actual washroom complete with access panels; and

7.4.2.7.19.(k).3 Fixtures selected for these applications are to have totally enclosed basins and skirts and be specifically designed for Ligature Resistant and Tamper Resistant applications.

7.4.2.7(20) Bariatric lavatories will be constructed as a wall-mounted epoxy coated stainless steel or cast solid surface sinks suitable for use by bariatric users. The fixture will be capable of withstanding a downward pressure of 500 kg on the front of the fixture.

7.4.2.7(21) Bariatric fixtures will be supported by an independent support structure that is attached to the floor on which the fixture is installed. The Bariatric fixtures will not be supported from the Facility walls;

7.4.2.7(21)(a) Bariatric washroom lavatory fixtures will be handsfree type.

7.4.2.7(22) Provide sink and sink/faucet to meet the following requirements:

7.4.2.7(22)(a) In addition to the sinks noted in Appendix 1B [Minimum Room Requirements] and in Appendix 1A [Clinical Specifications and Functional Space Requirements], provide additional sinks as required to meet the functional requirements of the Authority and/or of CSA Z8000 and CSA Z317.1;

7.4.2.7(22)(b)	Sinks will be required to meet the specific requirement of ASTM A112.19.3-2017/CSA B45.4-17 for construction materials and methods of fabrication;
7.4.2.7(22)(c)	Process sinks used in areas where Patients are receiving care or treatment, will be either stand-alone wall hung stainless steel fixtures with wall hangers or will be stainless steel bowls which have been integrally welded into a continuous stainless-steel counter;
7.4.2.7(22)(d)	The size, depth, number of bowls and the grade of the stainless steel used for the fixture will be selected to match the application in which the fixture will be used;
7.4.2.7(22)(e)	All sinks in laboratories will be 316 stainless steel with 316 stainless steel waste fittings;
7.4.2.7(22)(f)	Accommodate proper washing of equipment and intended application;
7.4.2.7(22)(g)	Sink bowls will have fully rounded corners complete with a drain assembly which is appropriate for the intended end-use of the fixture;
7.4.2.7(22)(h)	Drop in or under mounted stainless steel sinks will not be acceptable in clean areas of the Facility;
7.4.2.7(22)(i)	Drop in style stainless steel sinks will be considered for non-clinical areas such as lounges, Staff areas, and general purpose work rooms only;
7.4.2.7(22)(j)	All drop in stainless steel sinks will have a back ledge included with only the necessary openings that are required to accommodate the selected faucets;
7.4.2.7(22)(k)	Faucets selected for non-clinical areas such as lounges, Staff areas, and general purpose work rooms may be deck mounted, 200 mm centre to centre with gooseneck spout and 150 mm manual blade handles; and
7.4.2.7(22)(l)	Faucets selected for all other areas will include under deck mounted faucet body, gooseneck spout with laminar flow discharge and hands-free operation.

7.4.2.7(23) Pharmacy sinks will meet the following requirements:

7.4.2.7(23)(a) Provide type 316 stainless steel sinks and waste fittings for modular cleanrooms, scrub stations, anterooms, and medication dispensary areas in Pharmacy;

7.4.2.7(23)(b) Sinks will be integrally welded into a solid stainless steel deck; and

7.4.2.7(23)(c) Provide 150 mm manual blade handle faucets complete with swing gooseneck spout with laminar flow.

7.4.2.7(24) Scrub sinks. Refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] and 1B [Minimum Room Requirements] for locations within the Facility where scrub sinks are to be located. Scrub sinks to meet the following requirements:

7.4.2.7(24)(a) Integral backsplash, electronic hands-free faucets, and soap dispenser for hand hygiene;

7.4.2.7(24)(b) Be suitable for a user conducting surgery or other sterile procedures as a proprietary equipment item by a medical equipment manufacturer;

7.4.2.7(24)(c) Meet all requirements of CSA Z317.1;

7.4.2.7(24)(d) The faucet will have sufficient clearance and height to allow for proper surgical scrubbing to occur and will have a spray head that will provide no splash coverage during usage. Additional faucet requirements include:

7.4.2.7.24.(d).1 Provide electronic hands-free type faucets specifically designed to the needs of surgical scrubbing for procedures and remain on as required by the Facility Users;

7.4.2.7.24.(d).2 Will have single temperature discharge and means of manual adjustment at the faucet;

7.4.2.7.24.(d).3 Faucet will have a temperature and pressure balanced mixing valve located below the fixture; and

7.4.2.7.24.(d).4 Electronic faucets will be connected to the base-building power source with hard wired vital power source, concealed power boxes and transformers.

7.4.2.7(24)(e) Access for the plumbing and electrical will be provided below the scrub sink(s) complete with access panels that will allow for complete servicing

of the sink and all of it attached components without having to remove the sink; and

7.4.2.7(24)(f) Fixtures selected for these applications are to have totally enclosed basins and skirts and be specifically designed for scrub procedures.

7.4.2.7(25) Kitchen and seamless kitchen sinks will meet the following requirements:

7.4.2.7(25)(a) Provide type 316 stainless steel or cast solid surface sinks with under-deck mount faucets with 150 mm blade handle and gooseneck spout;

7.4.2.7(25)(b) Seamless kitchen sinks will be integrated into countertops of the same material; and

7.4.2.7(25)(c) Sink material, dimensions and number of basins will be determined in consultation with the Authority through the Review Procedure. Refer to Appendix 1B [Minimum Room Requirements] for the quantity and location for each type of sink.

7.4.2.7(26) Utility / Process Sinks

7.4.2.7(26)(a) Provide each utility / process sinks as indicated in Appendix 1A [Clinical Specifications and Functional Space Requirements] and Appendix 1B [Minimum Room Requirements].

7.4.2.7(26)(b) Sinks will be large stainless steel sink for Staff use in wash up of equipment and clinical supplies. Sink will be integral type within a stainless steel work surface. All corners will be coved and seamless. The sink basin drains will be located to prevent direct contact from the water stream.

7.4.2.7(26)(c) For single compartment sinks, provide a work surface on one side of the sink. For double compartment sinks, provide work surfaces on both sides of the sink.

7.4.2.7(26)(d) Sink dimensions will accommodate the intended use and will be determined in consultation with the Authority through the Review Procedure. Minimum sink basin dimensions will be 450 x 600 x 250 mm. Minimum work surface dimensions will be 600 x 600 mm. Sinks will be motorized height adjustable with a nominal 900 mm height.

7.4.2.7(26)(e) Provide a 900 mm high integral stainless steel back splash on all walls and stainless steel shelves above and below all sinks.

7.4.2.7(26)(f) Provide sinks with under deck mounted, 150 mm manual blade handle faucets and gooseneck laminar flow spout. The gooseneck spout will pivot.

7.4.2.7(27) Hand Hygiene Sinks

7.4.2.7(27)(a) Provide hand hygiene sinks at the minimum locations and quantities outlined in Appendix 1B [Minimum Room Requirements] or as otherwise noted in Appendix 1A [Clinical Specifications and Functional Space Requirements] and all other locations to suit the Authority's functional requirements.

7.4.2.7(27)(b) Hand hygiene sinks will comply with Best Practices for Hand Hygiene Facilities and Infrastructure in Healthcare Settings.

7.4.2.7(27)(c) Hand hygiene sinks will consist of the following combination in accordance with Fraser Health Hand Hygiene Sink and Faucet Requirements:

- 7.4.2.7.27.(c).1 Franke: HWSS1518P-00 Clinical wash basin, wall mount faucet, 18 gauge
- 7.4.2.7.27.(c).2 Faucet: Chicago 116.693. AB.1, except the emergency backup power system is not required.
- 7.4.2.7.27.(c).3 Spout Description: Gooseneck GN2FCJKABCP
- 7.4.2.7.27.(c).4 P-Trap / Strainers: Saniguard
- 7.4.2.7.27.(c).5 Mixing Valve: Bradley S59-4000 / A / BY
- 7.4.2.7.27.(c).6 Inline Check valves: SYMMONS LL-71B kit check screen.

7.4.2.7(27)(d) Hand hygiene sinks will have electronic hands-free type faucets as listed above.

7.4.2.7(27)(e) The water supply is to be pre-adjusted and be set for a temperature of 42 Celsius at the concealed mixing valve.

7.4.2.7(27)(f) Electronic sensor faucets for hand hygiene sinks will have means for users to adjust water temperature.

7.4.2.7(27)(g) Prepare a workflow pattern and risk assessment in consultation with the Authority to address

placement of hand hygiene sinks and ABHR dispensers.

7.4.2.7(27)(h) All laboratory areas with hand hygiene sinks will be equipped with eye/face wash stations positioned next to the hand hygiene sink.

7.4.2.7(27)(i) The hand hygiene sink for Anteroom – Secure Room will be a Ligature Resistant and Vandal Resistant solid surface sink with removable shroud, offset drain location, and with infrared controls. Design-Builder to select the sink in consultation with the Authority.

7.4.2.7(28) Soiled Utility and Soiled Equipment Hold plumbing fixtures will meet the following requirements:

7.4.2.7(28)(a) Provide each Soiled Utility room as indicated in Appendix 1A [Clinical Specifications and Functional Space Requirements] and Appendix 1B [Minimum Room Requirements] with a flush rim sink and a large stainless steel sink for Staff use in wash up of equipment and clinical supplies;

7.4.2.7(28)(b) Flush rim sink:

7.4.2.7.28.(b).1 No. 4 finish, 14ga stainless steel type 304, seamlessly welded, 1.9 L (0.5 US Gal) per flush, wall hung, washdown action, 19 mm (3/4") dia. rear spud, countersunk drain with welded perforated drain strainer, no factory P-trap, outlet connection 40 mm (1½"), two 3/8” stainless steel rod IV hooks above the sink, CSA-B45 certified. Nominal dimensions: 356 mm (14") wide x 302 mm (11 7/8”) projection x 487 mm (19-3/16") high.

7.4.2.7.28.(b).2 Sensor operated (with manual override) exposed flush valve for top spud urinal, chrome plated, 1.9 L (0.5 US Gal) factory set flow, quiet action diaphragm type with dual filter by-pass, infrared sensor, solenoid operated flush controller circuitry, Vandal Resistant. Smooth design stop cap on back-check angle stop (screwdriver operated), flush tube for 292 mm (11-1/2") rough-in, high pressure vacuum breaker, located above the urinal, 5 VA power required per unit. Provide 100 mm (4”) square electrical box for mounting sensor plate. Box mount hard wired transformer, 120 VAC/ 24 VAC, 50 VA.

7.4.2.7.28.(b).3	Carrier suitable for mounting on concrete floor, epoxy coated top and bottom universal steel hanger plates, heavy gauge epoxy coated steel offset uprights with welded feet supports. For one unit: 102 mm (4") for two to six units in a row: 152 mm (6") finished metal stud wall to back of pipe space.
7.4.2.7.28.(b).4	Cast iron union P-Trap with escutcheon.
7.4.2.7.28.(b).5	Urinal wall access cleanout, two (2) piece expandable plug with 102 mm (4") diameter stainless steel access cover, secured with Vandal Resistant stainless steel screws.

7.4.2.7(28)(c)	Each Soiled Utility Room large sink will be integral type within a stainless steel work surface. Minimum overall dimension will be 1.50 m long, 600 mm deep, and 900 mm high. The work surface will be recessed on three sides and slope towards the sink basin to prevent water from running onto the floor. Provide a 900 mm high integral stainless steel back splash on all walls. All corners will be coved and seamless;
7.4.2.7(28)(d)	Sink dimensions will accommodate the equipment and supplies to be washed. Minimum sink basin dimensions will be 450 x 600 x 250 mm. The sink drain will be located to prevent direct contact from the water stream;
7.4.2.7(28)(e)	Provide a stainless steel shelf above the sink spanning the full length of the integrated sink and work surface. Provide a slatted stainless steel shelf below the work surface(s) located at 1.5 m AFF. The sink and work surface design will allow a sharps bin to be placed beneath it;
7.4.2.7(28)(f)	Provide each sink with a below deck mounted faucet with gooseneck spout and a 200 mm single lever control on the hot and cold water supply. The gooseneck faucet will pivot;
7.4.2.7(28)(g)	In each Soiled Utility room, coordinate freestanding bedpan disinfector requirements with Appendix 1H [Equipment and Furniture];
7.4.2.7(28)(h)	Freestanding bedpan disinfector installation will be tight against the wall;

7.4.2.7(28)(i) Provide recessed hot and cold water connections complete with backflow prevention and shut off valves in a recessed stainless steel wall box to enable Equipment installation tight against the wall;

7.4.2.7(28)(j) Water, drainage and sanitary vent piping to be installed in accordance with the BCBC and the manufacturer's recommendations;

7.4.2.7(28)(k) Each Soiled Utility Room will be supplied with a wall-mounted, exposed emergency eyewash/ drench hose unit, plumbed with tempered water, positioned next to the hand hygiene sink; and

7.4.2.7(28)(l) Each Soiled Utility room will have a hand hygiene sink located in the room.

7.4.2.7(29) Housekeeping Rooms will meet the following requirements:

7.4.2.7(29)(a) Each Housekeeping Room will be supplied with a wall-mounted exposed bottle type emergency eyewash station positioned next to the hand hygiene sink;

7.4.2.7(29)(b) Each Housekeeping Room will have a floor mounted molded stone sink; and

7.4.2.7(29)(c) In Housekeeping Rooms, the Design-Builder to provide detergent/soap dispensing stations complete with reduced pressure principle backflow preventers and water hammer arrestors on both the hot and cold water supplies.

7.4.2.7(30) Floor Sinks will meet the following requirements:

7.4.2.7(30)(a) Provide floor sinks which are minimum 600 mm x 900 mm x 250 mm deep complete with 75mm (3") waste fitting, rigid vinyl protective caps on exposed sides and heavy gauge stainless steel wall guards;

7.4.2.7(30)(b) Each fixture will have two (2) sets of wall-mounted faucets, each with manual cross blade handles on the hot and cold water supply;

7.4.2.7(30)(c) One (1) set of faucets will include a top pail brace, integral vacuum breaker, hose end and integral stops for general water supply to mop pails;

7.4.2.7(30)(d) The second faucet will be complete with 12 mm reduced pressure back flow preventers on the hot

and cold water supply, hose end supply, integral stops, hose end connections to allow for connection of chemical mix tanks;

7.4.2.7(30)(e) The reduced pressure back flow preventers will be mounted in a stainless steel box with hinged solid door located within the walls complete with a direct drain from the box to the floor sink; and

7.4.2.7(30)(f) Provide wall mounted 22 gauge type 304 stainless steel 75 mm x 610 mm (3” x 24”) mop hanger bracket with three (3) spring loaded rubber holders and all mounting hardware/screws.

7.4.2.7(31) Provide plaster trap sinks to meet the following requirements:

7.4.2.7(31)(a) Provide plaster trap sinks at the following locations:

7.4.2.7.31.(a).1 K1.05 Machine Shop;

7.4.2.7.31.(a).2 K3.07 Exam Room - Patient Fitting; and

7.4.2.7.31.(a).3 Soiled Utility Rooms in the Emergency and Perioperative Components.

7.4.2.7(31)(b) Single compartment, wall hung, type 304 stainless steel, minimum dimensions to be 850 mm x 375 mm x 200 mm interior dimensions;

7.4.2.7(31)(c) Wall mount sink faucet, 200 centres gooseneck spout with laminar flow outlet, manual 100 mm wrist blade handles, and mounted on wall behind the sink;

7.4.2.7(31)(d) Wall mounted pre-rinse spray assembly with heavy duty hose and hose retainer. Water supply to be complete with a thermostatic mixing valve with temperature set for 42° Celsius;

7.4.2.7(31)(e) Provide plaster trap sinks complete with a stainless steel solids interceptor with perforated removable stainless steel basket;

7.4.2.7(31)(f) Stainless steel solids interceptor will be mounted on a stainless steel dolly with ball caster complete with valves and couplings on both inlet and outlet to allow for removal and cleaning;

7.4.2.7(31)(g) Plaster traps will be located such that they are serviceable from outside the room they serve. Traps will be sized sufficiently for the anticipated load;

7.4.2.7(31)(h) Provide convenient access to the trap's secured lid;

7.4.2.7(31)(i) Acceptable Manufacturers:

7.4.2.7.31.(i).1 Zurn;

7.4.2.7.31.(i).2 Watts;

7.4.2.7.31.(i).3 Or alternative as approved by the Authority.

7.4.2.7(32) Fixtures in the Secure Room

7.4.2.7(32)(a) Provide plumbing fixtures, pipe and valve covers, floor drains and access panels which are Vandal Resistant and Ligature Resistant at locations described in the Appendix 1B [Minimum Room Requirements].

7.4.2.7(32)(b) Provide combination sink/toilet fixtures in Secure Rooms, as described in Section 7.4.2.9(9).

7.4.2.7(32)(c) Water closet will have a contoured seat, Ligature Resistant skirt, and blowout style operation.

7.4.2.7(32)(d) Provide Ligature Resistant piezo electric operated flush valve and bubbler / filler, slow drain, and a 4-point anchor system for installation in a service chase.

7.4.2.7(33) Energy Centre Fixtures

7.4.2.7(33)(a) Provide double bowl stainless steel sinks with under-deck mount faucets with 150 mm blade handle and gooseneck spout integrated into stainless steel countertops for processing water samples and performing chemical treatment.

7.4.2.7(33)(b) In addition to Energy Centre sinks listed in Appendix 1B [Minimum Room Requirements], provide an additional sink of the same type in a mechanical space near the cooling towers to facilitate cooling tower water testing treatment.

7.4.2.7(33)(c) Sinks will be large and deep enough to accommodate the intended application.

7.4.2.7(33)(d) Provide one (1) emergency eyewash and shower station adjacent to each pressurized system such as the steam plant, hydronic boiler plant, chiller plant, and other similar systems. If plants equipment is located in multiple rooms, provide an additional emergency eyewash and shower station in each room.

7.4.2.8 Performance Criteria for Sinks

7.4.2.8(1) Provide hard-wired electronic faucets with concealed power boxes and transformers which are connected to the base-building vital power source.

7.4.2.8(2) All low voltage wiring, cables etc. will be mounted in junction boxes located within the wall below the fixture and will include stainless steel face plates with Tamper Resistant fastenings;

7.4.2.8(3) All line voltage plugs to low voltage wiring connections will be concealed in access boxes that are not accessible to the public or in concealed ceiling locations that are not visible without removal of an access panel;

7.4.2.8(4) All sensors will be able to operate for a minimum of 30 seconds without interruption of flow, to facilitate proper hand washing. All electronically operated faucets will have a means for user temperature adjustment. Sensors will retain the ability to turn off automatically when hands are no longer in the sensor range;

7.4.2.8(5) All sensors on scrub sinks will be able to operate for a range of time without interruption of flow, to facilitate proper hand washing for procedures. Sensors will retain the ability to turn off automatically when hands are no longer in the sensor range.

7.4.2.8(6) Provide sinks for Patient with a removable purpose built skirt or shroud to conceal the water and drain components which are accessible to Persons with Disabilities.

7.4.2.8(7) Plumbing fixtures, fittings, and carriers will be accessible for Persons with Disabilities where designated as accessible in Appendix 1A [Clinical Specifications and Functional Space Requirements].

7.4.2.9 Provide water closets to meet the following requirements:

7.4.2.9(1) Unless noted otherwise, water closets will be constructed of vitreous china to reduce the spread of infection, have elongated bowls and open front seat;

7.4.2.9(2) The bowl will be designed to accommodate the flow rate of the flush valve and to minimize the aerosolization of the toilet contents. All water closets will meet a certified MaP rating of 1000. Macerating water closets will not be permitted;

7.4.2.9(3) All wall-hung fixtures are to be designed for installation using fixture carriers in accordance with the manufacturer recommendations;

7.4.2.9(4) Select water closets will be installed with recessed wall-mounted bedpan disinfectors as listed in Appendix 1H [Equipment and Furniture]. Refer to Section 7.4.2.9(11)(a);

7.4.2.9(5) Provide seat covers on all Patient and accessible water closets. Ensure that all flush valve operators extend above the height of the open cover. All water closet seats are to be heavy-duty construction with stainless steel posts and self-sustaining hinges;

7.4.2.9(6) Water closets described as public use in Appendix 1A [Clinical Specifications and Functional Space Requirements] will consist of wall hung elongated bowls with an open front seat with no cover and include the following:

7.4.2.9(6)(a) Flush valve will be manual in areas where Patients are receiving care or treatment;

7.4.2.9(6)(b) Flush valve connection to the water closet will be through an exposed top spud, unless noted otherwise in Appendix 1B [Minimum Room Requirements];

7.4.2.9(6)(c) Mounting height to be 430 to 480 mm from floor to rim of seat; and

7.4.2.9(6)(d) Flush valve connection to the water closet will be through an exposed top spud.

7.4.2.9(7) Water closets described as for Patient use in Appendix 1A [Clinical Specifications and Functional Space Requirements] will consist of wall-hung elongated bowls with an open front seat and include the following features:

7.4.2.9(7)(a) Flush valve connection to the water closet will be through an exposed top spud;

7.4.2.9(7)(b) A cover; and

7.4.2.9(7)(c) Mounting height to be 430 to 480 mm from floor to rim of seat.

7.4.2.9(8) Water closets described as accessible in Appendix 1A [Clinical Specifications and Functional Space Requirements] will consist of wall hung elongated bowls, with an open front seat, and include the following features:

7.4.2.9(8)(a) Mounting height of 430 to 480 mm from floor to rim of seat;

7.4.2.9(8)(b) A cover; and

7.4.2.9(8)(c) The location of the flush valve will be in accordance with the accessibility requirements of the BCBC.

7.4.2.9(9) In the Secure Room, provide a white powder-coated stainless steel, floor-mounted, back-discharge, Vandal Resistant, Ligature Resistant, one-piece sink/toilet combination unit that includes the following features:

7.4.2.9(9)(a) Hemispherical penal filler/bubbler with mouth guard, integral seat, push button controls and in-wall concealed flush valve;

7.4.2.9(9)(b) Oval shaped bowl built into the assembly on the back of the toilet; and

7.4.2.9(9)(c) Anti-flood device with either piezo electric or pneumatic controls on supplies/waste to toilet and/or sink components.

7.4.2.9(10) Provide bariatric Patient ensuite washrooms with water closets located to allow Staff to position a bariatric Patient over the fixture. Bariatric water closets will meet the following requirements:

7.4.2.9(10)(a) Bowl: accessible to Persons with Disabilities, floor mounted with open front seat, load tested to 2000 lb., elongated vitreous china, certified MaP rating of 1000, 38 mm (1-1/2”) top spud connection, bolt caps and 480 mm (17”) rim height;

7.4.2.9(10)(b) Flush Valve: Chrome plated brass, diaphragm type, 610 mm (24”) rough-in dimension, 38 mm (1-1/2”) spud connection, non-hold open handle with antimicrobial coating, flush tube and wall escutcheons and 25 mm (1”) angle stop with Vandal Resistant cap; and

7.4.2.9(10)(c) Back Rest: 32 mm (1-1/4”) diameter stainless steel bar with #4 satin finish with flanges and covers, antique white solid core plastic laminate panel back, concealed snap flanges and all mounting hardware. Installation to comply with BCBC requirements for Persons with Disabilities. In addition, backrest will be determined in consultation with the Authority for the purpose of commode coordination. Design-Builder will provide adequate backing in wall for support.

7.4.2.9(11) Provide installation of recessed wall-mounted bedpan disinfectors to meet the following requirements:

7.4.2.9(11)(a) Install one (1) recessed wall mounted bedpan disinfector in all Ensuite – Patient Room – AIR – bariatric, Ensuite – Patient Room – HAU, Ensuite – AIR, and Ensuite – AIR – Bariatric. The recessed wall-mounted bedpan disinfector will be integrated with the water closet and will be complete with a frame and a floor-mounted, recessed fixture carrier that is independent of the wall system. Design-Builder will provide a complete functioning system which is installed and Commissioned.

7.4.2.9(11)(b) Design-Builder will plan for two distinctly separate stages of installation: installation of the recessed fixture carrier prior to and distinctly separate from the installation of the recessed wall-mounted bedpan disinfectors;

7.4.2.9(11)(c) The recessed wall-mounted bedpan disinfector installation will be flush to the wall with a fixture carrier and will have hot and cold water connections complete with all shut-off valves and back flow preventers necessary for a concealed application; and

7.4.2.9(11)(d) Water, drainage and sanitary vent piping to be installed in accordance with the BCBC and the manufacturer's recommendations.

7.4.2.9(12) Water closets for Cancer Centre therapy will be ADA compliant, siphon jet, wall mounted 14 gauge, type 304 stainless steel with elongated bowl, integral seat, concealed fixture carrier, white powder coated, 40 mm (1-1/2") flush valve connection and 4.8 lpf (1.28 gpf) concealed flush valve with ADA lever handle. Refer to Appendix 1B [Minimum Room Requirements] for quantity.

7.4.2.10 Provide urinals to meet the following requirements:

7.4.2.10(1) Urinals will be wall-hung vitreous china institutional fixture with partitions to contain splashing;

7.4.2.10(2) Each fixture will be complete with a low consumption concealed electronic hands-free flush valve operation; and

7.4.2.10(3) Each urinal will be installed with a separate urinal carrier that is floor mounted and independent of the wall systems.

7.4.2.11 Provide chilled and filtered water bottle fill stations located as indicated in Appendix 1B [Minimum Room Requirements]. Bottle fill stations will meet the following requirements:

7.4.2.11(1) Constructed from 304 stainless steel polished to a satin finish with antimicrobial impact resistant ABS surfaces with fold down housing for easy maintenance access. Bottle filler to have a sensor for touch free operation during filling. Bottle filler to have a 1 GPM fill rated and laminar flow water supply;

7.4.2.11(2) Connection to 12 mm [½"] cold water supply through a 12 mm [½"] Reduced Pressure Backflow Device mounted in a cabinet with laminated glass door, drain to adjacent P trap, a pressure regulating valve (set for max. 60 psi), a pressure gauge, an inline shock absorber and a shut-off valve. Line size from this connection will match the bottle filler requirements. Exterior of door will be labeled Backflow Preventer;

7.4.2.11(3) 40 mm [1-1/2"] drain and P- Trap;

7.4.2.11(4) Bottle filler will be connected to 110 V/ 60 Hz power supply thru a plug in supply. Electrical receptacle to be provided by Div. 26; and

7.4.2.11(5) Provide five spare water filters.

7.4.2.12 Provide showers to meet the following requirements:

7.4.2.12(1) Patient Shower:

7.4.2.12(1)(a) Provide a pressure balanced and high limit shower mixing valve with additional soft seated check valves on each of the water supplies;

7.4.2.12(1)(b) Patient showers will be a handheld style shower including Ligature Resistant shower elbow with check valve and quick disconnect fitting;

7.4.2.12(1)(c) Handheld shower hoses will have a smooth easy to clean surface;

7.4.2.12(1)(d) The length of the shower hoses to be sized to ensure the shower head cannot be submerged in any adjacent plumbing fixture;

7.4.2.12(1)(e) Slide bars provided for handheld showers will be designed and load rated to act as grab bars;

7.4.2.12(1)(f) Each of the floor drains will be required to have Vandal Resistant fastenings; and

7.4.2.12(1)(g) Shower bases constructed of fibreglass or acrylic will not be considered.

7.4.2.12(2) Staff Showers:

7.4.2.12(2)(a) Shower stalls will be fibreglass or acrylic but will not be less than 1.20 m x 1.20 m and be complete with a full top in the enclosure;

7.4.2.12(2)(b) Staff showers will be provided with a pressure balanced and high temperature limit shower mixing valve with additional soft seated check valves on each of the water supplies;

7.4.2.12(2)(c) Staff showers will be a handheld style hand shower head assembly with a slide bar and locking mechanism; and

7.4.2.12(2)(d) Slide bars provided for handheld showers will be designed and load rated to act as grab bars.

7.4.2.13 Provide emergency eyewash and shower stations to meet the following requirements:

7.4.2.13(1) Select fixtures with particular attention to performance relative to infection prevention and control. Refer to Fraser Health Authority publication Health and Safety Design Standard: Emergency Washing Facilities for further requirements;

7.4.2.13(2) Located and designed to supply tempered water within an acceptable time frame in accordance with ANSI Z358.1 and WorkSafe BC requirements. Provide all necessary signs identifying location and directions for their use;

7.4.2.13(3) Refer to Appendix 1B [Minimum Room Requirements] for locations where emergency showers and eyewash stations are required to be located in the spaces described in Appendix 1A [Clinical Specifications and Functional Space Requirements]. Provide emergency showers and eyewash stations in other locations as required to comply with applicable codes and standards including the Fraser Heath Authority standard noted in Section 7.4.2.13(1) and WorkSafe BC regulations;

7.4.2.13(4) Where standalone emergency eyewash stations are required, the fixtures are to be a stainless steel wall hung assembly complete with a water receptor, two soft spray eyewash spray heads with caps, tempered water supply and drain piping;

7.4.2.13(5) Eyewash stations will have a highly visible hand paddle that will operate the eyewash upon activation;

7.4.2.13(6) Where emergency eyewash stations are located over a plumbing utility sink, the emergency eyewash station will be a highly visible, swing away assembly that contains two soft spray heads, caps,

and tempered water service and will not interfere with the intended use and application of the utility sink;

7.4.2.13(6)(a) The eyewash station will be activated when pulled down into position over the sink; and

7.4.2.13(6)(b) The selection of the emergency eyewash will require coordination of the size of the sink and location of the faucet and eyewash to ensure that all components can be safely operated in an emergency. The eyewash will be accessible and overhead cabinets will not interfere with access or create a hazard.

7.4.2.13(7) The combination emergency shower / eyewash stations located within public areas of the Facility are to be exposed and highly visible. The exact model will be determined in consultation with the Authority and will comply with Fraser Health Authority publication Health and Safety Design Standard: Emergency Washing Facilities.

7.4.2.13(7)(a) The waste from the eyewash will be hard piped back into the wall and connected to the Sanitary Waste system.

7.4.2.13(8) Provide floor drains in all rooms with emergency showers with capacity to prevent water from spreading beyond the room;

7.4.2.13(9) Each emergency shower, eyewash and drench hose assembly will be supplied with an approved thermostatic mixing valve assembly that is specifically designed for safety Equipment installation. The mixing valve assembly will be certified to ANSI Z358.1 and will be sized to serve the demand of the fixtures served and will fail safe to cold water if there is a failure in the mixing valve;

7.4.2.13(10) The hot water recirculation system will be installed as close as possible to the emergency shower / eyewash mixing valve assembly;

7.4.2.13(11) Provide a test cone for every five (5) emergency showers installed in the Facility for monthly testing of the equipment; and

7.4.2.13(12) Wall mounted drench hoses may be substituted for emergency showers in some areas as approved by the Authority.

7.4.2.14 Provide hot and cold water hose bibbs to meet the following requirements:

7.4.2.14(1) Exterior hose bibbs and hydrants will be an encased non-freeze concealed type with lockable hinged doors. Hose bibbs in

parkade areas will be Vandal Resistant in an exposed lockable box. Heat trace is not an acceptable means of freeze protection for hose bibbs;

7.4.2.14(2) Will be Ligature Resistant and Vandal Resistant, except in mechanical spaces and roof spaces which are only accessible by Staff or other authorized personnel. Hose bibbs for parkade areas do not need to be Ligature Resistant;

7.4.2.14(3) Each hose bibb and hydrant will require an individual shut-off on the branch line servicing the fixture. The shut-off is to be located in a non-freeze location within the building;

7.4.2.14(4) The Facility interior and exterior water supply will be protected by an approved backflow prevention device on each hose bibb;

7.4.2.14(5) All interior hose bibbs and hydrants will be exposed chrome plated ball valve with hose end fitting and cap securely anchored to the structure;

7.4.2.14(6) All hose bibbs located on all roofs will be spaced at intervals no greater than 10 m apart, non-freeze, with shut-off valves and drains located internal to the Facility. The drains will be run to a separate drain location within the floor below the roof. Heat trace is not an acceptable means of freeze protection for hose bibbs;

7.4.2.14(7) Provide hose bibbs at the following locations, at minimum:

- 7.4.2.14(7)(a) Around the perimeter of the Facility at intervals no greater than 15 m apart and throughout the underground parking at intervals of no greater than 45 m apart. Underground parking hose bibbs will be winterized during cold weather;
- 7.4.2.14(7)(b) In all mechanical equipment and service rooms at intervals no greater than 20 m apart (hot and cold domestic water service);
- 7.4.2.14(7)(c) In both the clean and soiled loading docks provide one (1) domestic hot, and two (2) domestic cold, non-freeze type in recessed lockable boxes. Exact location to be determined by the Authority during design; and
- 7.4.2.14(7)(d) In Workshop – Main.

7.4.2.14(8) Provide an irrigation system for automatic, timed and condition controlled system for watering all garden plots. Refer to Section 8.2 for further requirements.

7.4.2.15 Provide Morgue plumbing systems to meet the following requirements:

7.4.2.15(1) Within the Morgue, provide plumbing services to all plumbing fixtures; coordinate with Appendix 1H [Equipment and Furniture] where applicable. All connections will be complete with shut-off valves, PRV check valves and all necessary back flow prevention devices;

7.4.2.15(2) Select fixtures with particular attention to performance relative to infection prevention and control;

7.4.2.15(3) Provide hot and cold water hose bibbs with backflow preventers recessed in stainless steel boxes;

7.4.2.15(4) All water services supplying the Morgue plumbing fixtures will require a reduced pressure back flow preventer on the main service to the Morgue zone. The backflow stations will need to be located exterior of the Morgue in a location that allows for proper maintenance; and

7.4.2.15(5) Sanitary waste piping, floor and trench drains will be constructed of stainless steel with mechanical couplings. Provide connection between the stainless steel piping and the main sanitary sewer system.

7.4.2.16 In the area of where the garbage bins and compactors are to be located, provide the following:

7.4.2.16(1) Large heavy duty, H20 loading, trench drains are to be installed at the low points below the bins and compactors to allow for collection of all drainage and waste products;

7.4.2.16(2) Install both hot (60 °C) and cold water hose bibbs at each end of the garbage bin and compactor installation;

7.4.2.16(3) Install a large solids interceptor with a removable perforated basket that can be removed and cleaned, on a daily basis, at the end of the trench drain assembly; and

7.4.2.16(4) Downstream of the solids interceptor install an oil interceptor complete with a draw off tank. The oil interceptor will be located outside of the areas where the garbage bins/ compactors are located.

7.4.2.17 The following requirements apply to the Elevators:

7.4.2.17(1) Elevator and Escalator Drainage

7.4.2.17(1)(a) All drainage systems installed in conjunction with Elevators and escalators will be in conformance with CSA B44;

7.4.2.17(1)(b) Elevators which are operated with hydraulic components will be provided with a separated drainage system sized to handle any potential water leakage and the flow from any fire suppression system within the elevator shafts. The drainage system will be complete with an oil interceptor, elevator pit drains and a separate check valve located outside of the elevator pit;

7.4.2.17(1)(c) Elevators which do not contain hydraulic components will be provided with a separated drainage system, sized to handle any potential water leakage and the flow from any fire suppression system within the elevator shafts. The drainage system will be complete with elevator pit drains and a separate check valve located outside of the elevator pit; and

7.4.2.17(1)(d) When the depth of the elevator pit is lower than the adjacent sanitary sewer system, provide a full pumping system with duplex pumps operating on delayed vital emergency power.

7.4.2.18 The following requirements apply to the Medical Device Reprocessing Department (MDR) plumbing system:

7.4.2.18(1) The domestic water systems will require a full reduced pressure back flow preventer system to serve the entire zone. Provide individual back flow prevention for Equipment as required by BCBC. Locate these back flow devices in mechanical spaces;

7.4.2.18(2) Provide stainless steel sinks in MDR as described in Appendix 1H [Equipment and Furniture] with features such as:

7.4.2.18(2)(a) Motorized height adjustable design, triple compartments with water spray hoses and water guns;

7.4.2.18(2)(b) Sink faucets supplied with reverse osmosis water;

7.4.2.18(2)(c) Lighting for each sink location;

7.4.2.18(2)(d) Sink bays paired in back-to-back position, separated by half-height wall fitted with continuous wet wall panel system;

7.4.2.18(2)(e) Sink bays with local exhaust ventilation above each sink;

7.4.2.18(2)(f) Sink bays with splash / water resistant electrical and data outlets;

7.4.2.18(2)(g) Surfaces sloped to adjacent drain boards where required; and

7.4.2.18(2)(h) Drain outlets with removable stainless steel strainers, where required.

7.4.2.18(3) Provide the following stainless steel sink accessories:

7.4.2.18(3)(a) Sinks with removable under-counter shelf, backsplash and skirts with indented mount for taps;

7.4.2.18(3)(b) Over-counter shelves;

7.4.2.18(3)(c) Exhaust shrouds to span sinks;

7.4.2.18(3)(d) Vacuum canister holders;

7.4.2.18(3)(e) Dividers between counters or sinks;

7.4.2.18(3)(f) Removable sink covers; and

7.4.2.18(3)(g) Exhaust shrouds

7.4.2.18(4) Provide connections for all specialized cleaning and sterilizing devices to clean water systems such as RO water systems;

7.4.2.18(5) Locate services such that each of the clean water systems will be produced and can be maintained adjacent to the MDR;

7.4.2.18(6) All RO water systems will be piped to the individual pieces of Equipment and will then be returned to a central storage tank. All special water systems will be supplied and produced from a packaged water system with redundancy for maintenance;

7.4.2.18(7) Provide laboratory air distributed throughout the Component. Laboratory air quality will meet the requirements of medical air quality as described in CSA Z7396.1. The laboratory air system will be designed, installed, tested and labeled in the same manner as an instrument air system, as described in CSA Z7396.1 and as required by final Equipment selection; refer to Appendix 1H [Equipment and Furniture]. Provide both wall and modular ceiling plate outlets to facilitate blowing and drying of Equipment; and

7.4.2.18(8) Where Authority supplied Equipment requires a drain for filter installation, the filter will be supplied with the Equipment. This applies to Equipment such as the automatic endoscope

reprocessors which has the drainage system configured to enable water filter replacement.

7.4.2.19 Provide the following in Workroom-Biomedical Engineering:

7.4.2.19(1) Provide workstations with medical gas services installed and functioning;

7.4.2.19(2) Medical gas outlets will be DISS-style outlets;

7.4.2.19(3) Provide utility sinks as required by Authority;

7.4.2.19(4) Provide two (2) large floor drains to accommodate the flow from rehabilitation whirlpool bath which are brought in for repairs; and

7.4.2.19(5) Provide two (2) hot and cold water hose bibb stations in the general area of the floor drains.

7.4.2.20 Provide plumbing system for the Patient Food Services and distributed Food Services areas to meet the following requirements:

7.4.2.20(1) A full list of Equipment to be provided by Design-Builder is available in Appendix 1I [Food Services Equipment List]. Service requirements in this list are for reference and planning purposes only. Design-Builder is responsible for all requirements and connections based on the final equipment selection;

7.4.2.20(2) Design-Builder will be responsible for all service connections, including for domestic hot and cold water (including filters, and accessories as required), sanitary waste and vents, grease waste and vents, and compressed air;

7.4.2.20(3) Service connections to each component will include all shut-off valves, check valves, unions, back flow preventers, PRV and reducer fittings as needed and required;

7.4.2.20(4) Grease interceptors are to be sized and supplied by the Design-Builder to suit the Equipment requiring service and to meet the requirements of the Metro Vancouver guidelines and the BCBC; and

7.4.2.20(5) Refer to the information in Appendix 1I [Food Services Equipment List] for information on any sinks, floor drains, emergency showers and eyewash equipment and hand hygiene sinks that will need to be supplied and installed by the Design-Builder.

7.4.2.21 Provide plumbing distribution for the surgical suites in the mechanical room above the surgical suites. Plumbing mains not to be installed over the surgical suites in order to facilitate future re-piping.

7.4.2.22 Provide compressed air systems to meet the following requirements:

7.4.2.22(1) Medical Compressed Air

7.4.2.22(1)(a) Refer to medical gas Section 7.4.3.

7.4.2.22(2) Laboratory Compressed Air

7.4.2.22(2)(a) Refer to medical gas Section 7.4.3.

7.4.2.22(3) Utility Compressed Air – Food Services

7.4.2.22(3)(a) Provide a food grade compressed air system (N+1 redundancy) in food services areas. Compressed air for Food Services may be supplied from the same system serving the labs provided that the system air quality meets the minimum requirements of both departments and system redundancy requirements are met.

7.4.2.22(4) Utility Compressed Air

7.4.2.22(4)(a) Provide utility compressed air system (N+1 redundancy) to be used in rooms, including mechanical rooms and FMO maintenance shops for pneumatic tool operation including reciprocating or rotary screw air compressors, air dryers and receiver tank.

7.4.2.22.4.(a).1 Provide minimum 50 mm (2") diameter compressed air line for FMO workshops with outlets in the areas and quantities as required in Appendix 1B [Minimum Room Requirements].

7.4.2.22.4.(a).2 Point-of-use quick connect outlets will be non-sparking and include upstream filters and regulators.

7.4.2.22.4.(a).3 Pressure requirements for the systems will depend on requirements of final devices and Equipment procured. Outlet pressures will be Authority adjustable.

7.4.2.22.4.(a).4 The utility compressed air system will be sized to accommodate all of the equipment provided by the Facility and will assume that 30% of the equipment will be operating at any given time.

7.4.2.22.4.(a).5 Provide for 15% increase in a capacity, including control panels for future.

7.4.2.22.4.(a).6 Piping for the utility air system will be Schedule 10 stainless steel type 304/304L or galvanized schedule 40 black iron piping with

ball valves installed on all main runs and on each branch line.

7.4.2.22.4.(a).7 Provide minimum six quick connect outlets in each mechanical room. Refer to Section 5.4.2 for Energy Centre requirements.

7.4.2.23 Plumbing Drainage and Venting Systems

7.4.2.23(1) Basic Requirements

7.4.2.23(1)(a) Provide sanitary, storm, specialty drainage, and venting systems to prevent disruption to the operation of the Facility or interference with other services during operation and maintenance activities. Design the systems so that, as much as possible, CSA Type I and CSA Type II rooms do not need to be entered when performing these functions. Refer to CSA Z317.2 for space Type definitions.

7.4.2.23(1)(b) Design all drainage systems such that the system connects to the site drainage services, utilizing gravity drainage wherever possible.

7.4.2.23(1)(c) Design-Builder will prevent the entry of construction debris into the piping systems to prevent clogging and will ensure all piping systems are free and clear of debris and collapsed or damaged piping prior to testing of the piping systems. Any damaged or collapsed pipe sections will be replaced.

7.4.2.23(2) Storm Drainage System

7.4.2.23(2)(a) The storm drainage system will connect to all roof drains, patio drains, exterior planter drains and all other exterior drains which will collect storm water.

7.4.2.23(2)(b) All storm drains will be selected to accommodate the roof surface, insulation, and structural system in which they will be installed.

7.4.2.23(2)(c) All installation of roof drains will be in accordance with the requirements of the RCABC and will require inspection to ensure that all roofing guarantees can be issued at the completion of the Project.

7.4.2.23(2)(d) All storm drains which are installed in planter drains will be complete with screens and fabric protection

that will prevent soil and debris from entering the storm drainage system.

7.4.2.23(2)(e) All storm drainage piping within the Facility will be insulated.

7.4.2.23(2)(f) Storm drainage collected from green roof areas will be piped to the rainwater harvesting system used for the Facility process water system.

7.4.2.23(3) Storm and Sanitary Pumping Stations

7.4.2.23(3)(a) Provide pumping systems for subsurface, storm, or sanitary drainage with 100% redundancy (one redundant unit for each active unit) and supply related equipment with emergency power.

7.4.2.23(3)(b) Provide the sump with twin compartments (separate chambers for settling and pumping) and size the sump to prevent short cycling of the pump.

7.4.2.23(3)(c) Provide engineered packaged pumping system(s) complete with controls and alarms including pump alternation, high water level alarm, pump one on, pump two on (where applicable) and pumps failure alarms. Provide local alarms annunciation with audible and visible alarms indication and remote connection via the BMS.

7.4.2.23(3)(d) All pump chambers will have premanufactured access lids in either single or double configuration with hydraulic assist lift chambers. Design of the access lids will require consideration regarding the loads that will pass over the installation and be supplied accordingly.

7.4.2.23(3)(e) All pumping systems will be supplied with Delayed Vital Power.

7.4.2.23(3)(f) Pump stations on the parking levels which may receive drainage containing hydrocarbons will be provided with intrinsically safe components and accessories including electrical connections.

7.4.2.23(3)(g) All storm piping from sump pump will be pressure pipe and joining method.

7.4.2.23(4) Sanitary Drainage System

7.4.2.23(4)(a) Provide drainage and venting piping and fittings of a material suitable for the expected effluent.

7.4.2.23(4)(b) All pipe materials acceptable by the BCBC for drainage systems are acceptable, with the following exception:

7.4.2.23.4.(b).1 ABS or PVC pipe materials are not acceptable for oil waste systems.

7.4.2.23(4)(c) Consider using non-metallic sanitary drainage piping where permissible by the BC Building Code and where practical for the fluid discharge.

7.4.2.23(4)(d) All vents will terminate outdoors; the use of air admittance valves will not be permitted.

7.4.2.23(4)(e) All piping will be installed parallel to Facility lines. Vertical piping will be installed plumb and horizontal piping level or graded as required by BC Building Code for sanitary or storm systems. Provide support under all wyes located at ends of branches and all p-traps.

7.4.2.23(4)(f) Conceal all sanitary, waste, and water piping in walls. Only trap arms and water supply piping will be permitted to be exposed below fixtures.

7.4.2.23(4)(g) At a lowest level within the Facility install a sanitary sewer bypass / diverter on each Facility sewer main complete with full port plug valves that will permit the sewer to be diverted to a sanitary sewage holding tank in a post-disaster condition. In addition, provide a means of pumping pressurized sewer discharge levels (those below grade not being able to drain by gravity) to multiple sewer lines/mains leaving the building complete with diverting valves.

7.4.2.23(4)(h) All diverter valves will be located to allow quick and easy access without having to remove equipment or having to dig up the location to operate or replace the valves.

7.4.2.23(4)(i) Fixture outlet piping for adjustable height fixtures will be installed so that no water will collect in the piping at any fixture height.

7.4.2.23(4)(j) Drainage piping material for corrosive waste products may only be changed downstream at the following points:

7.4.2.23.4.(j).1 Where the hazardous properties of the effluent are reduced such that a different piping material is suitable: e.g. the branch connects into a main drain line, such that the additional effluent flow dilutes the discharge; and

7.4.2.23.4.(j).2 Where a device is placed in-stream to reduce the hazard of the discharge, such as an acid neutralizer.

7.4.2.23(4)(k) Except for drainage from the Cyclotron vault, drainage piping material for radioactive waste products will consist of the following material:

7.4.2.23.4.(k).1 Cast iron piping will be the only material permitted for radioactive waste systems; and

7.4.2.23.4.(k).2 All radioactive waste systems will be run directly from the source to a location in the main building sewer where adequate dilution can be achieved.

7.4.2.23(4)(l) All drainage from the Cyclotron vault will consist of the following:

7.4.2.23.4.(l).1 Stainless steel piping, fully welded, will be the only material permitted;

7.4.2.23.4.(l).2 All radioactive waste will connect to the radioactive sump c/w N+1 sump pumps. Discharge from sump will based on reaching acceptable radioactive levels; and

7.4.2.23.4.(l).3 Refer to Design Guide GD 52 from CNSC for further requirements.

7.4.2.23(4)(m) Provide a trench drain system in the concrete floor from the Cyclotron to all hot cells for path of radioactive isotope lines.

7.4.2.23(4)(n) Insulate and heat trace storm water drainage, domestic and non-potable water piping, cooling water, condensate and exposed p-traps in unheated areas throughout as required by BCICA quality standards.

7.4.2.23(4)(o) Provide aluminum jacketing outside and on all exterior piping. In underground parking areas, provide PVC jacketing for services.

7.4.2.23(4)(p) Provide floor drains in all mechanical rooms, laboratory, kitchen, workshop, all wet areas or wet rooms, service spaces, food services areas, parking areas, emergency showers, and other

	rooms where water spillage from equipment or operations is reasonably expected to minimize maintenance and housekeeping issues. Floor drains located in mechanical and service rooms with full curbs around the entire room will have funnels that are shorter than the curb height around the room.
7.4.2.23(4)(q)	Where floor drains are provided in FMO workshops, floor drains will be provided with removable sediment baskets.
7.4.2.23(4)(r)	Floor drains in rooms with generators, fuel oil piping and day tanks will be piped to oil interceptors.
7.4.2.23(4)(s)	Floor drains and downstream piping will be sized to handle the maximum anticipated flows including sprinkler test full flow and from back flow preventer relief ports at full flow rated as noted in the manufactures information.
7.4.2.23(4)(t)	Provide floor or hub drains for all devices that may discharge water including, emergency showers and backflow prevention devices.
7.4.2.23(4)(u)	Install floor drains in Patient Care Areas only as needed for the specific use of the room as per CSA Z317.1 and CSA Z8000. These rooms include tubs and laundry facilities.
7.4.2.23(4)(v)	The floor drain installed in the Secure Room will have the grate secured with Tamper Resistant fasteners. The grating will be of a Ligature Resistant design.
7.4.2.23(4)(w)	Ensure all Equipment drain piping is terminated at floor drains with the proper air gap. Ensure that drains are properly selected and of adequate size to prevent spillover of the waste product into adjacent areas.
7.4.2.23(4)(x)	Provide factory pre-assembled electronic trap primers incorporating factory cabinets, calibrated distribution manifolds for equal water distribution, and that are controlled by electronic time clocks, BMS or other equally effective means as approved by the governmental authorities. Contractor fabricated manifolds and trap primers that rely on fixture use or pressure drop will not be permitted.

	The trap primers will serve drains that are subject to losing the trap seal, including infrequently used fixtures, p-traps serving all floor drains, in excessively hot conditions, mechanical rooms, Housekeeping Rooms or Soiled Utility rooms, floor drains for emergency showers, or floor drains without a dedicated load from Equipment or fixtures.
7.4.2.23(4)(y)	Locate trap primers in a location where they will easily be accessed, inspected, and repaired. Trap primer lines will be labeled at the manifold to identify which drains they serve.
7.4.2.23(4)(z)	Any machinery/service rooms located below grade will be fitted with fast acting, free flowing drains to rapidly disperse flood waters arising from both outside the Facility (such as severe weather), and a from any internal fluid system breaches. Drainage flow capacity will exceed that of the calculated maximum flow from the worst-case system breach. A means of cooling high-temperature heating water before it flows into public areas will also be included to minimize hazards of scalding. Drains will be configured such that water cannot back-flood up into machinery/service rooms (e.g. from overland flooding).
7.4.2.23(4)(aa)	Provide accessible clean-outs for all sinks and lavatories above the flood-level of the sink in conformance with the BCBC. Where bodily fluids may be encountered clean-outs will be provided in accordance with BCBC requirements.
7.4.2.23(4)(bb)	Provide neutralizers, interceptors and sediment traps to intercept corrosive liquids, oil, grease, dirt and solids where necessary and as required by the BCBC and Metro Vancouver guidelines.
7.4.2.23(4)(cc)	Provide interceptors in accordance with the manufacturer’s specifications.
7.4.2.23(4)(dd)	Sizing of the interceptors/neutralizer/dilution chambers will be in accordance with the guidelines set out in the ASPE Design manuals, Metro Vancouver guidelines, Plumbing Drainage Institute (PDI) design guidelines or the local governmental authorities.

7.4.2.23(4)(ee) Provide and show all design sizing information on the excel spreadsheets, as requested, for each of the systems.

7.4.2.23(5) Plaster / Solids Interceptors

7.4.2.23(5)(a) Install plaster / solids interceptors for all process sinks where cast / splint procedures are required; refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] and Appendix 1B [Minimum Room Requirements].

7.4.2.23(5)(b) Plaster / solids interceptor installations are to be designed to allow for removal of the entire interceptor and taken to a maintenance location where the interceptor can be cleaned and returned to service.

7.4.2.23(5)(c) Plaster sinks are to be complete with a stainless steel solids interceptor with perforated removable stainless steel basket. The interceptor is to be mounted on a stainless steel dolly with ball caster and is to have valves and couplings on both inlet and outlet to allow for removal and cleaning.

7.4.2.23(6) Grease Interceptors

7.4.2.23(6)(a) Provide grease interceptors to serve all designated sinks, dishwashers and floor drains in the food preparation areas sized to accommodate the anticipated full design loads.

7.4.2.23(6)(b) Provide an independent grease waste drainage system, sloped at a minimum 2 %, from each of the fixtures to the grease Interceptor.

7.4.2.23(6)(c) All grease interceptors, except small under-counter units, will be located outside the actual food preparation area and floor mounted in mechanical spaces to allow for servicing and clean-out. Grease interceptors will not be installed in ceiling spaces or accessed through floor access hatches.

7.4.2.23(6)(d) Do not install the interceptor in a location where workers would be required to stand on or walk over the interceptor.

7.4.2.23(6)(e) Each large, central grease interceptor installation will be complete with 50 mm welded stainless steel vacuum suction line running from the grease

interceptor to a designated location at the loading dock. The use of portable grease suction lines is not an acceptable means of grease interceptor maintenance.

7.4.2.23(6)(f) The location at the loading dock will be such that a grease vacuum truck can be parked in a dedicated location. Each end of the vacuum tubing will have a Kamlock fitting attached.

7.4.2.23(6)(g) Each grease interceptor installation will be complete with a 20 mm hot water hose bibb on the wall near the grease interceptor that will be connected to the 60OC hot water system.

7.4.2.23(6)(h) Grease interceptors located in food service areas throughout the Facility will be sized to accommodate the anticipated design loads. Each unit will be mounted on a wheeled platform to allow the equipment to be removed and relocated to the maintenance shops for cleaning. Each of the inlet / outlet connections on the interceptor will have union fittings that will allow for removal and replacement of the equipment. The use of portable grease suction lines is not an acceptable means of grease interceptor maintenance.

7.4.2.23(6)(i) Provide one (1) additional grease interceptor to allow for uninterrupted operation when any one of the interceptors needs to be taken out for service.

7.4.2.23(7) Acid / Corrosive Waste Neutralizers

7.4.2.23(7)(a) The acid / corrosive waste system may be a centralized system where multiple sources of acid / corrosive waste may be consolidated and effectively neutralized. Otherwise, provide an individual acid / corrosive waste neutralizer to serve each designated sink/s, floor drain/s in the RO water production mechanical rooms, Laboratory, fumehoods and in all other special services areas throughout the Facility.

7.4.2.23(7)(b) Provide an independent acid / corrosive waste drainage system, sloped at a minimum 2 %, from each of the fixtures to the acid / corrosive waste neutralizer.

7.4.2.23(7)(c) Locate the acid / corrosive waste neutralizer in a location where the maintenance department would be able to service the Equipment.

7.4.2.23(7)(d) Provide acid neutralizers at either the point of acid / corrosive waste discharge to the drainage system or at the termination of the acid / corrosive waste drainage system before connection into the sanitary drainage system.

7.4.2.23(8) Oil Interceptors

7.4.2.23(8)(a) Provide oil interceptors to serve all designated locations such as mechanical rooms, elevator pit drainage, parking area drains and garbage bin / compactor or all other special services areas throughout the Facility where oil may be used.

7.4.2.23(8)(b) Provide an independent oil waste drainage system, sloped at a minimum 2%, from each of the fixtures to the oil interceptor.

7.4.2.23(8)(c) ABS or PVC piping material will not be accepted for this system.

7.4.2.23(8)(d) Locate the oil interceptors in locations where FMO will be able to service the equipment without disruption to Facility operation.

7.4.2.23(8)(e) Provide oil interceptors at either the point of oil waste discharge to the drainage system or at the termination of the oil waste drainage system before connection into the sanitary drainage system.

7.4.2.24 Performance Criteria

7.4.2.24(1) Insulate storm drainage, domestic water piping, cooling water and exposed p-traps throughout per BCICA quality standards. Where piping and/or piping components are subject to freezing, provide insulation and heat tracing, unless noted otherwise. Provide vinyl service jacket on all exposed insulation inside, provide aluminium jacketing outside and on exposed piping in parking structure. Insulated pipes in the underground parking will be finished with vinyl service jacket on pipes that are higher than 2 m AFF. Ensure Life Safety Systems are not installed in locations subject to freezing.

7.4.2.24(1)(a) For water supplies to hose bibbs in the parkade, do not provide heat tracing. Provide a means of automatically winterizing the pipes. A possible

solution includes using BMS controlled control valves to isolate the branch and to open a low point drain. Arrange piping in the parkade to permit fully draining the supply line to each hose bibb.

7.4.2.24(2) All plumbing drainage for acidic fluids will be of ‘acid’ resistant material up to the connection with a neutralizer to reduce the acidity of the discharge to a neutral pH.

7.4.2.24(3) Provide flushing and disinfection of domestic water systems to AWWA and CSA infection control standards. Provide independent testing of piping systems once flushing and cleaning has been completed and provide documentation of testing to the Authority for review.

7.4.2.24(4) Provide trap primers as described in Section 7.4.2.23(4)(x) to maintain the prime of p–traps for showers, lavatories, and hand hygiene sinks in negatively pressurized Airborne Isolation Rooms Patient and AIR Anterooms.

7.4.2.24(5) Conceal all sanitary, waste, and water piping in walls. Only trap arms and water supply piping will be exposed, water supplies will be wall type only. Fixture outlet piping for adjustable height fixtures will be installed so that no water can collect in the drain piping at any fixture height. Provide solid supply tubing to sinks and lavatories for ease of cleaning, no braided flex in areas where Patients are receiving care or treatment. Trap arms will connect to drain piping with a slip joint connection at the wall, MJ clamp not acceptable. Provide chrome escutcheons for water and drain wall penetrations.

7.4.2.24(6) If domestic water system pressure exceeds the acceptable delivery pressure noted in BC Plumbing Code of 80 psi, then provide pressure reducing valves with 100% redundancy. Place the valves in accessible locations in Mechanical Rooms or accessible chases with valving to permit the servicing or replacement of each valve without impacting water supply to areas served. Pressure reducing valves dedicated to equipment with specific pressure requirements may be mounted beside equipment served and do not require redundancy.

7.4.2.24(7) Locate sanitary cleanouts between 1.2 metres and 1.5 metres from finished floor. Cleanouts will be Serviceable and oriented so that a drain auger can be easily inserted. Locate cleanouts for lavatories behind the mirror located above the fixture, Fixtures without mirrors will be provided with key lockable stainless-steel access doors.

7.4.2.24(8) Where water filters are required at point of service for equipment, they will be Serviceable, provided with adequate space below for housing removal to change filters, be equipped with isolation valves and unions, and be located in a space with a floor drain.

7.4.2.24(9) Where back flow prevention devices are required, they will be installed in mechanical or service rooms in a serviceable location.

7.4.2.24(10) Pumped storm and sanitary will be piped using pressure pipe and joint method. If sanitary system pumps into a force main, then the piping from the pump to the force main will be pressure pipe and suitable joining method and valves.

7.4.2.25 Shop Compressed Air system will have a N+1 compressor system serving a single storage tank. Shop air will be generated and filtered to meet ISO 8573-1 Class 3 parameters. Shop air will be distributed in stainless steel, copper or galvanized black steel piping to all compressed air outlet locations noted in Appendix 1B [Minimum Room Requirements]. Piping will not contaminate compressed air.

7.4.2.26 Workroom-Metal/Welding/Plumbing will be provided with a piped Nitrogen outlet served from a single bottle manifold. Nitrogen outlet pressure and flow to be user adjustable. Nitrogen piping will be purged brazed medical grade copper and all components to be oil free and will not contaminate the gas. Locate the Nitrogen outlet with the movable hood noted in Appendix 1B [Minimum Room Requirements] for brazing.

7.4.2.27 Provide a laboratory vacuum system to meet the following requirements:

7.4.2.27(1) Duplex medical vacuum pumps for laboratory use. Laboratory pumps to be separate from the medical vacuum pumps; and

7.4.2.27(2) Provide laboratory vacuum outlets as required. Refer to Appendix 1B [Minimum Room Requirements] for quantities of outlets. Design-Builder to confirm types and final locations of outlets with the Authority during detailed design.

7.4.3 Medical Gas Systems

7.4.3.1 Basic Requirements

7.4.3.1(1) All medical gas systems will be designed and constructed to CSA Z7396.1 Medical gas pipeline systems - Part 1 and CSA Z9170.1.

7.4.3.1(2) Provide medical gas outlets as required. The minimum locations and minimum quantities of medical gases for Patient use are outlined in Appendix 1B [Minimum Room Requirements].

7.4.3.1(3) Medical gas systems will include the following:

7.4.3.1(3)(a) Oxygen;

7.4.3.1(3)(b) Medical Vacuum;

7.4.3.1(3)(c) Medical Air;

7.4.3.1(3)(d) Nitrous Oxide;

7.4.3.1(3)(e) Nitrogen;

7.4.3.1(3)(f) Carbon Dioxide;

7.4.3.1(3)(g) Laboratory Air; and

7.4.3.1(3)(h) AGSS.

7.4.3.1(4) Provide manifold systems for:

7.4.3.1(4)(a) Medical oxygen system reserve;

7.4.3.1(4)(b) Medical air reserve;

7.4.3.1(4)(c) Nitrous oxide;

7.4.3.1(4)(d) Nitrogen; and

7.4.3.1(4)(e) Carbon dioxide gas systems.

7.4.3.1(5) Provide technical gases for the Cyclotron Vault and for the associated Lab/Production area as follows;

7.4.3.1(5)(a) Compressed air, instrumentation air quality (Vault and Lab);

7.4.3.1(5)(b) Helium (Vault and Lab);

7.4.3.1(5)(c) Hydrogen (Vault);

7.4.3.1(5)(d) Nitrogen (Vault and Lab);

7.4.3.1(5)(e) Nitrogen + 0.5% Oxygen (Vault);

7.4.3.1(5)(f) Nitrogen + 10% Hydrogen (Vault);

7.4.3.1(5)(g) Argon (Vault and Lab);

7.4.3.1(5)(h) Argon + 3% Fluorine (Vault); and

7.4.3.1(5)(i) Argon + 10% Fluorine (Vault).

7.4.3.1(6) Authority will provide all cylinder gases for the cyclotron. Design-Builder will provide all cylinder manifolds, racks for cylinders, all seismic restraints and all medical gas piping between cylinders and cyclotron. Most cylinders will be located in the technical space between the vault and the cleanrooms with a portion

located in each QC room. Two purities of helium will be provided by the Authority and connected directly by the Design-Builder to the cyclotron.

7.4.3.1(7) Design-Builder will provide a piped dedicated nitrogen supply from the cylinder gas storage room, Manifold Room - Centralized. This dedicated nitrogen line will not be shared with other areas of the Facility which require nitrogen.

7.4.3.1(8) Provide instrumentation quality compressed air to all cyclotron associated rooms as required by the Authority.

7.4.3.1(9) Provide an oil-free medical vacuum system.

7.4.3.1(10) Provide DISS-type outlets for all medical gases.

7.4.3.1(11) Each medical gas outlet will have a permanently marked, colour-coded non-interchangeable index system to prevent the connection of the wrong gases. Provide a secondary check valve to hold the line pressure if the primary valve is removed for maintenance.

7.4.3.1(12) Patient Rooms and Exam/Treatment Rooms will be provided with double headwall medical gas panels on each side of Patient bed.

7.4.3.1(13) All medical gas outlets in Procedure and Patient rooms will be provided with a Patient reference grounding system in conformance with the Canadian Electrical Code.

7.4.3.1(14) Medical gas piping will be degreased type ‘L’ copper to ASTM B819 and in conformance with CSA Z7396.1.

7.4.3.1(15) Provide a compound for the designated bulk oxygen site to serve the Facility. Coordinate the compound and oxygen bulk tank requirements with the supplier, including dimensions, architectural screening, piping connections, electrical connections, alarm wiring, and safety measures. Locate the compound exterior to the Facility in a location in compliance with the requirements of NFPA that can be accessed by a standard oxygen refueling truck. Provide all piping between the designated bulk oxygen site and the Facility including flexible connection at the entry point to the Facility.

7.4.3.1(16) Provide a medical gas oxygen connection on the exterior of the Facility for supplying oxygen into the Facility from external bulk storage tanks or truck as described in the Post-disaster Design.

7.4.3.1(17) Provide medical gas cylinder manifold room(s) within the Facility for the following medical gases: oxygen, nitrogen, and carbon dioxide based on anticipated usage from Appendix 1A [Clinical

Specification and Functional Space Requirements] and as determined with the Authority. Acceptable locations for the medical air reserve manifold system include either with the primary source equipment or adjacent to the other medical gases manifold rooms.

7.4.3.1(18) Manifolds for nitrogen, and carbon dioxide will be sized to hold medical gases as listed below, with an additional 15% spare capacity in manifold sizing:

7.4.3.1(18)(a) Nitrogen manifold system will have total capacity of two (2) weeks, one (1) week of capacity for each side of automatic change-over valve. Provide storage space for one (1) week spare capacity either within dedicated storage and exchange area or manifold space, as described in this schedule;

7.4.3.1(18)(b) Carbon dioxide manifold system will have total capacity of two (2) weeks, one (1) week of holding capacity for each side of automatic change-over valve. Provide storage space for one (1) week spare capacity space either within dedicated storage and exchange area or manifold space, as described in this Schedule; and

7.4.3.1(18)(c) Design the high pressure manifold systems, such that they will automatically switch to the spare bank of bottles and that switching to the spare bank is alarmed as required in this Schedule.

7.4.3.1(19) Storage and exchange area for spare medical gases and empty medical gases will be sized in accordance with capacity requirements of this Schedule. The room will meet the requirements of Fraser Heath Authority document Chemical Storage Design Requirements. Refer also to Section 7.5.11.1(22).

7.4.3.1(20) Storage and exchange area will accommodate, in addition to all other capacities listed, storage and exchange space for medical gases such as helium, mixtures of gases such as oxygen/helium, oxygen/nitrous oxide, two (2) carts for small grab-and-go oxygen cylinders each approximately 72"Hx28"Wx36"D or other gases as may be required by the Authority. Provide all racks and appropriate seismic restraints to secure bottles. A piping system for these gases is not required. The grab-and-go area for the un-manifolded gases and portable cylinders gases will have adequate space for storing carts plus ten (10) specialty gas cylinders.

7.4.3.1(21) Provide a central medical air and medical vacuum systems. Medical air and medical vacuum systems will each consist of at least three (3) interconnected sources of supply. Systems will be capable of supplying the system flow with any two (2) sources of supply being out of service. Provide ‘fail-safe’ controls: all units will continue to run and maintain service in the event of failure of the electronic controls, without human intervention. Provide multi and/or variable speed systems to allow for varying conditions. Provide for 15% increase in capacity, including control panels, for future. Medical air system reserve manifolded cylinder based system is to be sized as per following:

7.4.3.1(21)(a) Medical air reserve will have total capacity of thirty-six (36) hours, eighteen (18) hours of holding capacity for each side of the automatic change-over valve. Provide storage space for seventy-two (72) hours spare capacity within the manifold space, as described in this Schedule.

7.4.3.1(22) Connect new central medical air and medical vacuum systems to the essential system power supply in conformance with CSA Z32. Provide an essential system power supply from at least two (2) separate circuits such that these emergency services are maintained in the event a motor control centre is de-energized.

7.4.3.1(23) Medical air compressors will be equipped with a carbon monoxide alarm system to measure the level of carbon monoxide in parts per million by volume in the medical air. The system will initiate an alarm and provide a means to prevent gas from entering the piping system if the level exceeds 10 parts per million by volume. Alarm will notify the BMS.

7.4.3.1(24) Air intakes for medical air compressors will be provided with carbon filters with pressure drop alarm notifying the BMS.

7.4.3.1(25) Where laboratories or any other non-clinical area requires an air or a vacuum system, these systems will be independent from the medical air and medical vacuum systems. Non-medical compressed air systems will include the following:

7.4.3.1(25)(a) Laboratory air with N+1 redundancy for non-Patient use will be medical air quality in accordance with CSA Z7396.1-17 and used in such areas as MDR / Biomed / Pharmacy / Labs, braking systems on ceiling columns, and operating door open and door close on sterilizers. Connect to the Emergency Power System. Pressure requirements for the systems will depend on requirements of final

devices and Equipment procured. Outlet pressures will be Authority adjustable; and

7.4.3.1(25)(b) Provide a 1" laboratory air supply to the Labs. Location and quantity of outlets to be determined during design in consultation with the Authority.

7.4.3.1(26) Provide a dedicated active AGSS for all points of anaesthetic gas use and locations where other volatile anaesthetic agents will be used. Gas scavenging systems will be designed to applicable standards including CSA-Z7396.1 and will incorporate a Halogenated Drug Recovery System (HDR). AGSS will include at least three (3) vacuum producers and will be capable of supplying the system design flow with any two (2) vacuum producers out of service. Vacuum producers and the HDR will be connected to emergency power. System will have 15% spare capacity to permit future extension.

7.4.3.1(27) Service isolation valves will be valves of three piece bolted construction for medical gas service and will have ULC listing and CRN number. Valves will be labelled showing the appropriate gas service and pressure rating. All ball valves will have a quarter turn from closed to open and swing out during installation. Shut-off valves exceeding 65 mm used for medical vacuum systems may be butterfly valves. Provide degreased copper tube stubs with purge ports.

7.4.3.1(28) Area zone shut-off valves will be housed in a single steel box comprised of multiple shut-off valves with tube extensions, removable window incorporating a centre pull out ring. Provide pressure/vacuum gauges for each service. Provide label stating rooms served by valves. Boxes will be designed so that the shut-off valve handles prevent the closure of the box door or replacement of the cover when the valve is in the off position. The boxes will be large enough to permit the manual operation of the shut-off valves. The valves will be arranged such that the operation of one valve will not interfere with the proper operation of other valves located in the same box. Zone valves will serve a maximum of twelve (12) Patient beds.

7.4.3.1(29) Floors will be served from a minimum of three (3) separate sets of medical gas risers. The mains serving these risers will be looped such that either set of risers can feed the floor if one (1) riser is out of service. The loop mains will be provided with service valves so sections of the floor can be isolated without affecting the remaining floor operation. Medical gas systems will have the capability to back feed areas if the main pipeline service is disrupted.

7.4.3.1(30) Provide nitrogen at the necessary supply pressure to Operating Rooms to accommodate the use of speciality tools and the Equipment procured.

7.4.3.1(31) Medical gas supply Equipment for Patient care spaces will be sized to allow for 15% growth in capacity.

7.4.3.1(32) Decontamination/soiled Medical Device Reprocessing areas, general laboratories, media preparation and tissue culture labs will require CO2, laboratory air and/or nitrogen. Design-Builder will provide the services required to meet the requirements of the final Equipment and devices procured.

7.4.3.2 Performance Criteria

7.4.3.2(1) Provide a zone control valve box complete with zone alarm panel and removable window with pull-out ring at each zone.

7.4.3.2(2) Provide a main alarm panel to monitor all the medical gas systems installed in the Facility.

7.4.3.2(3) Sensing devices will initiate audible and visual alarms on the control panels for the medical air compressor system, medical vacuum system, laboratory air system and the AGSS. All alarms will notify the BMS.

7.4.3.2(4) Provide BMS alarm interface signal to the Facility central system for critical alarms such as high or low pressure. Auditory alarm signals will be clearly audible and produce a sound level of not less than 70 dBA at a distance of 2 metres and will require manual silencing.

7.4.3.2(5) Provide medical gas systems which exceed the minimum valving requirements of CSA Z7396.1. This requirement applies to the following areas: Inpatient Unit, all Level 1 Recovery and Level 2 Recovery areas in the Anesthetic Care Unit (ACU) Emergency. The isolation zones will be determined in consultation with the Authority through the Review Procedure.

7.4.3.2(6) All piping and components of the pipeline distribution systems that come into contact with the medical gases will be supplied clean and free from oil, grease and particulate material and capped or sealed to prevent contamination. On site cleaning of medical gas piping will not be permitted.

7.4.3.2(7) Provide a local alarm panel for each zone. Alarm panels will be connected to the emergency system power supply in conformance with CSA Z32. Remote alarm annunciation will be provided at a location with 24 hour continuous monitoring by

personnel. Provide an interconnected status and alarm point and signal to the BMS.

7.4.3.2(8) All local alarm panels will be individually connected to the BMS. Provide a single alarm interface signal from each local alarm panel to the BMS for critical alarms such as low or high pressure. Local alarms will be connected to the emergency power supply system in conformance with CSA Z32.

7.4.3.2(9) All medical gas systems will be certified in accordance with CSA standards by an independent and qualified testing agency. Supply the testing reports to the Authority.

7.4.3.2(10) All systems components requiring electrical power will be connected to the emergency system power supply in conformance with CSA Z32.

7.4.3.2(11) The medical gas supply system will be for Patient consumption only. If Equipment and/or procedure(s) require laboratory air, then provide separate dedicated source Equipment, piping, valving and monitoring to accommodate that application.

7.4.3.2(12) Design-Builder will conduct all installation tests of the medical gas supply systems required by CSA Z7396.1 including leak tests and cross connection tests.

7.4.3.2(13) Design-Builder will provide the Authority with documented evidence that the operational requirements of the medical gas supply systems have been met.

7.4.3.2(14) Zone valves will be installed immediately outside each anaesthetizing location.

7.4.3.2(15) Provide isolation valves on the medical gas branch lines serving each room.

7.4.4 Structural Moat Wall Seismic Gap and Future Underground Parking

7.4.4.1 Structural Moat Wall

7.4.4.1(1) Provide drainage within the space(s) between the structural moat wall and the exterior wall of the underground parking complete with catch basins and connected to parking drainage system.

7.4.4.1(2) Provide foundation drainage system in accordance with the Geotechnical Consultant’s recommendation and the Design-Builder’s Geotechnical Report.

7.4.4.1(3) Size domestic water P3 parking piping system and provide valved and capped connections (on all 4 sides of P3 level adjacent to

moat) to accommodate future installation of the hose bibbs within moat every 30 m spaced.

7.4.4.2 Future Underground Parking

7.4.4.2(1) Ensure all future underground parking areas are adequately sloped to drain. Provide drainage system/infrastructure connected to underground parking drainage system.

7.4.4.2(2) Provide foundation drainage system in accordance with Geotechnical Consultant's recommendation and the Design-Builder's Geotechnical Report.

7.4.4.2(3) Size domestic water P3 parking piping system and provide a valved and capped connections for the "future underground parking" to accommodate installation of the future hose bibbs spaced every 30 m apart.

7.5 Heating, Ventilating and Air Conditioning (Division 23)

7.5.1 Basic Requirements

7.5.1.1 Heating hot water, steam, and chilled water will be produced in the Energy Centre.

7.5.1.2 The Energy Centre will be designed to meet the peak coincident load with the largest heating source unit out of operation (N+1 redundancy).

7.5.1.3 Pumps, heat exchangers and other ancillary equipment redundancy will match that of the main Equipment. Ensure that no failure of any single pump, fan, variable frequency drive (VFD), packaged control panel, or central system control valve will be able to prevent heating, cooling, or ventilating of the Facility to the required design conditions.

7.5.1.4 Heating and steam boilers will be all electric with no natural gas or No. 2 fuel oil operation at all.

7.5.1.5 The Facility heating boilers will be the initial source of heat to start-up the Facility and reach acceptable thermal comfort levels. Once the Facility is at operating temperature, recovered heat from the heat recovery system will be the primary source of energy, followed by supplemental heat provided by dedicated heating boilers. The intent is to use recovered heat for Facility heating whenever possible and minimize the use of supplemental energy sources such as Facility boilers. Refer to Section 7.5.8.3 for requirements on Facility heat recovery chiller plant, as well as other heat recovery clauses in Section 7.5.

7.5.1.6 Apply energy heat recovery systems to offset plant heating requirements. Provide analysis of energy savings, life-cycle costing, and maintenance concerns.

7.5.1.7 Provide treatment equipment for introducing cleaners and/or corrosion inhibitors. Provide side stream filters with 5 micron cartridges, sight glass, corrosion

coupons, and differential pressure gauges across all pumps for all hydronic systems.

7.5.1.8 Provide EndoTherm hydronic additive to manufacturer's requirements for the heating water and chilled water systems to maximize heat transfer efficiency.

7.5.1.9 Provide identification on duct mains in every room and at least every 40' [12m]. Use stenciled letters in black and 3" [75mm] high. Provide identification on exhaust ducts at point of termination.

7.5.1.10 Performance Criteria

7.5.1.10(1) Design the heating Equipment to meet the maximum simultaneous Facility demand for all systems served by the Energy Centre plant.

7.5.1.10(2) Energy Centre plant will be capable of controlling and responding to periods of low usage. An acceptable strategy will include using multiple boilers with two of the boilers, each sized for 10% of overall required plant capacity.

7.5.1.10(3) In addition to meeting CSA Z32 and CSA Z317.2 requirements, the heating plant Equipment will be connected to the delayed vital electrical system, such that 100% of plant capacity is available at all times.

7.5.2 Heating Hot Water System

7.5.2.1 Hot water for heating will be provided from the Energy Centre in accordance with the following:

7.5.2.1(1) The Facility's heating water system will incorporate a cascading variable flow primary only loop. The heat recovery chillers will provide first stage low temperature heating water and the piping connections and valves will allow each heat recovery chiller to be fully decoupled from the others. Refer to Section 7.5.8.3 for heat recovery chiller sizing requirements.

7.5.2.1(2) The Facility low temperature heating water loop will supply water up to 48.9°C (120°F) to serve the following functions at minimum: radiation systems, heating/pre-heat coils within AHUs, reheat coils, and domestic water pre-heat. Other heating elements able to operate at lower supply heating water temperatures may also be served by the low temperature heating water loop.

7.5.2.1(3) The cascading variable flow primary loop will be topped up with heat from electric boilers when there is a shortage of heat generated by the heat recovery chillers.

7.5.2.1(4) Provide redundancy in the Facility's heating electric boiler(s) plant such that the initial Facility heating plant requirements will be met with one (1) boiler out of service.

7.5.2.2 Heating water boilers will be all electric high mass boilers. Heating for the domestic hot water heating system will be provided by independent electric domestic hot water heating elements.

7.5.2.3 Boilers will be fully modulating. Boilers will include a control package that will monitor all safety functions and will communicate with the overall process control system.

7.5.2.4 Provide primary hot water pumps with VFDs in a quantity that matches that of the boilers, including any N+1 boilers, to distribute hot water throughout the cascading primary loop. Primary pumps to be piped into common supply/return headers such that any pump can serve any boiler. Boiler system will operate on variable flow principles governed by facility loads. Provide minimum two (2) sets of supply / return mains between the boilers and the Facility heating water loop.

7.5.2.5 Domestic hot water pre-heating system will be served primarily by recovered heat from the Facility.

7.5.2.6 Steam boiler feed water system pre-heat will be heated steam condensate.

7.5.2.7 For all hydronic pumps provided with VFDs, do not install combination all in one Isolation/balance/check valves on the discharge side of the pump. Install a separate butterfly valve and check valve. Butterfly and check valve to be same size as drop, with the drop sized as per Section 7.1.2.15(12).

7.5.2.8 Select heating and reheat coils based on low temperature distribution to maximize primary hot water loop temperature differential and to provide opportunity to use recovered heat. Secondary heating loop supply temperature will be scheduled to 48.9°C (120°F) maximum.

7.5.2.9 Provide automatic isolation valves on the inlet of each boiler. Isolation valves to be proven open and heating water flow proven prior to energizing boiler heating elements.

7.5.2.10 Provide coalescing type dirt and air separator on the primary hot water supply main in the Energy Centre.

7.5.2.11 Provide energy metering to measure the heating load at the supply and return mains; refer to Appendix 1P [Metering Matrix] for meter details.

7.5.2.12 Modular expansion tanks are to be provided in accordance with system volumes at Substantial Completion as well as future system volume. The allowance for future system volume is an additional 10% over volumes at Substantial Completion. Make-up water will be measured via flow meter.

7.5.2.13 Provide humidification for the Facility such that all spaces meet the requirements of the standards listed in Section 2.4.

7.5.2.14 Provide centralized steam generation equipment for all process steam requirements within the Facility. Steam will not be used for humidification.

7.5.2.15 Ensure the feed water quality to steam generators is within the required conditions of the applicable codes, standards, and manufacturer's recommendations for both the generator and the downstream Equipment. Steam quality will be condensate and non-condensable gas free and minimum 97 % saturated vapour. Refer also to Section 7.4.2.3 for RO system make-up water requirements feeding steam boilers.

7.5.2.16 Provide connections in the steam system near the point-of-use, which can be used to access the steam for quality measurement.

7.5.2.17 The Facility's heating systems will be designed to exceed the energy efficiency requirements of ASHRAE 90.1.

7.5.2.18 In addition, the Facility's heating systems will be designed to meet or exceed the Facility's energy use target as indicated in Schedule 5 [Energy Guarantee], including additional requirements set in this Section 7.5.

7.5.2.19 The Facility's heat recovery systems, including heat recovery chillers and heat recovery network/sources, are key to ensuring energy efficiency is maximized, lowering operational costs and GHG's.

7.5.2.20 Maximize future heat recovery by optimizing use of renewable sources (facility exhaust, process cooling, etc.) within Facility.

7.5.2.21 Refer to Section 7.5.8 for more detailed information on Facility heat recovery.

7.5.2.22 Use of geo-exchange systems is not acceptable.

7.5.3 Steam System

7.5.3.1 Design the steam boiler plant to meet the maximum simultaneous Facility demand for all systems served by the steam boiler plant, as well as being capable of controlling and responding to periods of low usage. The steam plant will be sized assuming no diversity in MDR steam loads. Redundancy will be based on meeting the final plant capacity with one boiler out of service. All systems will meet the requirements of the standards referenced in Section 2.4. The steam boilers will operate between 80 psi and 100 psi. A minimum pressure of 80 psi will be fed to the MDR through N+1 PRVs.

7.5.3.2 Steam distribution will be configured to serve the Facility and future loads from a supply header located in the boiler room. Provide two (2) 100 mm (4") valved and capped connections to allow for the connection of the future steam plant for Future Expansion. Route condensate return piping from the future steam plant for Future Expansion for each of the aforementioned loads separately to the main

condensate tank. Provide a 50 mm (2") test branch on the supply header complete with isolation valve and throttling valve. Terminate the test branch outside the Energy Centre at a location that will not be a nuisance and that will comply with WorkSafe BC and Technical Safety BC requirements.

7.5.3.3 Steam boilers will be all electric high mass type.

7.5.3.4 Boilers will include a control package that will monitor all safety functions and will communicate with the overall process control system. Provide both surface and drum blowdown systems and all safety features. Include dual element feed water level controls to avoid high or low water and carryover.

7.5.3.5 Provide steam separators to achieve ideal dryness on outlet of each boiler.

7.5.3.6 Blowdown collection tank will recover heat and will preheat the boiler feed water.

7.5.3.7 Provide a main condensate tank with capacity to suit the installed boiler capacity.

7.5.3.8 Condensate transfer pumps will be configured to provide N+1 redundancy for the current load and space for a future pump for the future load.

7.5.3.9 Provide a main deaerator with a capacity to suit the installed boiler capacity.

7.5.3.10 Boiler feed pumps will be configured to provide N+1 redundancy for the current load and space for a future pump for the future load.

7.5.3.11 Pipe the condensate return system such that boiler operation can be maintained if the deaerator is out of service.

7.5.3.12 Where high pressure condensate accumulates in the plant space, provide flash tank with operating pressure of 35 kPa (5 psi) and recover steam to deaerator. Cooling water for the flash tank will be used for makeup to the domestic hot water system.

7.5.3.13 Include steam flow meter on plant main outlet to measure production.

7.5.3.14 Include water flow meter to measure Steam Plant make-up water demand.

7.5.3.15 Provide fully redundant PRV stations in a 1/3, 2/3 arrangement when load exceeds 700 kg/hr (1500 pph). For loads below 700 kg/hr (1500 pph), provide full size, redundant PRVs and globe valve bypass. All PRVs will have isolation valves up and down stream as well as strainers, relief valves, drip-pan elbows and vents to outdoors. Vents of different pressure reliefs will not be combined.

7.5.3.16 Steam supply to the MDR will have PRVs with redundancy and will have partial load sizing per Section 7.5.3.1.

7.5.3.17 Blowdown tank size will be in accordance with recommendations of National Board of Boiler and Pressure Vessel Inspectors.

7.5.3.18 Provide moisture separators, one (1) for MDR department, and one (1) moisture separator and steam filter at each sterilizer. Filters will have minimum efficiency of 98 % at 0.1 micron. Provide a bypass around the filter complete with associated valving. Coordinate with Authority selection of steam separators and filters, but generally the components will be as per Appendix 1Q [Acceptable Manufacturers List]. Use stainless steel piping 316L downstream of the filters to the sterilizers.

7.5.3.19 Plate and frame heat exchangers are not acceptable for steam systems.

7.5.3.20 For steam traps, provide two (2) isolation valves in series upstream of the trap. At minimum, the first isolation valve will have welded connections. For MDR steam traps, use F&T type steam traps.

7.5.3.21 For steam systems operating at 50 lbs or greater, provide at minimum ANSI Class 300 piping, fittings, valves and connected components.

7.5.3.22 For components 2” and less, provide threaded joints. For components over 2” provide welded joints.

7.5.3.23 Install steam pipes so that they are continuously sloped in direction of flow with no low points other than drip legs.

7.5.3.24 Comply with Technical Safety BC stress analysis and design registration requirements.

7.5.4 Humidification System

7.5.4.1 In lieu of traditional steam-based humidification system, humidification will be provided using an adiabatic system that utilizes high pressure RO water and atomizing nozzles. The system consists of RO water generation feeding an RO storage tank(s) with recirculation for legionella control. High-pressure pumping stations distribute 6895 kPa (1000 PSI) water to staging valves at each AHU. These staging valves deliver high pressure water through atomising nozzles within each air handling unit to humidify supply air. Air handlers will require a wet section of approximately 2 m length or longer if required to allow for adequate absorption of the high-pressure spray.

7.5.4.2 Regardless of Technical Safety BC registration requirements, perform stress analysis of the high pressure RO water system for all pipe sizes.

7.5.4.3 Provide a dedicated N+1 redundant RO water system complete with UV recirculation and storage tank. Provide redundant MeeFog high pressure pump units. Provide staging valve unit and nozzle manifold for each AHU. Provide stainless steel piping rated for 6895 kPa (1000 PSI) for distribution from pump units to each AHU.

7.5.4.4 Dehumidification System

7.5.4.4(1) As part of the psychrometric analysis of the air systems, include analysis not only on humidification systems, but also on

dehumidification systems using the 2050 weather data. Should the analysis reveal that dehumidification is required, provide the necessary infrastructure to dehumidify the air supplied to the Facility. Provide calculations to the Authority.

7.5.5 Stack

7.5.5.1 Provide a structural stack for the emergency generators.

7.5.5.2 Provide individual flues for each generator, sized to limit back pressure to less than 80% of the allowable transient back pressure rating. Flues will be guided within the outer shell of the stack to allow for expansion. Flues will be individually insulated.

7.5.5.3 Flues will terminate at a height that complies with applicable codes, standards, regulations and will not permit entrainment into Facility air intakes and openings. Stack will be freestanding above the height of the Energy Centre.

7.5.5.4 Provide a stainless steel finishing jacket over the stack insulation. The jacket will be of a uniform colour and finish, and not require ongoing maintenance.

7.5.5.5 Wind loading, seismic zone, exposure factor and deflection will be in accordance with the BCBC.

7.5.5.6 Provide lighting and markings in accordance with Transport Canada standards.

7.5.5.7 Provide external access ladders with safety rail system and platform(s).

7.5.6 Fuel Systems - Boilers

7.5.6.1 No fuel oil system for boilers is required or permitted.

7.5.7 Fuel Systems – Generators

7.5.7.1 No Bulk fuel storage tanks are required.

7.5.7.2 The packaged generator sub-base tank capacity will be sufficient for 72 hours of operation at full nameplate prime kW rating.

7.5.7.3 Provide packaged generators with fuel oil transfer pumps so that fuel oil may be moved from one generator sub-base tank to another. Refer to Sections 7.7.4 and 5.5 for further information.

7.5.7.4 Provide fuel polishing system as per Section 7.2.

7.5.8 Cooling

7.5.8.1 Basic Requirements

7.5.8.1(1) Chilled water will be produced in the Energy Centre. The design and operation of the Energy Centre will be optimized to allow

energy recovery for heating purposes and to minimize the cost of operation.

7.5.8.1(2) Comply with CSA Z32 and CSA Z317.2 requirements by connecting cooling plant Equipment to the delayed vital electrical system. Critical cooling and 24/7 cooling loads will be served at all times other than the anticipated disruption during transition between normal and delayed vital power.

7.5.8.2 Chilled Water System General Requirements include:

7.5.8.2(1) Design the cooling plant to meet the maximum simultaneous Facility demand for all systems served by the cooling plant, as well as being capable of controlling and responding to periods of low usage. Systems include air handling units, fan-coil units, and heat recovery coils. All chillers will unload down to 15 % of rated capacity, to accommodate Facility part load conditions. All systems will meet the requirements of the standards referenced in Section 2.4.

7.5.8.2(2) Provide redundancy such that the design load and required plant capacity is continuously maintained with the largest chiller or cooling tower out of service. Provide chiller redundancy such that a failed chiller can be repaired, removed or replaced while maintaining continuous Facility operations.

7.5.8.2(3) Chiller water side pressure drop through evaporator and condenser sections may exceed 30 kPa [10’ w.c.] provided that efficiency requirements of Section 7.5.8.3(7) are met.

7.5.8.2(4) The chiller plant will be configured in a parallel arrangement with means of automatic isolation of each chiller to prevent flow through inactive units.

7.5.8.2(5) The chiller plant will be designed with minimum 8.5°C [15°F] temperature differential to minimize pumping power.

7.5.8.2(6) Design the chilled water system with a fully variable flow strategy through chillers and Facility chilled water loop, to reduce system pumping power.

7.5.8.3 Facility Heat Recovery Chiller System:

7.5.8.3(1) Design the heat recovery chiller plant that will minimize need for additional Facility heating, supplemented by heating boilers.

7.5.8.3(2) Recover all heat from heat recovery coils installed in locations as described in Section 7.5.

7.5.8.3(3) Recover all heat from any other sources such as process cooling via chilled water and similar.

7.5.8.3(4) Design the heat recovery chiller plant to meet the maximum simultaneous Facility demand for all systems served by the cooling plant including heat extracted by all heat recovery coils. To respond to periods of low usage, the chiller plant will be capable of controlling and unloading down to 15% of the combined rated plant capacity while maintaining performance as set out in Section 7.5.8.3(14). All systems will meet the requirements of the standards referenced in Section 2.4.

7.5.8.3(5) All chillers (A/C chillers and heat recovery chillers) will be water cooled, high efficiency, electrical, institutional grade chillers, rated in accordance with AHRI 550/590. A/C chillers will be centrifugal type chillers, while heat recovery chillers will be screw type chillers. No absorption chillers will be permitted. Chillers will utilize non-CFC refrigerant and will meet LEED requirements.

7.5.8.3(6) Chilled water distribution will be configured to serve the Facility and future loads from supply and return headers located in the chiller room. Provide valved connections for the Facility and two (2) 150 mm diameter valved and capped connections for future loads (in addition to the Future Expansion connection).

7.5.8.3(7) Chillers will meet efficiency requirements of ASHRAE 90.1 standard at AHRI testing conditions.

7.5.8.3(8) Chiller control sequences will include chiller staging to maximize the overall plant efficiency at all loading conditions. Chiller control sequences will also include chilled water temperature and system differential pressure reset and variable water flow. Base chilled water temperature and differential pressure reset on tracking position of all control valves (positive feedback).

7.5.8.3(9) The plant will be powered as per Section 7.7.4.2(20).

7.5.8.3(10) Provide continuously available 24/7 cooling for all areas containing specialized Equipment including imaging rooms included in Section 7.3.1.1(15)(a), Radiation Treatment, Cyclotron and continuous internal heat gains such as elevator machine rooms, server rooms, electrical, UPS and Communications Rooms via a process chilled water loop.

7.5.8.3(11) Optimize heat recovery from the chiller system such that all heat extracted from the chilled water system/condenser water can be recovered to provide heat to the Facility and the Energy Centre, in accordance with Section 7.5.11.1(19). Recovered heat uses

include all Facility heating, reheat, domestic hot water preheating and domestic hot water heating.

7.5.8.3(12) Extracted heat that is in excess of Facility's heating needs from the Facility's chilled/condenser water loop and reject to the atmosphere through the Facility cooling towers.

7.5.8.3(13) The heat recovery chillers and associated plant systems will be capable of producing Facility heating water supply temperatures with leaving source water temperatures as low as 4°C.

7.5.8.3(14) In primary-secondary chilled water loop configuration, provide dedicated primary chilled water pumps with VFDs in a quantity equivalent to the number of the chillers, sized to be capable to unload down to 25% of peak design flow of the smallest chiller. Interconnect the supply/return mains with isolation valves such that any pump can serve any chiller. Secondary Facility chilled water pumping will be with N+1 configuration and ensuring that pumps can unload down to 25% of peak design flow of the smallest chiller. Provide minimum two (2) sets of supply / return mains between the chillers and the Facility chilled water loop.

7.5.8.3(15) Provide condenser water pumps with VFDs in a quantity that matches that of the chillers, sized to be capable to unload down to 25% of peak design flow of the smallest chiller. Interconnect the supply/return mains with isolation valves such that any pump can serve any chiller or cooling tower. Provide two (2) sets of condenser water supply / return mains between the chillers and the cooling towers. The piping arrangement will permit replacement of condenser water mains while allowing the plant to continue delivering design cooling capacity. Provide accessible isolation valves in the condenser water mains to the cooling towers at each floor level.

7.5.8.3(16) The Energy Centre will be designed with sufficient back-up capacity and redundancy in accordance with CSA Z317.2, in addition the following will be provided:

7.5.8.3(16)(a) Ensure that no failure of any single pump, fan, variable frequency drive (VFD), or central system control valve will be able to prevent cooling of the Facility to the required design conditions.

7.5.8.3(16)(b) The chilled water system will be configured to prevent use of pressure break heat exchangers.

7.5.8.3(16)(c) Provide multi-cell induced draft cooling towers, with condenser water to cells valved to isolate individual cells while keeping the remainder of the cooling

tower operational at full design capacity. Locate the cooling towers to ensure cooling tower discharge does not enter the Facility or any other buildings through air intakes or other openings. Provide each tower wet basin as all stainless steel construction, a galvanized tower housing, and copper coil construction. Provide towers with anti-slip maintenance access platforms to service all sides of each tower, at no greater than 2.7m (9') vertical intervals, accessible by stairs, and for access at the tower base, middle and top. Provide each platform complete with guardrails. Provide walking platform inside the basin and provide discharge isolation dampers. Provide a cooling tower sweeper system. Provide a gantry crane with fixed supporting structure or davit arm supplied with cooling tower manufacturer, to facilitate servicing each cooling tower. Make-up water to the cooling towers will be measured via flow meter and the capacity of the makeup water system will meet the flow requirements anticipated in year 2080.

7.5.8.3(17) Provide energy meters on the heat recovery chiller chilled water loop, condenser loop, and condenser water loop to the cooling towers to measure the heat recovered from the chillers; refer to Appendix 1P [Metering Matrix]. Chilled water plant is to operate on variable primary flow principles governed by Facility demands. Chillers are to be selected to operate on variable flows through both the evaporator and condenser.

7.5.8.3(18) For winter operation of chillers, sufficient cooling tower capacity in an N+1 arrangement will be winterized, and heat traced. The winterized cooling tower section will be easily isolated from the rest of the array when seasonal equipment is drained.

7.5.8.3(19) Provide automatic isolation valves on the inlet side of each chiller and cooling tower.

7.5.8.3(20) Provide coalescing type dirt and air separator on chilled water return main entering the Energy Centre.

7.5.8.3(21) Provide water treatment packages for the condenser water systems. Provide treatment Equipment for introducing corrosion inhibitors and biocides into the cooling towers. Provide packaged high efficiency solids separators.

7.5.8.3(22) Modular expansion tanks are to be provided in accordance with designed system volumes. Make-up water to the chilled water system will be measured via flow meter.

7.5.8.4 Performance Criteria

7.5.8.4(1) Provide Equipment for all necessary cooling, including the required redundancy in the cooling systems and cooling required by Facility systems in a post-disaster event.

7.5.8.4(2) Provide AHU's capable of 100% outdoor air for free cooling despite the heat recovery strategies described in this Schedule. Apply sensible and latent energy recovery systems to offset plant cooling requirements.

7.5.8.4(3) Cooling towers will be provided with variable speed controllers on all motors. Provide sump heaters for cooling towers designed to operate in winter. Sump heaters and sump water level will be integrated into the BMS.

7.5.8.4(4) Chilled water plant to be controlled to optimize operation based on outdoor temperature and cooling demand.

7.5.8.4(5) Cooling tower performance will be certified in accordance with Cooling Tower Institute Standard STD-201. No open-type cooling towers are allowed except spray coil (closed circuit evaporative fluid cooler) type cooling towers. Install cooling towers such that they:

7.5.8.4(5)(a) are located away from fresh air intakes.

7.5.8.4(6) Chillers and cooling towers will be designed and located so as not to have an adverse effect on the mechanical systems for this Facility or any adjacent building.

7.5.8.4(7) for maintenance, safety and appearance.

7.5.8.4(8) Installation will comply with Legionella Mitigation Plan described in Section 2.5.7.4(7).

7.5.8.4(9) The cooling systems will be designed to exceed the Facility's energy target.

7.5.9 Hydronic Distribution

7.5.9.1 At a minimum, provide isolation valves at the following locations:

7.5.9.1(1) at each set of piping branches from the main distribution line or riser;

7.5.9.1(2) at all locations where the branches serve groups of rooms with similar uses;

7.5.9.1(3) on branches serving individual equipment and terminal devices; and

7.5.9.1(4) other locations as required for maintenance or emergency shut-off.

7.5.9.2 Heating and Cooling System

7.5.9.2(1) As a minimum the following system structure and principles will be required to support the design or similar alternate approach:

7.5.9.2(1)(a) Utilize passive heat transfer of thermal energy from reclaim source to load whenever conditions permit;

7.5.9.2(1)(b) Integrate and separate systems based on supply and return of fluid temperatures (this is independent of whether they are used for heating, cooling or both);

7.5.9.2(1)(c) Use switchover cooling / heating coils in all exhaust relief coils;

7.5.9.2(1)(d) Use cascading of Building Systems/loads from high grade heating to medium grade heating (e.g. reheat coils cascading to AHU coil for heating); and

7.5.9.2(1)(e) Provide dedicated hydronic chilled water and heating water loops for AHU coils, and exhaust relief coils.

7.5.10 Space Heating and Cooling

7.5.10.1 Basic Requirements

7.5.10.1(1) HVAC system will provide a comfortable internal environment for the Patients and Staff and will meet the required environmental conditions for the equipment.

7.5.10.1(2) Provide all necessary space, ventilation and process heating for the Facility.

7.5.10.1(3) Space heating and cooling capacity will be sufficient to meet the required indoor design temperature and relative humidity to comply with the Standards referenced herein including CSA Z8000 and CSA Z317.2.

7.5.10.1(4) Space heating capacity will be sufficient to meet the required indoor design temperatures to comply with the standards referenced in Section 2.4 while using the January 1% outside design temperature for the City as outlined in the BCBC.

7.5.10.1(5) Space cooling capacity will be sufficient to meet the required indoor design temperatures to comply with Climate Resilience Guidelines for BC Health Facility Planning & Design and other

standards referenced in Section 2.4 while using the July 2.5% outside design wet and dry bulb temperatures for the City as outlined in Section 7.1.2.3(1).

7.5.10.1(6) Connect sources of heating that serve CSA Type I and Type II spaces to electrical power in accordance with CSA Z32; refer to Section 7.7.4.2(20).

7.5.10.1(7) Provide air curtains at regularly used entrances as described in Section 5.7.4.1(12) which will prevent cold drafts from entering the adjacent occupied space.

7.5.10.1(8) Design pumps to:

7.5.10.1(8)(a) Operate at the system fluid temperature without vapour binding and cavitation with a minimum 1 m net positive suction head (NPSH) margin, at design flow;

7.5.10.1(8)(b) Be non- overloading in parallel or individual operation;

7.5.10.1(8)(c) Operate within 25% of the midpoint of published maximum efficiency curve;

7.5.10.1(8)(d) Incorporate a variable frequency drive (VFD) for pumps with 3HP or higher motors for energy savings under part-load conditions; and

7.5.10.1(8)(e) Incorporate mechanical seals with equal or better construction and performance of A.R. Thomson model TAC 20 for pumps with less than 10HP motors and model TAC 33 for pumps with 10HP motors and greater.

7.5.10.1(9) Ensure pump construction and installation will permit complete pump servicing without disrupting piping or motor connections. Close coupled pumps will only be permitted on motor sizes less than 3hp. Provide pumps requiring motors rated at 10HP and greater as a horizontal base mounted configuration.

7.5.10.1(10) Insulate all piping subject to condensation, freezing, heat tracing, heat losses (heating piping) or heat gains (chilled water piping), as well as all heat recovery loop piping and other commonly insulated piping, equipment and accessories in accordance with all applicable standards as a minimum.

7.5.10.1(11) Provide seismic mitigation and Facility separation devices for all piping that crosses Facilities and/or Utility corridors.

7.5.10.1(12) Ensure that no air within the air conditioning system, outside of the central air handling equipment, drops below its dew point temperature.

7.5.10.1(13) All refrigerants used will be environment friendly and will comply with the Facility's LEED rating target and all current Standards.

7.5.10.1(14) Once through cooling with domestic water is not permitted for any process or service within the Facility, except as an emergency back-up for chilled water terminal units serving critical cooling loads as approved by the Authority.

7.5.10.1(15) Provide continuously available chilled water or condenser water systems for all areas containing specialized medical equipment, Communications Rooms, elevator machines, Computer systems and Electrical Rooms for managing continuous internal heat gains. Cooling and heat rejection for these critical loads may be served by the central cooling plant provided the system incorporates redundancy per CSA Z317.2 requirements and is connected to the delayed vital electrical system. Design HVAC terminal components in conjunction with equipment location in order to mitigate unnecessary heat gain into the space.

7.5.10.1(16) Provide back-up cooling for medical imaging Equipment and other specialized medical Equipment with critical cooling loads as determined by the Authority as follows:

7.5.10.1(16)(a) For water cooled Equipment, provide a domestic cold water connection and drain line piped to a nearby hub drain for connection to the Equipment chilled water inlet and outlet in a switchover arrangement. This system will be enabled automatically during a failure of the chilled water distribution and provide once-through-cooling for emergency use only; and

7.5.10.1(16)(b) For air cooled Equipment, provide N+1 redundant terminal units serving rooms housing Equipment with critical cooling loads. Additionally, if these terminal units are supplied with chilled water, provide back up once-through-cooling for emergency use during a failure of the chilled water distribution as described in Section 7.5.10.1(16)(a).

7.5.10.1(17) Provide a dedicated chilled water circuit to serve diagnostic imaging machines located in rooms in Section 7.3.1.1(15)(a), Linear accelerators and Cyclotron. The system will incorporate a centrally located filtration system, in accordance with the

manufacturer's requirements. Coordinate with Appendix 1H [Equipment and Furniture].

7.5.10.1(18) Provide continuously available chilled water for the water cooled condensing units for the Food Services and all other walk-in refrigerators, freezers, and cold rooms. Make final connections to the condensers and provide back-up once-through-cooling as per Section 7.5.10.1(16)(a) for emergency use only. Provide refrigerant piping between the condensers and the respective refrigerator, freezer or cooler, charge with refrigerant and oil and fully Commission. Refer to Appendix 1I [Food Services Equipment List].

7.5.10.1(19) Provide chilled water to walk in refrigerators and provide with dual condensers connected for redundancy. Additionally provide back-up once-through-cooling as per Section 7.5.10.1(16)(a) for emergency use only. Review the Equipment Summary located in Appendix 1H [Equipment and Furniture] and Appendix 1I [Food Services Equipment List].

7.5.10.1(20) Space heating for the decontamination suite will be by radiant means to ensure minimal air velocity within the space.

7.5.10.1(21) Provide N+1 redundant HVAC terminal component units for cooling of the following spaces at minimum: Communications Rooms, Computer rooms, main Electrical Rooms, Unit Substation rooms, UPS rooms, Server Room – OR Integration System, and other spaces where continuously available cooling is required for critical Facility operations as determined by the Authority. Electrical and Communication Rooms will not share the same cooling equipment. Where chilled water fan-coil units are used to serve Electrical or Communication Rooms, include reasonable means to shield any electrical equipment and to redirect and drain piping leaks away from the electrical equipment, including future electrical equipment in the same space.

7.5.10.1(22) If terminal units for spaces listed in Section 7.5.10.1(21) require pressurized pipes containing liquid of any kind, design the system to minimize the risk of leakage and provide leak detection systems integrated with the BMS.

7.5.10.1(23) Provide minimum three (3) sets each of heating and chilled water risers and minimum two (2) steam risers through the Facility. For inpatient floors, provide a minimum of two (2) risers and loop all services on each floor. Interconnect the risers on each floor with isolation valves. Arrange the piping and provide sufficient isolation valves on risers and interconnecting pipes such that portions of the risers may be isolated to facilitate repair or future renovations, while not impacting operation of occupied areas.

7.5.10.1(24) Where glycol snow melt equipment including pumps and heat exchangers is installed at parking levels, install the equipment in a room. Provide a glycol snow melt system with 100% redundant source components for the following:

7.5.10.1(24)(a) All underground parking exterior vehicle ramps;

7.5.10.1(24)(b) Ambulance drive aisle;

7.5.10.1(24)(c) External Ambulance Canopy/Vehicle Bay; and

7.5.10.1(24)(d) Public and Hospital Transfer Vehicle drive aisles at drop off areas including sidewalk areas between vehicles and entrance doors.

7.5.10.1(25) Provide cooling for the Cyclotron:

7.5.10.1(25)(a) The Cyclotron will be complete with a packaged cooling system (skid mounted) supplied by the Cyclotron vendor complete with DI water cooling. Provide a dedicated secondary chilled water loop for indirectly cooling the Cyclotron and beam magnets primary DI cooling circuit through a packaged heat exchanger; and

7.5.10.1(25)(b) Provide a domestic water-cooling system to serve as backup to the chilled water loop noted above.

7.5.10.1(26) Similar to the Cyclotron, provide a domestic water-cooling system to serve as back to the chilled water loop for the Linear Accelerators. The back up system will be as described under Section 7.5.10.1(16).

7.5.10.1(27) Account for heat gain to spaces from equipment including freezers, refrigerators and sterilizers (user side and service room) and provide air supply and cooling accordingly. Exhaust the sterilizer/autoclave service room to ensure that the room will be negatively pressurized relative to the adjacent clean spaces. Avoid use of supplemental recirculating air conditioners, with the exception of spaces noted above for medical imaging equipment, Electrical Room and Telecommunications Rooms.

7.5.10.2 Performance Criteria

7.5.10.2(1) Install piping in an orderly manner aligned with structural elements and at right angles. Slope piping to permit complete drainage of the system. Make allowances in all pipe sizing to provide flexibility for Future Expansion.

7.5.10.2(2) Weld components, products and fabrication techniques will be provided in compliance with Regulations and Requirements of Province of British Columbia “Power Engineers Boiler and Pressure Vessel Safety Act and Regulations”.

7.5.10.2(3) Weld installation, repair or alternations to pressure piping systems will be performed by licensed welders, certified for work in accordance with Regulations and Requirements of Province of British Columbia “Power Engineers Boiler and Pressure Vessel Safety Act and Regulations”.

7.5.10.2(4) Field welding to be in accordance with procedures of CSA-W117.2 and current edition of ASME/ANSI B31.1 Code.

7.5.10.2(5) Welding personnel contractor will have trade qualifications to ITA BC or equal with the appropriate supervision requirements.

7.5.10.2(6) Weld Testing Requirements: Perform Radiographic testing of a random 10% (in consultation with the Authority) of the welds in hydronic and steam piping systems. Testing is to be done by a specialist qualified in accordance with CSA W178.1 and CSA W178.2 and approved by the Authority. Testing is to be done to the requirements of governing authorities. In the event of weld rejection, the Authority has the right to insist on further 10% testing of joints at the Design-Builder's cost. Any further failures will result in 100% of the welds being tested. Repairs will also be at the Design-Builder's cost.

7.5.10.2(7) Examination of Flanged Joints: At the Authority’s discretion, a random check of 10% of bolted flanged connections will be made to verify that flanged connections are properly mated with no shear force acting on bolts as well as bolt torque verification. Supply all labour to disconnect and reconnect the selected flanged joints. If improperly mated joints are found, remove, and reinstall the affected piping so that the flanges mate properly. If improperly mated joints are found, additional 10% of joints will be checked, and the Design-Builder will be responsible for the repair of any other improper joints discovered.

7.5.10.2(8) Examination of Pipe Grooves: At the Authority’s discretion, a random check of up to (10%) of the grooves may be done to verify proper groove depth and profile to manufacturer specification for the pipe material being grooved. If improperly grooved joints are found, additional 10% of joints will be checked, and the Design-Builder will be responsible for the repair of any other improper joints discovered.

7.5.10.2(9) Install equipment and piping with adequate service space, access panels and the ability to remove equipment for servicing or

replacement. Locate services that require access for regular maintenance above non-critical spaces, such as corridors, to minimize or eliminate disruptions to the delivery of health care services. Coordinate placement of ceiling devices to ensure sufficient access to ceiling spaces.

7.5.10.2(10) Equip all high points in piping with air removal devices such as air collection chambers and air vents. Do not locate automatic air vents above the ceilings of occupied spaces.

7.5.10.2(11) Provide isolation valves, grooved couplings or unions, and bypass piping to allow for equipment isolation and removal without unduly affecting the system operation or major drain down.

7.5.10.2(12) Provide pressure independent balancing control valves (or manual balance valves on non-variable flow hydronic systems), flow-measuring devices, and temperature and pressure sensors throughout the system to facilitate system balancing. Where possible pressure independent balancing control valves (or manual balance valves on non-variable flow hydronic systems), will be of same manufacture as the large diameter balance and control valves unless a valve is not manufactured as part of their offering.

7.5.10.2(13) Ensure all piping is accessible. No in-slab or under-slab piping is permitted except for snow melt systems in Section 7.5.10.1(24) and as indicated in Section 5.12.8.4.

7.5.10.2(14) Room return air in specific spaces indicated in CSA Z317.2 will not recirculate within the terminal units serving the space.

7.5.10.2(15) Any ventilation and/or radiant heating sources serving Type I and Type II areas will be connected to the Facility’s emergency power supply.

7.5.10.2(16) Insulate all chilled water and condenser water piping, equipment and accessories in accordance with the most stringent of applicable Standards, including BCICA and ASHRAE 90.1 standards. Provide a canvas or PVC service jacket on all exposed piping inside; exterior piping will have aluminum jacketing. Provide PVC jacketing for services in underground parking areas.

7.5.10.2(17) Chilled water and heating water piping will be Schedule 40 Steel 12” and below and standard wall 14” and above, or schedule 10 type 304 stainless steel for heating and chilled water applications or Type K copper. Open loop Condenser water piping will be schedule 40 in all sizes. Copper piping in heating and chilled

applications will be limited to short run outs and coil connections will be soldered with lead free or 95/5 solder.

7.5.10.2(18) Utilize threaded fittings for 50 mm piping and smaller. Minimize the use of threaded fittings in favour of the other acceptable joining methods, wherever possible. Utilize welded long radius fittings for 65 mm piping and larger for steel piping or as indicated in Section 7.5.10.2(19).

7.5.10.2(19) Victaulic mechanical/grooved joint for piping 12 mm (1/2") and larger can be used in all hydronic applications as per Section 7.1.2.15(13).

7.5.10.2(20) CFC and HCFC based refrigerants will not be used in the refrigeration equipment.

7.5.11 Ventilation

7.5.11.1 Basic Requirements

7.5.11.1(1) Provide all necessary ventilation for all spaces to comply with the Standards referenced in Section 2.4, including CSA Z8000 and CSA Z317.2. Submit calculations for review by the Authority. Include SMACNA recommended duct leakage rates for sizing air systems. The following spaces will be provided with ventilation which exceeds the CSA Z317.2:

7.5.11.1(1)(a) Procedure Room - Fluoro and Imaging Room - Multipurpose IR will be designed for 15 AC/hr;

7.5.11.1(1)(b) All Exam Rooms and Exam/Treatment Rooms throughout the Facility will be designed for 9 AC/hr; and

7.5.11.1(1)(c) Procedure Room – General and Procedure Room - Endoscopic will be designed for 20 AC/hr.

7.5.11.1(2) Design the air handling equipment including ductwork for the Facility to provide 100% outdoor air capability at all times of the year including heating and cooling season design days with no reduction in room air change rates. For sizing the Facility central heating and cooling plants, when operating in 100% outdoor air mode the IPU patient rooms may use 4 instead of 6 air changes per hour as permitted by CSA. Requirement for 100% outside air includes normal day to day operation, operation during fire mode smoke control sequences, an internal catastrophic event, and high VOC or NOx. Although the Authority may choose to operate the ventilation system in partial recirculation mode, the energy model targets will be based on using 100% outside air. In addition, with regards to AHU's structure, zoning and ductwork

network, and control strategy, Design-Builder will be required to achieve, at a minimum the following requirements:

7.5.11.1(2)(a) Compliance with BCBC Division B, Part 3, clauses such as 3.3.3.5, 3.3.3.6, 3.3.3.7 and clause 3.1.8.7;

7.5.11.1(2)(b) Compliance with CSA Z317.2 applicable clauses concerning smoke control management; and

7.5.11.1(2)(c) In addition to BCBC Division B, Part 3, clause 3.3.3.5, provide all these areas (similarly to areas covered by clauses 3.3.3.6 and 3.3.3.7) with a mechanical supply air so that during a period of two (2) hours, after the start of a fire in another space, compartments will not contain more than 1% by volume of contaminated air from the fire area.

7.5.11.1(3) The Meeting and Education spaces (Group Room, Computer Training Room, associated meeting rooms). Administration spaces, meeting spaces, and Energy Centre ventilation systems may be designed to ASHRAE Standard 170 for Healthcare Facilities provided these spaces are not served from a common ventilation system serving the Facility.

7.5.11.1(4) Design all Operating Rooms and Procedure Rooms in the Perioperative Component to support invasive procedures in accordance with applicable CSA Z317.2 guidelines.

7.5.11.1(5) In addition to the requirements of CSA Z317.2, design the ventilation systems such that all areas designated as Outbreak Control Zones can operate to mitigate the spread of infections during an outbreak. The ventilation system will be:

7.5.11.1(5)(a) Easily converted by the Facility operator into a negative pressure condition with respect to adjacent floor areas by proportionally changing the supply, return, and exhaust air ratio for all rooms within the zone;

7.5.11.1(5)(b) Programmed into the BMS system with the required settings such that the Outbreak Control Zone settings for each zone can be implemented with a single command;

7.5.11.1(5)(c) Easily configured to ensure that no airborne infection can be re-circulated into any ventilation system from any Outbreak Control Zone. HVAC system will be able to maintain CSA Z317.2 Table 1 requirements while in outbreak control mode;

7.5.11.1(5)(d) Commissioned, balanced and demonstrated to the Authority in real time as part of the verification process prior to Substantial Completion. Refer to Section 5.5.6.1 for additional requirements;

7.5.11.1(5)(e) Sized to accommodate the spaces operating as Outbreak Control Zones simultaneously as described in Section 5.14.1.8;

7.5.11.1(5)(f) The OCZ anterooms will be designed to be open during normal operation and will be treated as circulation corridors according to CSA Z317.2 Table 1. When an OCZ is changed from normal operation to outbreak control mode, the anteroom doors will be closed, and a differential pressure monitor/ alarm will be engaged to monitor pressure difference from non-OCZ corridor to anteroom to OCZ corridor; and

7.5.11.1(5)(g) Design the OCZ to attain air separation based on pressure difference. Pressures will cascade from non-OCZ corridor to anteroom to OCZ corridor. Provide air flow from outside the OCZ into the OCZ with the anteroom providing a staging area for staff to don and doff PPE without being exposed to the OCZ.

7.5.11.1(6) Provide HVAC systems that maintain appropriate pressure relationships between various areas of the Facility and provide necessary outdoor air quantity, air filtration, cleansing and exhaust to control the transmission of infection. Refer to applicable infection control standards and CSA Z317.2 for the relative pressurization and other minimum indoor air quality requirements for the Facility. Where Staff are situated behind a transaction window, ensure directional airflow from the Staff side to the Patient/visitor side.

7.5.11.1(7) Provide HVAC systems with adequate backup capacity and equipment redundancy to ensure continuous Facility operations at all times.

7.5.11.1(8) Ventilate compartments containing inpatients, areas of refuge and Contained Use Areas (where applicable) as per Part 3 of the BCBC. Ventilate the Facility to also comply with the additional requirements for high buildings as per Part 3 of the BCBC. Arrange duct shafts and duct mains to minimize or eliminate use of fire wrap on ducts. Refer to Section 5.10.

7.5.11.1(9) Provide air handling units with sectional coils and manual isolation valves that will enable isolation and repairs to the damaged sections of coils without stoppage of the system. Provide air handling units with freeze/burst proof switchover coils.

7.5.11.1(10) The Design and Construction of the Facility will comply with the requirements of CSA Z317.2 for a Class A-2 HCF (Healthcare Facility), except as follows:

7.5.11.1(10)(a) Air handling systems (supply, return, and exhaust) will be provided with sufficient redundancy such that in the event of a failure or scheduled shutdown of one (1) unit there will be no disruptions in Facility operation. CSA Type I spaces will maintain 100% redundancy. CSA Type II and III spaces will maintain 70% redundancy.

7.5.11.1(11) HVAC systems for Communications Rooms will condition the spaces to meet temperature and relative humidity requirements as per the most restrictive of ASHRAE 2015 Environmental Guidelines for Datacom Equipment, TIA-942-A-2012, Section 7.8.9.7(3), or the following:

7.5.11.1(11)(a) Temperature: 18-27 °C [64-81 °F] dry bulb;

7.5.11.1(11)(b) Maximum relative humidity: 60 %;

7.5.11.1(11)(c) Maximum dew point: 15 °C [59 °F];

7.5.11.1(11)(d) Maximum rate of temperature change: 5 °C [9 °F] per hour; and

7.5.11.1(11)(e) Pressure: positively pressurized.

7.5.11.1(12) Coordinate with electrical and IM/IT Equipment requirements to determine the cooling loads in Communications Rooms.

7.5.11.1(13) For clusters of Airborne Isolation Rooms, inpatient units and floors for infection control, provide dampers of sufficient quality to ensure minimal leakage of airflow. Provide pressure sensors and end switches for dampers to ensure isolation has been achieved.

7.5.11.1(14) Provide air filtration in accordance with all applicable standards. Provide a minimum filtration level of MERV 10 on all air handling units, fan-coil units and water-to-air heat pumps. Ensure all HVAC systems will perform such that any indoor Contaminants are maintained at less than 50% of their occupational exposure limits (OELs).

7.5.11.1(15) Provide dedicated supply air with HEPA filters for spaces as required by applicable standards. In addition, air supplied to the clean side of the MDR, operating rooms and procedure rooms will be HEPA filtered at the associated air supply distribution. HEPA filters will be located within a mechanical service space and will not require maintenance access from the spaces served by the HEPA filtered air.

7.5.11.1(16) Where HEPA filters are installed, provide all required ports and connections for dispersed oil particulate (DOP) scan testing. For testing the HEPA filters for the clean rooms, provide a remote aerosol injection port in a nearby ISO 8 space to minimize disruption to the clean rooms.

7.5.11.1(17) Provide the ventilation system and all components in accordance with all applicable standards, including ASHRAE and CSA standards.

7.5.11.1(18) Provide fans with Variable Frequency Drives (VFDs) for energy savings under part-load conditions. Select motor starters in accordance with Section 7.7.7.2(7). Motor loads of 100 hp or greater will be provided with reduced voltage motor starter acceptable to BCH.

7.5.11.1(19) Provide a heat recovery system with heat recovery hydronic coils on all Facility exhaust and relief air systems except highly contaminated exhaust. Chilled water heat extraction coils, protected by filters, will be selected for minimum 15°F water side temperature differential to minimize pumping power. Each heat recovery coil will be selected to extract both sensible and latent heat to 48°F WB. Heat recovery systems will include a bypass for heat recovery coils and air filters for use when there is no demand for heat to prevent inefficient fan use. In addition to bypass motorized dampers, provide motorized isolation dampers upstream and downstream of the heat recovery coils for servicing purposes, to ensure that servicing personnel are not exposed to exhaust stream during maintenance/servicing. Where heat recovery coils are part of exhaust systems serving Outbreak Control Zones, provide means of additional controls/ monitoring to be able to control sensible cooling only during outbreak operation.

7.5.11.1(19)(a) All heat recovery coils on Air Handling Unit relief air will be sized for air handling unit maximum air flow to enable maximum heat recovery during 100% outside air (normal) operation. The intent is to operate in 100% outside air mode whenever possible to promote over ventilation and improved

indoor air quality without reducing heat recovery capacity.

7.5.11.1(19)(b) Heat recovery coils are not required on exhaust or relief air from underground parking areas and mechanical spaces.

7.5.11.1(19)(c) Heat recovery coils are not required in exhaust or relief air streams where the flow rate is under 710L/s (1500CFM).

7.5.11.1(20) Provide enthalpy recovery wheels complete with bypass as an integral component of all major AHUs serving the CH and CC. Relief air heat recovery coils are not required in AHUs that have enthalpy recovery equipment as described in Section 7.5.11.1(20). Heat recovery coils only need to be sized up to a maximum of the available heat recovery chiller plant capacity. Configure supply and exhaust fans to minimize cross-contamination between the exhaust air and outside air streams. All contaminated exhaust including radioactive, fume hoods, MDR soiled area, and ED area will not undergo energy recovery. Enthalpy recovery equipment may consist of the following:

7.5.11.1(20)(a) An enthalpy type wheel for both sensible and latent heat recovery. Energy recovery device will transfer moisture entirely in the vapour phase. Desiccant will be silica gel for maximum latent energy transfer. Include purge section and variable speed motor to control heat recovery effectiveness. Effectiveness will be minimum 70% sensible effectiveness and minimum 40% latent effectiveness. Energy transfer ratings will be AHRI Certified to Standard 1060 and bear the AHRI certification symbol for AHRI Air-to-Air Energy Recovery Ventilation Equipment Certification Program. Cross leakage will be less than 2% at 250Pa pressure differential; and

7.5.11.1(20)(b) A Flat plate, cross flow heat exchanger will be made of alternating layers of corrugated aluminum and RC134 polymeric bactericidal desiccant impregnated media and meet NFPA 90A and NFPA 90B requirements under UL Standard 723. The hydroscopic polymer will exchange water by direct vapor transfer without the need for condensation. The enthalpy plate will be capable of withstanding 1,250 Pa pressure differentials without permanent deformation or decrease in performance. Effectiveness will be minimum 70% sensible effectiveness and minimum 40% latent

effectiveness. Energy recovery performance for component will be rated in accordance with AHRI Standard 1060 and certified to AHRI. Heat exchanger will be tested in accordance with ASHRAE 84. Cross leakage will be less than 1%.

7.5.11.1(21) Provide factory-fabricated air handling equipment to ensure the highest construction standard. The controls contractor will provide the associated monitoring and controls for connection to the BMS.

7.5.11.1(21)(a) Air handling units will have double-walled construction with minimum 50 mm thick insulation, galvanized steel exterior, stainless steel or painted aluminum interior.

7.5.11.1(21)(b) Air handling unit floors will be reinforced minimum 3 mm aluminum or 14 ga stainless steel checker plate with continuously welded seams. Base will be structural steel minimum 150 mm C-channel around perimeter.

7.5.11.1(21)(c) Interior surfaces of air handling units will be light in colour, washable, smooth, non-porous and free of obstructions that may impede airflow or the ability to thoroughly clean the unit.

7.5.11.1(21)(d) There will be no standing water in air handling units. Install leak-proof drain pans with continuously welded seams and corners. Drain pans will be 16 ga type 304 stainless steel, double sloped to drain. Drain size minimum 32 mm (1-1/4”).

7.5.11.1(21)(e) The air handling unit will have a 40 mm perimeter collar around the entire unit and around each floor opening to ensure the unit is internally watertight. Each section of the air handling unit will have a capped and threaded drain connection.

7.5.11.1(21)(f) Provide air filters to comply with CSA Z317.2 and Section 7.5.11.1(14). Electronic air filters are not acceptable.

7.5.11.1(21)(g) For air handling units that require HEPA air filtration, provide conventional HEPA final filters.

7.5.11.1(21)(h) In addition to the air filtration noted above and required by CSA Z317.2, provide air handling units with a 100 mm carbon filter rack and filters. Carbon filters will not shed dust and in turn will require no

post-filter. Carbon filter pressure drop will not exceed 125Pa at 2 m/s.

7.5.11.1(21)(i) Provide pressure sensors and pressure switches to monitor and shut-off fans in over-pressure conditions to prevent damage to air handler casings or ductwork.

7.5.11.1(21)(j) Air handling units to be constructed for 100% outside air for normal operation as noted above. Units to have provision for 100% recirculation operation to comply with CSA Z317.2 for external catastrophic event operation.

7.5.11.1(22) For medical and technical gas storage rooms, provide ventilation systems in compliance with the most stringent requirements of the BC Fire Code, CSA Z7396.1, NFPA-99, and Fraser Health Authority Chemical Storage Design Requirements.

7.5.11.1(23) Provide an exhaust air system suitable for the Laboratory requirements and any other special venting requirements as per CSA standards. These systems will be interlocked through the BMS, with the supply air systems. If system serves more than one (1) piece of equipment, provide N+1 redundancy in fans. Laboratory ventilation systems will supply sufficient make-up air for exhaust systems to maintain required pressurization.

7.5.11.1(24) Provide Vandal Resistant and Ligature Resistant HVAC equipment and devices in Consult Room – ED, Secure Room, and Anteroom – Secure Room.

7.5.11.1(25) Provide dedicated room temperature control for the Secure Room. The temperature controller is to be installed outside of the Secure Room for control by Staff.

7.5.11.1(26) AIR rooms will be designed to function as typical Patient rooms when not in use for airborne isolation. Provide heat recovery for all AIR exhaust systems.

7.5.11.1(27) The ventilation system will be designed to isolate a cluster of Inpatient pods and convert them to an Outbreak Control Zone should an internal or external pandemic and/or disaster occur; refer to Section 5.14.1.8.

7.5.11.1(28) All spaces designated as infectious control or isolation will be connected to emergency power for ventilation and pressurization control.

7.5.11.1(29) CSA Type I spaces will have separate supply, return, and exhaust systems from CSA Type II and CSA Type III spaces.

Where a zone is predominately Type II and/or Type III, with a small percentage of isolated Type I spaces within it, the supply may be combined. Return and/or exhaust sharing is dependent on space uses and whether or not recirculation is permitted, per CSA Z317.2. Where a Component or Sub-Component contains 50% or more Type I spaces by net area, the entire Component or Sub-Component will be served by dedicated AHU(s) serving Type I areas/spaces.

7.5.11.1(30) Provide HEPA filters on Facility exhaust air systems as required by CSA Z317.2 only if required for the following spaces: Airborne Isolation Rooms (AIR's), Decontamination Room, Outbreak Control Zones, and other critical spaces as determined by the Authority to be highly contaminated and unsuitable for direct exhaust to the outdoors. That is, terminate the exhaust in a manner to avoid triggering the need for HEPA filtration. HEPA filters for Outbreak Control Zone exhaust systems can be omitted provided the Design-Builder adequately demonstrates to the Authority, the mitigation of contaminated air re-entrainment in the Facility.

7.5.11.1(31) Ventilation, cooling, and heating for Commercial Opportunity and Retail spaces, including make-up air and NFPA-96 commercial exhaust hoods, will be provided by future tenants during their TI fit outs. Cooling and heating for these spaces will be electrically driven with no supply of natural gas, chilled water, or heating water from the Facility. Provide exterior exhaust and air intake louvers and unobstructed ceiling space to accommodate the installation of tenant equipment and ductwork. Allocate suitable nearby roof areas for the installation of tenant condensing units.

7.5.11.1(32) Provide all ventilation for kitchen equipment and for other Equipment as required by Appendix 1I [Food Services Equipment List] and Appendix 1H [Equipment and Furniture], including VAV NFPA exhaust hoods for the cooking equipment and condensate canopies over the dishwashers.

7.5.11.1(33) Provide ventilation and mechanical cooling systems for the Electrical Room(s) within the Energy Centre.

7.5.11.1(34) Apply CSA-Z317.2 and ASHRAE Standard 170 for space pressurization and minimum air change rates. If the standards differ apply the most stringent requirement.

7.5.11.1(34)(a) Provide minimum of two (2) air changes per hour of outdoor air to ventilate Mechanical and Electrical spaces. Air condition mechanical rooms as the waste heat can be recovered to offset heating loads. Air condition Electrical spaces as described

in this Schedule. Air change calculations for spaces without ceilings is to be based on occupiable area (2300 mm occupiable height).

7.5.11.1(34)(b) The Procedure Room-General will be considered equivalent to the General Minor Surgical Procedure function as listed in Table 1 of CSA Z317.2 with a minimum of five (5) outdoor air changes and 15 total air changes.

7.5.11.1(35) Ductwork velocity not to exceed 1500 feet per minute. For future flexibility, allowance will be made up to 1800 fpm to accommodate future air handling growth. Air handling units will also have static requirements built in to accommodate increase. Design-Builder will provide an air balancing report confirming this requirement has been met.

7.5.11.1(36) Ventilation for Grease Trap Truck parking area

7.5.11.1(36)(a) Provide ventilation for Grease Trap Truck servicing area to ensure odours are not entrained in the following:

7.5.11.1.36.(a).1 Facility air intakes;
7.5.11.1.36.(a).2 Operable windows;
7.5.11.1.36.(a).3 Any other Facility opening; and
7.5.11.1.36.(a).4 Openings in adjacent buildings.

7.5.11.1(36)(b) If the Grease Trap Truck parking space for clean out is located underground near the Loading Dock, provide a full, secure enclosure accessible by the Authority through access gates, with dedicated exhaust so that foul odours do not enter the Facility.

7.5.11.1(37) Provide ventilation for smudging as follows:

7.5.11.1(37)(a) The Design will accommodate smudging ceremonies in all Patient Room spaces within Component B Inpatient Unit as described in Appendix 1A [Clinical Specifications and Functional Space Requirements]. At each Care Team Station, provide a call button for use when smudging is requested. A signal will be sent to the BMS to indicate a call for smudging. The Facility operator will have the option of setting the associated ventilation system to 100% outside air (if not already running at 100% outside air) while smudging is underway.

7.5.11.1(37)(b) For rooms where smudging is likely to occur on a more regular basis including Viewing Room in the Morgue, Sacred Space and Gathering Area, provide a dedicated exhaust system for use during smudging and for a period of time after the smudge has ended to ensure that the room has been purged of smoke. When these rooms are being used for smudging, the air will not be returned to the central HVAC system. When the rooms are not being used for smudging, the air supplied may be returned. The rooms will be negatively pressurized relative to the rest of the Facility.

7.5.11.1(38) Ventilation systems serving Pharmacy spaces will be designed to comply with the most current version of USP 797 Model Standards for Pharmacy Compounding of Non-Hazardous Sterile Preparations and NAPRA guidelines. Ventilation systems serving Oncology Pharmacy spaces will be designed to comply with the most current version of USP 800 Hazardous Drugs – Handling in Healthcare Settings and NAPRA guidelines. Relative humidity will be controlled between 35% to 60% for the various spaces and their associated temperatures indicated in NAPRA guidelines and USP797/800 standards. For IV Staging & Prep/Checking Room and corridor leading to this room, maintain ISO 8 air quality as a minimum. Where a conflict exists between the standards, the most stringent will govern. Provide all required testing and certification for the Pharmacy and Oncology Pharmacy HVAC systems. Provide cleanroom air terminals with air filter access from the ceiling space or provide air terminals matching those used for ORs as per Section 6.11.6. Filters will not be accessed from the room side.

7.5.11.1(39) Provide ventilation for the Frozen Section Room and Storage-Cryogen-Biomed. The rooms will also incorporate an audible and visual oxygen deprivation alarm with the display mounted outside the room to warn users not to enter should the oxygen level be inadequate. Each FM Service elevator lobby, along the vertical route of travel to the rooms, requires the same monitoring/annunciation equipment; link the BMS to all alarms. Comply with WorkSafe BC regulations for spaces that may experience oxygen deficiency.

7.5.11.1(40) Provide ventilation, such as supply, exhaust, close capture systems (such as dust collectors, exhaust hoods, etc.) and make-up air, as required, for the FMO/AM workshops to suit woodworking, spray painting, solvent tanks, flammable paint storages, acetylene torch cutting and brazing and welding, and other similar processes driven by operation and equipment

indicated in Appendix 1H [Equipment and Furniture] and Appendix 1A [Clinical Specifications and Functional Space Requirements]. Comply with WorkSafe BC Regulations and guidelines.

7.5.11.1(40)(a) The design will accommodate 4 workers using the dust control system at the same time.

7.5.11.1(40)(b) Mechanical systems will enable work on the following types of materials used in Workshop-Carpentry; wood, plastic, aluminum, stainless steel, glue, paint, and stains. Provide the dust collector for Workshop-Carpentry in a room separate from the workshop. Provide recirculating fan-filter units in a quantity suitable for the workshop area and include local start/stop request switch for BMS activation.

7.5.11.1(40)(c) Acetylene torch usage will occur in the Workshop-Metal/Welding/Plumbing and Workshop-Main. Provide a close capture exhaust system at one work bench as minimum in Workshop-Main. Provide multiple close capture exhaust hoods on articulating arms to suit the number of welding stations and the plasma cutter in Workshop-Metal/Welding/Plumbing in addition to the room general exhaust system. Mount articulating arms at a height so as to not interfere with workflow or cause safety issues, while being accessible for a worker to position the exhaust hood while standing on the floor.

7.5.11.1(40)(d) Provide a close capture exhaust hood on an articulating arm for soldering in Workshop-Electrical.

7.5.11.1(41) Provide ventilation, such as supply, exhaust, close capture systems (such as dust collectors, exhaust hoods, etc.) and make-up air, as required, for the Radiation Therapy Workrooms and Machine Shop to suit woodworking, spray painting, solvent tanks, flammable paint storages, soldering, acetylene torch cutting and brazing and welding, 3D printing, and other similar processes driven by operation and equipment indicated in Appendix 1H [Equipment and Furniture] and Appendix 1A [Clinical Specifications and Functional Space Requirements]. Provide a close capture exhaust system for the metal melting and plaster forming areas.

7.5.11.1(42) Ventilation systems for MRI suites will meet applicable standards and MRI Equipment manufacturer’s requirements. Provide non-

ferrous materials for the systems including ducts, diffusers, grilles, heating and cooling pipes and hangers.

7.5.11.1(43) Provide all mechanical services required for the MRI suite including ventilation systems, pressure relief and cryogen vent pipes. Refer to Section 5.1.3 for additional requirements.

7.5.11.1(44) Provide ventilation including humidity control from rooms with a whirlpool and hydrotherapy rooms (where applicable).

7.5.11.1(45) In addition to providing ventilation systems for the MDR and for the Satellite MDR to meet CSA Z317.2 requirements, provide a stainless steel bench style exhaust system for each utility/process sink. The exhaust inlet will extend the entire width of the sink. Provide condensate canopies at sterilizing Equipment including autoclaves and cart washer. Arrange the return and exhaust points as applicable such that they assist with removal of both sensible and latent heat from the various sterilizing Equipment.

7.5.11.1(46) Provide a stainless steel bench style exhaust system for each utility/process sink for the Urinalysis Area located in the Chemistry Lab. The exhaust inlet will extend the entire width of each sink.

7.5.11.1(47) Provide means of monitoring pressure differential between MDR and OR's relative to MDR elevator shaft. Ensure that the ventilation system is designed to maintain positive pressurization of MDR and OR's relative to MDR elevator shaft. MDR elevator shaft will be negatively pressurized by providing means of exhaust from MDR elevator shaft.

7.5.11.1(48) For patients requiring airborne precautions, provide procedure and surgical rooms and associated anteroom with air change rate and relative pressurization to meet CSA Z317.2 requirements.

7.5.11.1(49) Provide ventilation for the Cyclotron and for the radiation treatment vaults.

7.5.11.1(49)(a) Provide dedicated air handling units in an N+1 arrangement to serve the Cyclotron, each AHU may be sized for more than 50% of required capacity. Air handling units will be equipped with HEPA filters and will comply with Section 7.5.11.1(21). The ventilation system for the Cyclotron will be installed in a mechanical room over the Cyclotron area including nuclear exhaust filters. The ceiling over the Cyclotron area will contain minimal mechanical equipment in order to have service and replacement space for the Cyclotron equipment.

7.5.11.1(49)(b) Provide ceiling mounted ULPA fan-filter units to serve the Clean Rooms (housing Hot cells).

7.5.11.1(49)(c) Provide all ISO classified rooms and cGMP area with room differential pressure differential sensors and HMI(s). Refer to Section 7.6.3.21 for further requirements.

7.5.11.1(49)(d) Provide each space/room within the Cyclotron production area with dedicated supply and/or exhaust air valves as applicable. Each space/room will be an independent thermal and pressure zone.

7.5.11.1(49)(e) Provide the Cyclotron Area with venturi style air valves.

7.5.11.1(49)(f) Pass throughs within the Cyclotron Lab Production area will be ventilated.

7.5.11.1(49)(g) Refer to Design Guide GD 52 from CNSC for further requirements.

7.5.11.1(49)(h) As appropriate for a Class II Nuclear Facility which has a research and production component.

7.5.11.1(50) Provide ventilation for the CC that complies with CSA Z317.2 and Z8000.

7.5.11.1(51) Provide an oxygen sensor with local visual and audible alarm and alarming at the BMS for the following space:

7.5.11.1(51)(a) M1.10 Storage-Chemical

7.5.11.1(52) Provide a hydrogen sensor with local visual and audible alarm and alarming at the BMS for the following spaces:

7.5.11.1(52)(a) M1.33 Cyclotron Vault

7.5.11.1(52)(b) M1.22 Quality Control Room – Clean Rooms

7.5.11.1(52)(c) M1.23 Quality Control Room - Small Clean Room

7.5.11.1(52)(d) M1.39 Technical Area

7.5.11.1(53) Ventilation ductwork for surgical suites and serving those areas of Component M. Functional Imaging as set out in Section 5.1.2.8(2) will be installed in the mechanical room or interstitial floor directly above the surgical suites and Component M. Functional Imaging. Ventilation ductwork includes VAV boxes, associated heating pipes for reheat coils and any required filters.

Refer also to Section 7.4.2.24 for the location of related plumbing distribution.

7.5.11.1(54) Similar to the surgical suites, provide access from below the MDR for accessing services including plumbing and ventilation equipment that might be installed below. Provide service access to maintain all MDR services without having to enter the ceiling space of the clinical areas.

7.5.11.2 Performance Criteria

7.5.11.2(1) Incorporate a strategy to allow the installation and removal of major HVAC equipment such as fans without disrupting Facility operations.

7.5.11.2(2) Consolidate the location of fans, common filters (e.g. HEPA), and other Equipment in mechanical rooms. Allow for adequate clearance for service access. Do not place this Equipment in confined spaces and prevent small doors and hatch access.

7.5.11.2(3) Provide bag in – bag out HEPA filters with bubble tight dampers as per CSA Z317.2 and N+1 redundancy for exhaust systems serving Airborne Isolation Rooms, their associated washrooms and Outbreak Control Zones. Refer to Section 7.5.11.1(30). Filter system to be located in readily accessible locations and be designed such that filters can be replaced without impacting the operation of the rooms served by the system.

7.5.11.2(4) All supply air, return air and general exhaust air systems will be located in interior mechanical rooms free from exposure to the elements.

7.5.11.2(5) Where unavoidable, Equipment for supply air, return air and general exhaust systems may be located exterior to the Facility provided it is designed and constructed to withstand exposure to outdoor conditions and concealed with an architectural screen. Refer to Section 7.1.27.

7.5.11.2(6) Make allowances in supply, return and exhaust duct sizing and Equipment selections to provide flexibility for future changes in spaces. Allow for a future increase in capacity of duct mains and the capability of the air handling units in accordance with the requirements set out in Section 7.1 Mechanical Systems Design Principles.

7.5.11.2(7) Provide fresh air intakes, cooling coil drain pans, air handling units, ductwork, and all other interconnected components to prevent moisture or Contaminants from collecting within the system. Provide sufficient access panels to allow for inspection and cleaning. Do not use duct mounted humidifiers except for

spaces with an upper relative humidity limit exceeding 60% as indicated in CSA Z317.2.

7.5.11.2(8) Locate fresh air intakes so as not to entrain Contaminants from outdoor sources, including existing exhaust points of adjacent buildings, Facility exhaust points, loading dock, the railway and parking areas.

7.5.11.2(9) Fresh air intakes will be located such that they are not accessible or adjacent to public areas and are separated from exhaust air outlets. Ensure that fumes from the generator exhaust are not introduced into the Facility or adjacent buildings' fresh air intakes.

7.5.11.2(10) For the purpose of the third-party Dispersion Study Analysis and Report, utilize advanced calculations and/or modeling, such as wind tunnel analyses with scale models, computer simulations, or CFD analyses. The wind model will demonstrate the airflow effects around the Facility due to local wind conditions, establishing separation distances that will confirm that the location of Facility air intakes, pollutant sources, and exhaust design are designed per ASHRAE Handbooks (Chapter 24 of the 2021 ASHRAE Handbook — Fundamentals, Chapter 46 of the 2019 ASHRAE Handbook — HVAC Applications and CSA Z317.2). Pollutant sources include emergency generators, idling diesel trucks at the loading docks, and idling diesel ambulances at the Ambulance Bay. The model will evaluate all Site-specific conditions and variables, the proposed Design-Builder design and the normal operation, emergency smoke operation and post-disaster operation of the Facility. The model will fully evaluate the Facility and system design to satisfy the Authority that there are no adverse effects on the operation of the Facility.

7.5.11.2(11) Ensure all supply, return, and exhaust air is fully ducted to the space being served. Ceiling area will not be used as return air plenums. Door grilles are only permitted for non-medical storage and service rooms. Utilizing door undercuts or door leakage to transfer air for rooms with greater than 45 l/s (95 cfm) air change requirements not permitted.

7.5.11.2(12) Insulate all ductwork in accordance with applicable standards. Insulate all air exhaust ducts which are exposed to exterior from the connection to the exhaust Equipment up to termination point on roof or exterior walls. Provide canvas service jacket on all exposed ductwork insulation inside and up to 3 m AFF in mechanical rooms.

7.5.11.2(13) Provide seismic mitigation and building separation devices for all ductwork that crosses the Facility and/or Utility corridors.

7.5.11.2(14) No in-slab or under slab ductwork is permitted.

7.5.11.2(15) Refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] for a description of the different types of Airborne Isolation Rooms and their locations. Provide the following:

7.5.11.2(15)(a) For all Airborne Isolation Rooms (negatively pressurized), locate supply air diffusers and exhaust air grilles to reduce the exposure of uninfected occupants in the space. Utilize directional and dilution airflow principles: supply air from high-level non-aspirating diffusers located away from the Patient bed, and exhaust air from low-level grilles located next to the Patient's head. Provide differential pressure monitors at Airborne Isolation Rooms, as per CSA Z317.2, to monitor and to ensure proper pressurization has been achieved as required. Provide door contact switches for all differential pressure monitors to prevent nuisance alarming;

7.5.11.2(15)(b) For Airborne Isolation Rooms with an AIR Anteroom, provide the AIR Anteroom with both supply and exhaust air. Differential pressure monitors will measure pressure between the isolation room and adjacent corridor, between the Airborne Isolation Room and the AIR Anteroom, and between the AIR Anteroom and adjacent corridor;

7.5.11.2(16) Provide differential pressure monitors at smoke-controlled zones including areas of refuge. The monitors will:

7.5.11.2(16)(a) Be used to facilitate Commissioning; and

7.5.11.2(16)(b) Alarm if pressurization is not at set point when a differential is required.

7.5.11.2(17) Ensure all ductwork that provides humid air using duct-mounted humidifiers is constructed of welded stainless steel of a suitable alloy or of a material equally resilient to corrosion. Ensure all ducts are sloped to drain points and are accessible for inspection and cleaning.

7.5.12 Exhaust Systems

7.5.12.1 Basic Requirements

7.5.12.1(1) Design exhaust air discharges to ensure that there is no cross contamination with outdoor air intakes on the Site. In addition, terminate exhaust ducts away from transient areas and away form where any person would regularly be working.

7.5.12.1(2) Provide exhaust fans and locate them at the end of the exhaust ductwork systems. Ensure that the fans will be readily serviceable and are separated from spaces that contain other mechanical equipment. Provide welded pressure ductwork after isolation and other contaminated exhaust fans to the Facility exterior.

7.5.12.1(3) Integrate control of the exhaust systems with the ventilation supply air systems for spaces with differential pressure requirements from adjacent spaces.

7.5.12.1(4) Provide smoke removal exhaust systems to permit fire fighters to vent each floor area within the meaning of Part 3 of the BCBC.

7.5.12.1(5) Provide exhaust air systems suitable for special venting requirements as per CSA standards. Interlock these systems, through the BMS, with associated supply air systems. Provide an exhaust air system suitable for the laboratory requirements, surgery rooms, morgue and any other special venting requirements as per CSA standards or program specific requirements. These systems will be interlocked with the supply air systems.

7.5.12.1(6) Provide commercial-grade NFPA-96 exhaust hood systems where commercial cooking operations will occur. Make allowance within the base-building Facility design for the installation of future commercial exhaust hood systems; refer to Appendix 1I [Food Services Equipment List]. Interlock the hood(s) with a make-up air system, either by hard wiring or through BMS, to ensure proper pressurization within the Facility is maintained.

7.5.12.1(7) Provide/extend exhaust systems for the emergency generators as required. Refer to Section 5.4.2. Ensure exhaust termination points are located so combustion gases are not entrained in:

7.5.12.1(7)(a) Facility air intakes;

7.5.12.1(7)(b) Operable windows;

7.5.12.1(7)(c) Any other Facility opening; or

7.5.12.1(7)(d) Openings in adjacent buildings.

7.5.12.1(8) All exhaust systems will be on emergency power as required by CSA Z32 and accounted for in the emergency generator sizing without diversity.

7.5.12.1(9) Provide refrigerant detection and exhaust system in accordance with CSA B52.

7.5.12.1(10) Provide exhaust systems for enclosed parking areas controlled by carbon monoxide-monitors connected to BMS.

7.5.12.1(11) Make provisions in the Facility exterior building envelope, such that the Authority can easily install and connect portable negative pressurization ventilation units for future Facility renovations; refer to Section 5.1.1.2. These connection points will be available for use without adversely affecting the Facility envelope or health care operations. Provide sufficient connection points at the Facility exterior such that all internal areas can be served by negative pressurization ventilation units. For spaces that are below grade, install capped ducts at the ceiling of the spaces, run the ducts through a shaft to the nearest level with outside wall access, and terminate the ducts at the Facility exterior.

7.5.12.1(12) Provide exhaust for elevator machine rooms and/or elevator shafts as required to meet CSA B44, Technical Safety BC and elevator manufacturer requirements. Any required cooling for these spaces will be in addition to exhaust required by CSA B44, Technical Safety BC and elevator manufacturer requirements.

7.5.12.2 Performance Criteria

7.5.12.2(1) The following spaces will be provided with a dedicated exhaust system and 100% redundancy; refer to Appendix 1A [Clinical Specifications and Functional Space Requirements] for quantity and locations:

7.5.12.2(1)(a) Airborne Isolation Rooms,

7.5.12.2(1)(b) Airborne Isolation Rooms ensuite washrooms;

7.5.12.2(1)(c) Decontamination Room including associated spaces; and

7.5.12.2(1)(d) Chemical Storage Rooms.

7.5.12.2(2) Biosafety cabinets, laminar flow cabinets, fume hoods, grossing tables, specimen mounting tables, dissecting tables, and downdraft tables will be provided with dedicated exhaust systems that are appropriate for their CSA Class and Type. Provide canopies connected to the general exhaust system for ovens, autoclaves and other heat emitting Authority Equipment. Where multiple cabinets are tied into a common system, where permitted by Canadian Biosafety Standard, a 100% redundant central exhaust system will be provided. Specimen mounting tables and grossing tables will be equipped with countertop-level exhaust.

Provide a close capture exhaust arm for the Biomedical Equipment Cleaning Area and workbench areas. Review the Equipment summary located in Appendix 1H [Equipment and Furniture] and Appendix 1A [Clinical Specifications and Functional Space Requirements] to ensure that all Equipment, rough-in for Equipment and support systems have been accounted for and provided. Allow for ducting, Commissioning, testing, and balancing the exhaust from all biosafety cabinets, fume hoods, grossing workstations and laminar flow cabinets. Include face velocity, containment and any other testing for fume hoods as required by WorkSafe BC regulations. Refer to Section 6.1.1.8.

7.5.12.2(3) Provide vents to outdoors for flammable storage cabinets. Installation to meet BC Fire Code and WorkSafe BC regulations.

7.5.12.2(4) Fume hoods, other smoke/fume generating process booths/spaces, and Oncology Pharmacy Biosafety cabinets will be provided with dedicated exhaust systems that are corrosion/ chemical resistant to the exhaust media.

7.5.12.2(5) Provide dedicated exhaust systems as required for medical Equipment; refer to Appendix 1H [Equipment and Furniture]. Do not use portable systems.

7.5.12.2(6) Provide exhaust systems for the Cyclotron.

- 7.5.12.2(6)(a) All exhaust from the Cyclotron facility to be sent to high plume dilution exhaust fans located on the roof. Provide fans with N+1 redundancy.
- 7.5.12.2(6)(b) The exhaust system will be a manifolded system that collects from fume hoods, general exhaust air valves and exhaust from the hot cells, and other exhaust equipment/terminals.
- 7.5.12.2(6)(c) Fully weld all exhaust ductwork and fabricate from 316 stainless steel.
- 7.5.12.2(6)(d) Exhaust systems within the Facility will be under negative pressure.
- 7.5.12.2(6)(e) No fire dampers or combination smoke/fire dampers are permitted in the exhaust system.
- 7.5.12.2(6)(f) Exhaust from hot cells and the Cyclotron vault, including technical/equipment area serving the Cyclotron, will run through an N+1 Nuclear Filtration System (complete with radiation monitoring system)

prior to exhausting to a common exhaust manifold system.

7.5.12.2(6)(g) Provide a gas hold-up system, procured through the hot cells vendor. The system captures the release from the hot cells during a failure mode and holds the gas for the required decay time prior to releasing the gas to the manifold exhaust system.

7.5.12.2(6)(h) Coordinate installation of stack monitoring system and provide all required work/hardware for installation and tie in to Integrated Radiation Monitoring System listed in Appendix 1H [Equipment and Furniture] Attachment 2 Cancer Centre Equipment List.

7.5.12.2(6)(i) Refer to Design Guide GD 52 from CNSC for further requirements.

7.5.12.2(7) Ensure all ductwork that exhausts humid air at or near saturation is constructed of welded stainless steel of a suitable alloy or alternative as approved by the Authority. Ensure all ducts are sloped to drain points and are accessible for inspection and cleaning. Provide all recovery coils with drain pans and properly sloped drains.

7.5.13 Metering Requirements for Energy Measurement and Verification

7.5.13.1 Provide meters on all services connecting to the Facility from an external infrastructure including: domestic water and electrical services.

7.5.13.2 Provide all required meters, sensors, and trend logging Equipment at end uses within the Facility to meet the energy monitoring requirements set out in Schedule 5 [Energy Guarantee]. For additional funding pursue the incentive programs as per Section 7.1.21; refer also to Appendix 1P [Metering Matrix].

7.5.13.3 Connect all meters to the BMS to monitor, record, report and analyze energy consumption. Coordinate electrical metering and the energy management system with the applicable requirements noted in this Schedule.

7.5.13.4 Design metering intervals will be 15 minutes or less with all points trended and data logged for a minimum of 36 months for all points associated with LEED or energy model verification.

7.5.14 Sound Attenuation and Vibration Isolation

7.5.14.1 Design all mechanical systems to prevent sound and vibration transmission between spaces, to prevent transmission from mechanical equipment to the spaces, and to minimize sound and vibration transmission to the outside of the

Facility and Ancillary Buildings. Provide sound attenuation to limit sound levels in accordance with Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

7.5.14.2 All flexible rubber connections and isolators will have been manufactured no more than one (1) year prior to installation to ensure maximum design service life. Date of manufacture is to be clearly indicated on each device. Where possible, avoid the use of flexible rubber connections on mechanical piping equipment connections. Use roll grooved pipe flexible coupling system to manufacturer's requirements instead.

7.5.14.3 Systems will be provided with noise attenuation screening if the equipment or their exterior openings are located facing and within 200 m of residential areas.

7.5.14.4 Provide vibration isolation devices on all equipment with rotating components.

7.5.14.5 Ensure all suspended equipment utilize spring isolators designed for the weight and vibration characteristics of the equipment.

7.5.14.6 Provide flexible connections to isolate mechanical equipment sound and vibration from ducting, piping and electrical wiring systems.

7.5.14.7 Ensure duct silencers meet or exceed the requirements of the ductwork for cleanliness and inspection and comply with CSA standards for infection control.

7.5.14.8 Utilize fibre free internal insulation.

7.5.14.9 For structural vibration limits due to the operation of Facility mechanical and electrical systems; refer to Appendix 1D [Acoustic, Vibration, and Noise Control Measures]

7.5.14.10 Do not install volume dampers in close proximity to the air terminals, while meeting sound level requirements in Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

7.5.15 Testing, Adjusting, Balancing (TAB) and Commissioning (Cx)

7.5.15.1 Design-Builder will:

7.5.15.1(1) Perform TAB and Cx of all mechanical equipment and systems in accordance with the Standards referenced in Section 2.4 and procedures described in Section 5.5.6.1.

7.5.15.1(2) Demonstrate to the Authority that the mechanical and electrical systems are substantially operational by testing, adjusting, balancing, and Commissioning the systems. Demonstration to the Authority will include redundancy in the case of equipment failure and spare capacity.

7.5.15.1(3) Include in the TAB and Cx activities in Section 5.5.6.1, DOP testing of all HEPA filters by a third party certified testing agent complete with documentation indicating successful testing.

Coordinate site access and safety orientation with the testing agency.

7.5.15.1(4) Include in the TAB and Cx activities in Section 5.5.6.1, testing of the clean rooms (Cyclotron production areas and pharmacy areas). Include DOP testing of HEPA filters as noted above and room particle count.

7.5.16 Vibration Measurements

7.5.16.1 Perform vibration measurements when other building and outdoor vibration sources are at a minimum level and will not influence measurements of equipment being tested.

7.5.16.1(1) Turn off equipment in the building that might interfere with testing.

7.5.16.1(2) Clear the space of people.

7.5.16.2 Perform vibration measurements after air and water balancing and equipment testing is complete.

7.5.16.3 Measure and record vibration on rotating equipment over 3hp.

7.5.16.4 Measure and record equipment vibration, bearing vibration, equipment base vibration, and building structure vibration. Record velocity and displacement readings in the horizontal, vertical, and axial planes. Measure full spectrum and overall acceleration readings. Provide a report in both hard copy and electronic format.

7.5.16.4(1) Pumps:

7.5.16.4(1)(a) Pump Bearing: Drive end and opposite end.

7.5.16.4(1)(b) Motor Bearing: Drive end and opposite end.

7.5.16.4(1)(c) Pump Base: Top and side.

7.5.16.4(1)(d) Building: Floor.

7.5.16.4(1)(e) Piping: To and from the pump after flexible connections.

7.5.16.4(2) Fans and HVAC Equipment with Fans:

7.5.16.4(2)(a) Fan Bearing: Drive end and opposite end.

7.5.16.4(2)(b) Motor Bearing: Drive end and opposite end.

7.5.16.4(2)(c) Equipment Casing: Top and side.

7.5.16.4(2)(d) Equipment Base: Top and side.

7.5.16.4(2)(e) Building: Floor.

7.5.16.4(2)(f) Ductwork: To and from equipment after flexible connections.

7.5.16.4(2)(g) Piping: To and from equipment after flexible connections.

7.5.16.4(3) Chillers and HVAC Equipment with Compressors/Vacuum Pumps:

7.5.16.4(3)(a) Compressor Bearing: Drive end and opposite end.

7.5.16.4(3)(b) Motor Bearing: Drive end and opposite end.

7.5.16.4(3)(c) Equipment Casing: Top and side.

7.5.16.4(3)(d) Building: Floor.

7.5.16.4(3)(e) Piping: To and from equipment after flexible connections.

7.5.16.4(4) Emergency Generators:

7.5.16.4(4)(a) Engine and alternator test points selected as recommended by the manufacturer.

7.5.16.5 For equipment with vibration isolation, take floor measurements with the vibration isolation blocked solid to the floor and with the vibration isolation floating. Calculate and report the differences.

7.5.16.6 Inspect, measure, and record vibration isolation.

7.5.16.6(1) Verify that vibration isolation is installed in the required locations.

7.5.16.6(2) Verify that installation is level and plumb.

7.5.16.6(3) Verify that isolators are properly anchored.

7.5.16.6(4) For spring isolators, measure the compressed spring height, the spring OD, and the travel-to-solid distance.

7.5.16.6(5) Measure the operating clearance between each inertia base and the floor or concrete base below. Verify that there is unobstructed clearance between the bottom of the inertia base and the floor.

7.5.17 Structural Moat Wall Seismic Gap and Future Underground Parking

7.5.17.1 Structural Moat Wall

7.5.17.1(1) In the spaces, voids, or gaps between the structural moat wall and the exterior wall of the underground parking provide “active, passive or natural ventilated” ventilation system, which meets the requirements of applicable codes.

7.5.17.1(2) Provide all required control work necessary for integration of the moat space monitored/controlled equipment through BMS.

7.5.17.2 Future Underground Parking

7.5.17.2(1) Provide ventilation systems (i.e. transfer fans) complete with CO NO2 detection for ventilation control to comply with applicable codes.

7.5.17.2(2) Where exhaust and outdoor air shafts serving the P3 parking area will be also used/utilized for future underground parking, their sizing will take into account additional capacity to accommodate the future underground parking.

7.5.17.2(3) Provide chilled water, hot water and similar hydronic services required for future spaces/rooms such as electrical rooms, Telecommunications Rooms and pressurization vestibules anticipated to be located within the future underground parking. Services to be valved and capped for future connection.

7.5.17.2(4) BMS

7.5.17.2(4)(a) Bring within future parking space, additional BMS infrastructure to allow for all future expansion of the BMS controls.

7.6 Integrated Automation (Division 25)

7.6.1 Overview

7.6.1.1 Principles, Guidelines and Requirements

7.6.1.1(1) Design-Builder will provide an integrated automation system to converge all Facility Building Systems and select Authority Equipment into an open, adaptable and interoperable hardware and software platform for centralized monitoring and control.

7.6.1.1(2) All Facility sub-systems intended to be interfaced into the integrated automation system will employ standardized object-oriented data formats and protocols for accurate representation of all system data points for instant and seamless integration.

7.6.1.1(3) All components and controllers supplied will be true “peer-to-peer” communicating devices. Components or controllers requiring “polling” by a host to pass data will not be acceptable.

7.6.1.1(4) All Ethernet-networked devices within the integrated automation system will connect to a single, converged FMO network. There will be no silo vendor networks/switches permitted except as required to meet the Authority’s functional and operational requirements.

7.6.1.1(4)(a) Software for all Facility systems will reside on Authority or FMO servers and computers. All Integrated Automation software applications will be required to operate within a virtualized server environment. There will be no silo vendor servers and/or computers except as required to meet the Authority’s functional and operational requirements;

7.6.1.1(4)(b) Ensure that all integrated automation technology, systems, and Authority equipment are compatible and seamlessly interfaced using open-standards and protocols;

7.6.1.1(4)(c) Ensure that the Facility's integrated automation system and sub-systems are not encumbered with proprietary hardware and software limitations;

7.6.1.1(4)(d) Design-Builder will work in conjunction with the Authority in defining the FMO Network and virtualized server requirements;

7.6.1.1(4)(e) Utilize the integrated automation system to support the Commissioning process and reporting (refer to Section 5.5.6.1 for more detailed Commissioning/ training requirements); and

7.6.1.1(4)(f) Train the Authority's FMO Network specialist(s) on the configuration, setup, Commissioning and continuous optimization and maintenance of the integrated automation framework in the Facility; refer to Section 5.5.6.1 for more detailed Commissioning/training requirements.

7.6.1.1(5) Adherence of all Facility systems to industry standard protocol ANSI / ASHRAE STD 135-2016 BACnet/IP is required to assure protocol and data object interoperability between all system components. Minimum BACnet protocol revision compliance is Level 4 or greater, with the ability to support data read and write functionality.

7.6.1.1(6) All devices to be BTL Listed, use BACnet\IP and physical connection will be via Ethernet. If BACnet\IP is not available for a device connection, other protocols may be used on a case-by-

case basis as approved by the Authority if they can seamlessly integrate into the integrated automation framework.

7.6.1.1(7) All control point naming and tagging conventions will be standardized using the ASHRAE 223P Building Interoperability with Bricks and Haystacks standard to be customized for the Facility.

7.6.1.1(8) All Facility integrated automation systems and sub-systems will be engineered to operate independently in a stand-alone mode, such that if they lose Ethernet network and/or server connectivity they continue to function without loss of local controller services.

7.6.1.1(9) Design-Builder will provide a virtual software environment for the integrated automation systems simulating the user interface and demonstrating the integration of the Facility Division 25 systems, sub-systems and integrated systems of other Divisions prior to physical installation of these systems. Design-Builder will:

7.6.1.1(9)(a) simulate the real-time management of all interfaced sub-systems; and

7.6.1.1(9)(b) facilitate the optimization of the integrated automation systems by a system expert provided by Design-Builder.

7.6.1.1(10) The BMS will meet cGMP and CNSC requirements for redundancy, reliability, security of data and data trend-logging. To meet cGMP trend logging and data records, a historian-based storage system will be provided both On-site and Off-Site (coordinate with Authority for data storing). In addition, cGMP and CNSC area will require installation of dedicated “Environmental Management System” (EMS) mostly for monitoring environmental parameters.

7.6.1.1(11) Refer to Section 7.6.3.37 for additional requirements.

7.6.2 Integrated Building Management Platform

7.6.2.1 Basic Requirements

7.6.2.1(1) System Overview

7.6.2.1(1)(a) The aim of the integrated building management platform (IBMP) is to combine the data from the Facility operational systems (listed in Section 7.6.2.1.3.(c).7) and building data to provide insights, improving the efficiency and productivity of the Facility operator. Providing them a single operator platform.

7.6.2.1(1)(b) The IBMP will be integrated to the mechanical BMS platform to pull point data, analytics information and Facility alarm information seamlessly from the BMS.

7.6.2.1(1)(c) The IBMP will be integrated to electrical systems (listed in Section 7.6.2.1(3)(c).7.4 and Authority Equipment (listed in Section 7.6.2.1.3.(c).7) to pull point data, analytics information, and alarm information from these systems.

7.6.2.1(1)(d) The IBMP will be integrated with the CMMS system (Maximo) to pull Asset and space data, maintenance requests, O&M manuals and analytics.

7.6.2.1(1)(e) The IBMP will utilise the BIM data (listed in appendix1U BIM Requirements) for the visualisation of the data.

7.6.2.1(1)(f) The IBMP will provide the framework for a Digital Twin of the Facility. The digital twin will be composed of three (3) key elements, the physical Asset, the digital replica of that Asset and the flow of data that connects the two.

7.6.2.1(1)(g) The IBMP will be developed with future iterations and opportunities in mind. It will be flexible enough to integrate with other systems and modules and will be based on recognised data standards.

7.6.2.1(1)(h) The IBMP will deliver comprehensive suite of live dashboards that the Authority will use to derive insights.

7.6.2.1(1)(i) The IBMP will be used for monitoring and reporting and will not initiate control requests to any systems or equipment.

7.6.2.1(2) IBMP will be selected and developed by the Authority in consultation with Design-Builder.

7.6.2.1(3) System Responsibilities

7.6.2.1(3)(a) Refer to Appendix 1W [Systems Responsibility Matrix] for Authority and Design-Builder scope overviews.

7.6.2.1(3)(b) Authority will:

7.6.2.1.3.(b).1 Provide design feedback to Design-Builder.

7.6.2.1(3)(c) Design-Builder will:

- 7.6.2.1.3.(c).1 Work with the Authority to specify the system;
- 7.6.2.1.3.(c).2 Select the system in consultation with the Authority;
- 7.6.2.1.3.(c).3 Provide all system infrastructure;
- 7.6.2.1.3.(c).4 Provide all system equipment;
- 7.6.2.1.3.(c).5 Provide all system software;
- 7.6.2.1.3.(c).6 Train the Authority's Staff on the use of the system; and
- 7.6.2.1.3.(c).7 Integrate the IBMP to the following sub-systems and software platforms and Authority Equipment:
  - (c).7.1 The BMS;
  - (c).7.2 Facility CMMS (Computerized Maintenance Management System);
    - (c).7.2.1 FHA FMO and IM/IT will cover following CMMS scope: Defining new data and relationships, configuring integrations and workflows, configuring new views/reports/users.
    - (c).7.2.2 DB will provide integration with IBMP, allowing for interactions with various sub-Building Systems, processing data and logic, communication with Maximo accordingly.
  - (c).7.3 X-Y Gantry Ceiling Lift System(s);
  - (c).7.4 Electrical systems;
    - (c).7.4.1 Generators;
    - (c).7.4.2 Lighting controls;
    - (c).7.4.3 Load management system;
    - (c).7.4.4 Metering;
    - (c).7.4.5 Switchgear;
    - (c).7.4.6 ATS / HVATS;
    - (c).7.4.7 EVSE;
    - (c).7.4.8 UPS;
    - (c).7.4.9 Fire alarm system;
    - (c).7.4.10 EV charging stations system; and
    - (c).7.4.11 Clock system.
  - (c).7.5 Facility Building System data and alarms;
  - (c).7.6 Pneumatic tube system;
  - (c).7.7 Elevators;
  - (c).7.8 Equipment data and alarms;
  - (c).7.9 MDR Sterilizers;

(c).7.10 MDR Washer/disinfectors;
(c).7.11 MDR Cart washers;
(c).7.12 Other MDR Equipment;
(c).7.13 Bedpan disinfectors;
(c).7.14 Ceiling lifts;
(c).7.15 Medication Management System (ADC);
(c).7.16 All fridges and freezers, including laboratory and pharmacy (Hospital and Oncology) fridges and freezers;
(c).7.17 Fume hoods; and
(c).7.18 Biosafety cabinets.

7.6.2.2 Performance Criteria

7.6.2.2(1) The IBMP will pull real-time data produced by energy and equipment systems in order to identify faults, trends, anomalies and opportunities for improved performance and reduced energy use in the operation of Facility mechanical, electrical, and other equipment systems.

7.6.2.2(2) The IBMP will utilize a state-of-the-art database technology designed for the efficient storage and analysis of large volumes of time series data.

7.6.2.2(3) Design-Builder will use standardized name and tagging conventions (such as ASHRAE 223 / NBIMS) to develop a consistent, standardized methodology for naming and describing spaces, assets (in line with Appendix 1U [BIM Requirements]) and data points associated with the networked devices and integrated automation systems throughout the Facility. This includes all systems listed in Section 7.6.2.1.3.(c).7.

7.6.2.2(4) The IBMP is to provide insights that energy optimization measures are operating as expected through the visualization of energy usage at the point-of-use, notification of faults showing where control sequences are not functioning as prescribed, and insights into the opportunities for improved performance in the operation of Facility systems.

7.6.2.2(5) In consultation with the Authority, Design-Builder will create energy optimization insights and analytical rules to show that all mechanical and electrical sequences of operations as specified for each Facility system for use during Commissioning and on-going Facility operations.

7.6.2.2(6) The analytic software application will operate on the latest versions of Microsoft Windows, Linux and Apple OSX operating systems available at Service Completion.

7.6.2.2(7) The IBMP will accept and normalize data from a variety of sources such as BACnet\IP, oBix Modbus TCP, Sedona, OPC, MQTT the web services protocol defined by Project-Haystack. It will also support data access via the following SQL compatible databases, CSV format files, XML format files, web services, JSON, and other electronic data interchange techniques. Once data has been imported, the software will provide a unified data format to enable the ability for specified analytical algorithms to identify patterns across the different data sets independent of original format.

7.6.2.2(8) The IBMP will provide open, REST-based API's to enable integration with third-party software applications. The open APIs will enable data to be entered/imported into the database, exported from the database, posting of analytic queries from external applications and output of analytic results to external applications, and integration with third-party software applications such as maintenance management and work order processing. APIs will be fully documented and available as part of the standard product. All data and analytic results will be available via the REST API.

7.6.2.2(9) Design-Builder will coordinate all custom applications developed for the IBMP in consultation with the Authority such that the applications are tailored to the Authority's operations.

7.6.2.2(10) Ideally the IBMP will be deployed locally in the Facility (on-premise). Deployment will not be limited to a SaaS (Software as a Service) deployment model. Cloud-based operation will be supported on Microsoft Azure and Amazon Web Services as a minimum. Cloud-based operation will be reviewed with the Authority.

7.6.2.2(11) The IBMP will include a built-in subscription to an industry recognised worldwide weather service approved by the Authority Energy Management Team providing weather data for all major metropolitan areas. Weather service will provide an update frequency of at minimum every three (3) hours. Weather data will include:

7.6.2.2(11)(a) Current temperature;

7.6.2.2(11)(b) High temperature for the day;

7.6.2.2(11)(c) Low temperature for the day;

7.6.2.2(11)(d) Sunrise and sunset times;

7.6.2.2(11)(e) Relative Humidity; and

7.6.2.2(11)(f) Degree days (heating and cooling with adjustable balance point value).

7.6.2.2(12) The weather service will include a three-day forecast and provide historical weather data extending back at least 1 year. The IBMP software will be capable of integrating to other weather services and locally connected sensors via a documented weather data API.

7.6.2.2(13) The IBMP will provide automatic notification of detected issues, alerts via emails or smart devices as well as automated emailing of reports. The rules and conditions that trigger automated notification will be created in consultation with the Authority.

7.6.2.2(14) In addition provide Facility weather station, integrated with IBMP and BMS, supplying data which will be used for Building Systems/operation optimization. Data to include the following:

7.6.2.2(14)(a) Temperature (DB and WB);

7.6.2.2(14)(b) Humidity (absolute and relative);

7.6.2.2(14)(c) Wind direction and speed;

7.6.2.2(14)(d) Precipitation (rain rate and accumulation);

7.6.2.2(14)(e) Barometric Pressure;

7.6.2.2(14)(f) Cloud ceiling;

7.6.2.2(14)(g) Visibility;

7.6.2.2(14)(h) Dust accumulation;

7.6.2.2(14)(i) Lightning distance; and

7.6.2.2(14)(j) 360 degree imaging sensor.

7.6.2.2(15) Email and or smart device notification services will as a minimum provide:

7.6.2.2(15)(a) immediate notification of detected issues and alerts;

7.6.2.2(15)(b) daily digest or summary of detected issues; and

7.6.2.2(15)(c) the ability to delineate which issue notifications are sent to which recipients down to the level of specifying that specific issues or categories of issues are sent to individual recipients.

7.6.2.2(16) Notifications will include hyperlinks which when selected will take the user directly to the visualization of the issue in the software

application. Users will be required to authenticate for access to the visualizations.

7.6.2.2(17) Email of reports will be formatted as PDF, HTML, PNG, or Excel documents. Emails will also provide direct links to the dashboards on the system.

7.6.2.2(18) The IBMP will provide the ability to develop customized rules and algorithms tailored to the operational needs and characteristics of individual departments within the Facility, monitoring and verification of any data points in the Facility, and the fault detection requirements of the Project without dependence on the manufacturer for rule development. Tools for user development of customized rules will be provided as a standard part of the product and fully documented.

7.6.2.2(19) The IBMP will provide an extensive library of standard analytic functions. In consultation with the Authority, Design-Builder will use standard and customized analytic functions as elements to build custom analytic rules and visualizations for the specific needs of individual user groups. Include analytics for predictive and condition based maintenance programmes. Source code for the standard and custom analytic functions will be provided as part of the standard product and the Authority will have the option to make modifications.

7.6.2.2(20) The IBMP will present all views, data visualizations and dashboards in a standard web browser using HTML5 technology. The use of plug-ins or Java in the browser will not be permitted. The system will support the use of the current version of industry leading browsers as a minimum.

7.6.2.2(21) The IBMP will include standard views to present analytic results, which will be automatically generated when issues are found by analytic rules. No programming or development will be required to create these views. These views will include as a minimum:

7.6.2.2(21)(a) All rule violations across a portfolio of sites, all rule violations per site, and rule violations per equipment system, including time, date and duration of all violations;

7.6.2.2(21)(b) Standard filters to enable the user to easily look at rule violations by site, space, Asset data, exception type for any selected date or date range;

7.6.2.2(21)(c) Automatic calculation and presentation of Key Performance Indicators (KPIs) including the following features;

7.6.2.2.21.(c).1 It will be possible to define custom KPIs as needed. It will be possible to filter KPI results based on: Department, building, KPI type, and date range as a minimum;

7.6.2.2.21.(c).2 Carbon emission reporting metrics based upon ISO 16745-1 and automatic verification based upon ISO 16745-2; and

7.6.2.2.21.(c).3 Custom KPIs are to be developed in consultation with the Authority.

7.6.2.2(22) The IBMP will allow for any standard view to be saved as a dashboard report for easy access by the Authority and will allow all reports to be emailed as PDF, HTML, PNG, or Excel documents. Any standard system view will be able to be saved as a custom report including its configuration criteria, e.g., time range, targets (sites or equipment), rule violations or other configuration options as applicable to the standard system view.

7.6.2.2(23) Design-Builder will use the IBMP to create custom reports, dashboards and data views, in consultation with the Authority. Custom reports will be able to be created by making queries against the database and saving the query as a saved report. Saved reports/dashboards will be able to be executed by typical system users with a single mouse click. Data views will be customizable to display different metrics in real-time to Staff based on user credentials.

7.6.2.2(24) The IBMP will allow for the export of any and all report views and will support export in CSV, Excel, XML, HTML PNG, SVG and text format. Export of report views will be a feature available to the typical operator and be able to be accomplished with 2-3 mouse clicks and include the ability for operators to send the report as an email when selecting the export format.

7.6.2.2(25) The IBMP will automatically create 2-axis charts for all-time series data once it has been entered into the database. Examples of data that will be presented in auto-generated charts include: sensor values, control point status, setpoints and other numeric, time stamped data values. An application to enable navigation of the data charts will be provided and will organize data into groups related to equipment systems.

7.6.2.2(26) The IBMP will support the presentation of data on mobile and handheld devices providing the following capabilities as a minimum:

7.6.2.2(26)(a) Presentation of analytic information in a text-based format with drill down hierarchy including: site level

summary, equipment level summary, and detailed listing of detected issues on individual equipment.

7.6.2.2(26)(b) Ability to view graphic representations data and analytic visualizations on the handheld device.

7.6.2.2(26)(c) Handheld user interface will not require the download or installation of an application. Rather, the handheld user interface will utilize native web interfaces for presentation of information to the user.

7.6.2.3 Integration

7.6.2.3(1) Facility System Data and Alarms

7.6.2.3(1)(a) The IBMP will record, analyze data and annunciate events and alarms of all base-building electrical, mechanical and conveyance systems in the Facility. Event and alarm data will include the location of the device causing the alarm.

7.6.2.3(1)(b) Design-Builder will integrate the IBMP to the following systems such that the IBMP is capable of pulling and analyzing data from all components of each system:

7.6.2.3.1.(b).1 BMS:

(b).1.1 Refer to Section 7.6.3 Building Management System.

7.6.2.3.1.(b).2 Electrical systems;

(b).2.1 Refer to Section 7.7 Electrical.

7.6.2.3.1.(b).3 Pneumatic Tube System; and

7.6.2.3.1.(b).4 Elevators.

7.6.2.3(2) Equipment Data and Alarms

7.6.2.3(2)(a) The IBMP will record and annunciate Equipment data and alarms including the status, location, temperature, humidity, and Asset data for Equipment including walk-in freezers and coolers, laboratory Equipment, medical Equipment, and:

7.6.2.3.2.(a).1 all equipment and systems listed in Section 7.6.2.1.3.(c).7.

7.6.2.3(2)(b) If a device does not natively integrate to the IBMP, Design-Builder will provide all gateways, data loggers, and temperature probes for each device to interface with the IBMP.

7.6.2.3(2)(c) Refer to Section 7.6.3 BMS for additional information on alarm requirements.

7.6.2.3(2)(d) All walk-in and standalone laboratory and medical grade refrigerators, coolers and freezers will have trend logs for temperature and status and alarms integrated into the IBMP with a graphic interface dedicated for access and monitoring by lab users; refer to Appendix 1H [Equipment and Furniture].

7.6.3 Building Management System

7.6.3.1 System Overview

7.6.3.1(1) The BMS network will reside on a virtual FMO local area network (VLAN), residing on Authority network. Refer to Section 7.8 Communication (Division 27) for additional requirements.

7.6.3.1(2) All BMS software will reside on Authority provided servers (maintained by IM/IT) and computers.

7.6.3.1(3) BMS vendor and product will be selected by Design-Builder and in compliance with Appendix 1Q [Major Equipment Acceptable Manufacturers List].

7.6.3.1(4) The BMS network includes the following sub-systems as minimum:

7.6.3.1(4)(a) DDC and PLC controls network systems;

7.6.3.1(4)(b) Energy metering and other Sub-Metering as per Appendix 1P [Metering Matrix];

7.6.3.1(4)(c) HVAC and Environmental Controls;

7.6.3.1(4)(d) Facility Electrochromic glazing system and associated control system;

7.6.3.1(4)(e) Any other Mechanical systems Controls;

7.6.3.1(4)(f) Steam and condensate related systems controls;

7.6.3.1(4)(g) Plumbing system controls (sewer and storm drainage pumping and other system stations controls);

7.6.3.1(4)(h) Plumbing system controls (Domestic hot, cold, tempered and other associated potable water and non-potable systems controls);

7.6.3.1(4)(i) Any other plumbing systems controls;

7.6.3.1(4)(j) RO system(s) controls;

7.6.3.1(4)(k) Medical gases and other Facility gases system controls including the designated bulk oxygen site, (this applies to generated, bottled or any other sources of supply);

7.6.3.1(4)(l) Laboratory and utility compressed air system controls;

7.6.3.1(4)(m) Instrument air systems;

7.6.3.1(4)(n) MDR sterilization and other associated Equipment;

7.6.3.1(4)(o) Kitchen systems controls, including make-up air system, kitchen exhaust air and general exhaust system, space thermal and other controls, coolers and freezers systems;

7.6.3.1(4)(p) Parking ventilation/exhaust system, CO monitoring and associated exhaust control;

7.6.3.1(4)(q) Pneumatic tube systems control;

7.6.3.1(4)(r) Other specific medical or other unique equipment (in consultation with Authority) to be monitored for alarms or other parameters such as: freezers, coolers;

7.6.3.1(4)(s) Fire suppression system, including fire alarm panel integration;

7.6.3.1(4)(t) Bedpan washer/sterilizers;

7.6.3.1(4)(u) Medication Management System (ADC);

7.6.3.1(4)(v) Smoke evacuation system controls;

7.6.3.1(4)(w) Smoke management system controls;

7.6.3.1(4)(x) Stairs pressurization systems controls;

7.6.3.1(4)(y) Outbreak Control Zone system controls;

7.6.3.1(4)(z) Electrical systems monitoring, including:

- 7.6.3.1.4.(z).1 Generators;
- 7.6.3.1.4.(z).2 Generator fuel management systems;
- 7.6.3.1.4.(z).3 Lighting controls;
- 7.6.3.1.4.(z).4 Load management system;
- 7.6.3.1.4.(z).5 Electrical metering;
- 7.6.3.1.4.(z).6 Switchgear;

7.6.3.1.4.(z).7 ATS/HVATS;
7.6.3.1.4.(z).8 EVSE;
7.6.3.1.4.(z).9 UPS;
7.6.3.1.4.(z).10 Fire alarm system;
7.6.3.1.4.(z).11 Clock systems;
7.6.3.1.4.(z).12 EV charging stations system; and
7.6.3.1.4.(z).13 Other systems identified in Section 7.7 Division 26.

7.6.3.1(4)(aa) Post-disaster unique systems pertaining to mechanical, plumbing, fire protection, and other associated Facility Building Systems such as root barrier and moisture sensor grid refer to Section 8.2.4.4(2)(f);

7.6.3.1(4)(bb) Back-up systems pertaining to mechanical, plumbing, fire protection, and other associated Facility Building Systems;

7.6.3.1(4)(cc) Other specific medical or other unique Facility equipment in consultation with Authority to be monitored for alarms or other parameters such as: “closed loop sanitizers”, ceiling lifts, freezers, coolers; and

7.6.3.1(4)(dd) Other systems as described in this Schedule to be integrated with the BMS.

7.6.3.1(5) The Authority will:

7.6.3.1(5)(a) Provide design feedback to Design-Builder.

7.6.3.1(6) The Design-Builder will:

7.6.3.1(6)(a) Select the system in consultation with the Authority;

7.6.3.1(6)(b) Provide all system infrastructure;

7.6.3.1(6)(c) Provide all system equipment;

7.6.3.1(6)(d) Provide all system software (including training);

7.6.3.1(6)(e) Commission all system infrastructure, equipment and software; and

7.6.3.1(6)(f) Integrate the system to the following systems/network levels:

7.6.3.1.6.(f).1 All sub-systems described in this section;
7.6.3.1.6.(f).2 Authority Network and FMO VLAN; and
7.6.3.1.6.(f).3 Integrated building management platform.

7.6.3.2 Basic Requirements

7.6.3.2(1) Provide a complete and fully functional integrated BMS complete with systems as described in Section 7.6, for the Facility that performs the following functions:

7.6.3.2(1)(a) Automatically operates, monitors and manages the Facility's mechanical and other systems to provide a high level of occupant comfort and maintains a healthy and productive environment without disruption to the delivery of clinical and Patient treatment services.

7.6.3.2(1)(b) Provides an internet-based means of external monitoring by the Authority, including all associated hardware and software. Change or control rights by external access will not be allowed.

7.6.3.2(1)(c) Interfaces with the Facility's mechanical, electrical and communication systems and controls.

7.6.3.2(1)(d) Meters, trends and archives all data related to the flow of services into and out of the Facility, including domestic water, medical oxygen, and electricity and considers seasonal variations in flow rate. Refer to Appendix 1P [Metering Matrix].

7.6.3.2(1)(e) Annunciates Facility and equipment alarms, including fire alarm, security alarms, freezer alarms, lab alarms, medical Equipment indicated in Appendix 1H [Equipment and Furniture] alarms, medical gas alarms, space pressure alarms, lighting, UPS, generator, switchgear alarms, temperature and humidity setpoint alarm. Coordinate with Authority for any additional alarm monitoring requirements.

7.6.3.2(1)(f) Monitors and tracks the status, temperature, humidity and alarms for equipment identified in consultation with the Authority.

7.6.3.2(1)(g) Acquires, collates and archives all data associated with energy measurement and verification.

7.6.3.2(1)(h) Contains safeguards to prevent unauthorized external access and follows vendor best practices for security handling.

7.6.3.2(2) Design the controls system to allow monitoring and operation of the Facility from a BMS location in the Facility, from the Energy

Centre Control Room, within a regional control centre, or from any location with appropriate security controls in place via an integrated BMS over IP.

7.6.3.2(3) The BMS will be non-proprietary and designed with open protocol.

7.6.3.2(4) The BMS platform will be a completely integrated (front-end and back-end) Native BACnet/IP system that is installed by a BTL Listed BACnet provider and that can facilitate integration of a wide range of Facility Building Systems via BACnet or protocol gateways to convert the data into BACnet.

7.6.3.2(5) All equipment and point naming conventions for all BMS points will follow the ASHRAE 223P Building Interoperability with Bricks and Haystacks standard for seamless integration with the IBMP via open protocol BacNet/IP.

7.6.3.2(6) The BMS will be provided as a complete package from one supplier, who will ensure that all BMS devices and equipment are compatible.

7.6.3.2(7) All BMS devices and equipment will communicate with the IBMP via open protocol communications.

7.6.3.2(8) The BMS will optimize the system performance under all operating conditions to minimize Facility energy usage.

7.6.3.2(9) The BMS will accommodate future technological changes and the architecture of the BMS will permit expansion of the system for future renovations.

7.6.3.2(10) The BMS will be an independent system separate from the fire alarm and other control systems.

7.6.3.2(11) Provide BMS complete with analytics, automated fault detection, diagnosis and reporting (AFDDR) software. AFDDR platform/software will consist of the following features as a minimum:

7.6.3.2(11)(a) Detection and Diagnostics platform, capable of rule-based algorithms and pattern recognition techniques, with portfolio views, building and system-level interactive views, system performance auditing (including KPI’s) and an actionable Insight management portal; and

7.6.3.2(11)(b) Energy Information System (EIS) platform that has portfolio-level and building-level energy management capabilities, including powerful energy

baselining, multiple resource metering and interactive views with flexible perspectives. Energy Management Information System (EMIS) will encompass Energy Monitoring, Targeting & Reporting with weather normalized baselining, benchmarking and other advanced energy features.

7.6.3.2(12) The system will be able to set an optimized baseline of Facility operation for future recommissioning. Configure and operate the AFDDR Software to ensure the Facility remains continuously optimized, and the need for fault diagnosis by the Facility operator is minimized. AFDDR Software will provide customizable web-accessible reports available to the Authority, with rules and dashboard customized in consultation with the Authority. AFDDR will also be utilized as a Commissioning as described in Section 5.5.6.1.

7.6.3.2(13) Data archiving, measurement and verification and continuous Commissioning requirements include:

7.6.3.2(13)(a) provide a data collection and data archiving and analytics package to facilitate Measurement and Verification, Continuous Commissioning and AFDDR.

7.6.3.2(14) BMS system to include all necessary devices and programming to provide automatic changeover to all backup systems with no unnecessary delays.

7.6.3.2(15) The BMS will monitor, control, indicate alarms, and provide trending where applicable for all connected sensors and control points.

7.6.3.2(16) User interface will be graphical in nature with animated graphics to indicate equipment operation. Graphics will be grouped in systems and in Components and/or departments.

7.6.3.2(17) The BMS documentation will include a detailed narrative description of the sequence of operation of each system.

7.6.3.2(18) Install equipment to provide access and ease of maintenance.

7.6.3.2(19) Connect to equipment specified in other sections and to equipment supplied and installed by other Divisions or by the Authority.

7.6.3.2(20) Provide integration of setpoint control for all Major Mechanical Equipment, zone setpoints and energy dashboard with FMO Network level interface.

7.6.3.2(21) Zoning

7.6.3.2(21)(a) Zoning for HVAC systems will be based on occupancy, room location within the Facility, CSA Z317.2 space classification, room orientation, room relative pressurization, and room heating and cooling loads. Configure zoning to minimize reheat/re-cool. Zone means thermal and flow control, rather than just thermal, this approach ensures control over zone pressure.

7.6.3.2(21)(b) Provide independent zones (single zone per patient room) with dedicated supply and return/exhaust VAV (capable of providing pressure control, flow control and thermal control and monitoring) boxes for the following spaces/rooms at minimum: Patient care rooms, procedure rooms, consult rooms, and other rooms as determined by the Authority where independent zoning is required to support the space's clinical functionality. Use of motorized dampers with flow stations in lieu of VAV boxes is not permitted. Refer to also Fraser Health Technical Design Requirements for Fraser Health Facilities for additional requirements on zoning. For open Patient spaces without four walls and a door such as the Stretcher bays or Chair Bays a single VAV or VAVR may can be used to a maximum 5 stretcher or chair bays. For the Stretcher and Chair Bays located in the perimeter zone, Section 7.6.3.2(21)(e) will apply.

7.6.3.2(21)(c) For non-Patient Care Areas, a maximum of three (3) rooms will be on one (1) zone.

7.6.3.2(21)(d) Open area interior control zones will not exceed 180 square metres.

7.6.3.2(21)(e) Perimeter zones will be no more than 4.7 m from an outside wall along a common exposure. Perimeter zones will not exceed 30 square metres.

7.6.3.2(21)(f) Provide zone level display on zone sensor of all sensed parameters required by CSA Z317.2, Table 5.

7.6.3.2(21)(g) Zone floor areas to provide control of smoke in a fire situation to align with the fire and smoke zones. Zone floor areas to accommodate the Outbreak

Control Zones and ensure zones served by VAV boxes do not cross zones.

7.6.3.2(21)(h) Measure supply air temperature delivered to each zone. Where zone heating or cooling coils are utilized, modulate coil output to based on room temperature.

7.6.3.2(22) Design all components to default to a safe position upon failure and install all components to ensure reliable operation at any failure situation. Fail safe components will be hard-wired to provide reliable operation in all circumstances.

7.6.3.2(23) Monitor critical alarms for essential Facility Building Systems and Life Safety Systems at the BMS. Provide ability to direct alarms (such as text or email) to a mobile device. Alarms to be displayed on master alarm panel located in Energy Centre Control Room. Critical alarms include the following:

7.6.3.2(23)(a) Fire alarm system for Initial Stage 1 alarm, Stage 2 Evacuation, supervisory and trouble;

7.6.3.2(23)(b) All temperature alarms resulting from setpoint deviations;

7.6.3.2(23)(c) Failure of any HVAC or plumbing equipment including zone level equipment;

7.6.3.2(23)(d) Medical gas system high- and low-pressure alarms;

7.6.3.2(23)(e) All alarms relating to the fire protection and life safety or life support system;

7.6.3.2(23)(f) UPS, Emergency Power Systems;

7.6.3.2(23)(g) Alarm locally and monitor all medication, blood, and bone fridges via the BMS; and

7.6.3.2(23)(h) All alarms relating to the generators, loss of Utility power, transfer switches, switchgear, or associated control systems.

7.6.3.3 BMS Performance

7.6.3.3(1) System will conform to the following minimum standards:

7.6.3.3(1)(a) Graphic Display:

7.6.3.3.1.(a).1 A graphic with 20 dynamic points will display with current data within 10 sec.

7.6.3.3(1)(b) Graphic Refresh:

7.6.3.3.1.(b).1 A graphic with 20 dynamic points will update with current data within 8 sec. and will automatically refresh every 15 sec.

7.6.3.3(1)(c) Configuration and Tuning Screens:

7.6.3.3.1.(c).1 Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic will automatically refresh within 6 sec.

7.6.3.3(1)(d) Object Command:

7.6.3.3.1.(d).1 Devices will react to command of a binary object within 2 sec. Devices will begin reacting to command of an analog object within 2 sec.

7.6.3.3(1)(e) Alarm Response Time:

7.6.3.3.1.(e).1 An object that goes into alarm will be annunciated at the workstation within 15 sec.

7.6.3.3(1)(f) Program Execution Frequency:

7.6.3.3.1.(f).1 Custom and standard applications will be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.

7.6.3.3(1)(g) Performance:

7.6.3.3.1.(g).1 Programmable controllers will be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.

7.6.3.3(1)(h) Multiple Alarm Annunciation:

7.6.3.3.1.(h).1 Each workstation on the network will receive alarms within 5 sec of other workstations.

7.6.3.3(1)(i) Reporting Accuracy:

7.6.3.3.1.(i).1 System will report values with minimum end-to-end accuracy listed in Table 1.

7.6.3.3(1)(j) Control Stability and Accuracy:

7.6.3.3.1.(j).1 Control loops will maintain measured variable at setpoint within tolerances listed in Table 1.

7.6.3.3(2) Table 1: Sensors, Meters, Calculated Values and Required Accuracies

Table 1									
#	**Object Description and Location if Applicable**	**Sensor or Value Type**	**Sensor Type or Calculation Method**	**Expected Range**	**Required End-to-End Accuracy**	**Display Resolution**	**Refresh Interval (min)**	**Trend Interval (min)**	**Accuracy Required for Control**
S1	Ambient Dry-Bulb Temperature	AI	Locate in weather station or ventilated enclosure in fully shaded location away from thermal mass bodies	-29°C to 40°C (-20°F to 120°F)	±0.5°C (±0.1°F)	±0.25°C (±0.5°F)	1	10	±1.0°C (±2°F)
S2	Ambient Wet-Bulb Temperature	AI	Locate in weather station or ventilated enclosure in fully shaded location away from thermal mass bodies	–29°C to 40°C (-20°F to 120°F)	±1.5°C (±3.0°F)	±0.25°C (±0.5°F)	1	10	±1.5°C (±3°F)
S6	Facility Main Meter Power	AI/BI (pulse)	True RMS (Remote Monitoring Station) Refer to Electrical Sections						
S8	Zone (Space) Temperatures	AI	10000 ohm Thermistor or 1000 ohm RTD	–1°C to 38°C (30°F to 100°F)	±0.5°C (±0.1°F)	±0.25°C (±0.1°F)	1	1	±0.5°C (±1°F)
S9	Carbon Dioxide	AI	Nondispersive Infrared Sensor Technology	0 to 2000 ppm	±50 ppm	50 ppm	1	1	50 ppm
S10	Carbon Monoxide	AI	Electrochemical Sensor	0 to 100 ppm	±5 ppm	50 ppm	1	1	50 ppm
S11	Air Pressure (Ducts)	AI	Variable Capacitance	0 to 2 kPa (0 to 8 in. w.g.)	±25 Pa (±0.1 in. w.g.)	125 Pa (±0.5 in. w.g.)	1	1	25 Pa (0.1 in. w.g.)
S12	Air Pressure (Space)	AI	Variable Capacitance	-25 to 25 Pa (-0.1 to 0.1 in w.g.)'	3 Pa (±0.01 in. w.g.)	3 Pa (±0.01 in. w.g.)	1	1	1.3 Pa (0.005in. w.g.)
S13	Water Pressure	AI		0 to 1034 kPa (0 to 150 psi)	±2% of Full Scale	7 kPa (1 psi)	1	1	3.5 kPa (0.5 psi)
S14	Water Temperature	AI		(0°C to 107°C) (32°F to 225°F)	±0.5°C (±1°F)	±0.5°C (±1°F)	1	1	±0.5°C (±1°F)
S15	Delta-T	AI	10000 ohm Thermistor or 1000 ohm RTD Matched Pair		±0.15°C (±0.25°F)	±0.25°C (±0.5°F)	1	1	±0.15°C (±0.25°F)
S16	Relative Humidity	AI		0% to 100%	±5% RH	5%	1	1	±5% RH
S17	Water Flow	AI			±2% of Reading	1000 L/s	1	1	

Table 1									
#	**Object Description and Location if Applicable**	**Sensor or Value Type**	**Sensor Type or Calculation Method**	**Expected Range**	**Required End-to-End Accuracy**	**Display Resolution**	**Refresh Interval (min)**	**Trend Interval (min)**	**Accuracy Required for Control**
S18	Ducted Air Temperature	AI	10000 ohm Thermistor or 1000 ohm RTD	7°C to 60°C (45°F to 140°F)	±0.5°C (±1°F)	±0.5°C (±1°F)	1	1	±0.5°C (±1°F)
S19	Electrical Meters	AI/BI (Pulse)	Pulse Output Refer to Electrical Sections						
S28	Airflow Rate (Measuring Stations)	AI	Electronic or Differential Pressure		±5% of Reading Down to 0.75 m/s (150 fpm)	0.05 L/s (0.1 cfm)	1	1	±5% of Reading Down to 0.75 m/s (150 fpm)
S30	Airflow (Terminal)	AI	Electronic or Differential Pressure		±10% of Reading	47 L/s (100 cfm)	1	1	±10% of Reading
S31	Airflow (Pressurized Spaces)	AI	Electronic or Differential Pressure		±3% of Reading	24 L/s (50 cfm)	1	1	±3% of Reading

AI = analog input; BI = binary input; calculated = value calculated by the BMS hardware or BMS software

7.6.3.4 Interface with Other Systems

7.6.3.4(1) Control/monitor and interface with systems as per Section 7.6.3.

7.6.3.4(2) Work, materials, and equipment will comply with the most restrictive of local, provincial, and federal authorities' codes and ordinances or as specified herein.

7.6.3.5 Materials

7.6.3.5(1) Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Authority. Spare parts will be available and will be stocked within the Fraser Valley and Greater Vancouver Regional District for at least five years after completion of this Project Agreement.

7.6.3.6 Communication and System Architecture

7.6.3.6(1) All networked control products will be comprised of an industry standard open protocol BACnet/IP internetwork. Communication involving control components (i.e. all types of controllers and operator interfaces) will conform to ASHRAE Standard 135. Networks and protocols proprietary to one company or distributed by one company are prohibited.

7.6.3.6(2) Provide new wiring and network devices as required to provide a complete and workable control network.

7.6.3.6(3) Each controller will have an Ethernet communication port.

7.6.3.6(4) Network operator interface and value passing will be transparent to internetwork architecture.

7.6.3.6(5) An operator interface connected to the BMS will allow the operator to interface with each networked controller as if directly connected. BMS information such as data, status, reports, system software, and custom programs will be viewable and editable.

7.6.3.6(6) Inputs, outputs, and control variables used to integrate control strategies across multiple controllers will be available on the network.

7.6.3.6(7) Systems will be expandable to at least twice the required data points with additional controllers, associated devices, and wiring. Expansion will not require operator interface hardware additions or software revisions. Provide spare points on panels and/or controllers installed in mechanical and Electrical Rooms/Telecommunications Rooms for future growth.

7.6.3.6(8) Building control panels, and controllers with real-time clocks will use the BACnet time synchronization service. System will automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system will automatically adjust for daylight saving and standard time as applicable.

7.6.3.6(9) BMS server will be capable of simultaneous direct connection and communication with BACnet/IP, OPC and TCP/IP corporate level networks without the use of interposing devices.

7.6.3.6(10) Any break in Ethernet communication between the standard client and server workstations on the network will result in a notification at each workstation.

7.6.3.6(11) The building controllers (BCs) will be capable to support subnetwork MS/TP communication with terminal unit controllers. Maximum one (1) MS/TP subnetwork can be supported per single building controller (BC).

7.6.3.6(12) The network architecture will consist of two levels of networks as follows:

7.6.3.6(12)(a) The automation and floor level network will be BACnet/IP. It will network all the building controllers

(BCs), advanced application controllers (AACs), the automation server, and operator workstations.

7.6.3.6(12)(b) Sub-network: Subnetworks will be BACnet MS/TP LAN. These subnetworks will network Advanced Application Controllers (ASCs), Custom Application Controllers (CACs) and Application Specific Controllers (ASCs). Each MS/TP subnetwork will be limited to a maximum of 50 connected devices. Each MS/TP subnetwork will be limited to one floor level.

7.6.3.6(13) The following devices will reside on the automation level BACnet/IP over Ethernet network:

7.6.3.6(13)(a) All systems and their controllers (other than ones indicated below to be on MS/TP) indicated in Section 7.6.3 will be on BACnet/IP network.

7.6.3.6(14) The following devices can reside on MS/TP sub-networks:

7.6.3.6(14)(a) Terminal units such as VAV units or fan coils;

7.6.3.6(14)(b) Other minor terminal equipment;

7.6.3.6(14)(c) Advanced application controllers for AHUs less than 2,500 L/s;

7.6.3.6(14)(d) Controllers for air moving equipment less than 2,500 L/s; and

7.6.3.6(14)(e) Local hydronic circulating equipment not part of the Energy Centre and less than 5 hp.

7.6.3.6(15) Zone and floor level controllers, terminal units, packaged AC units, auxiliary equipment will reside on either BACnet/IP over Ethernet network of a MS/TP sub-network.

7.6.3.6(16) The system will meet peer-to-peer communication services such that the values in any one controller can be read or changed from all other controllers. The software will provide transparent transfer of all data, control programs, schedules, trends, and alarms from any one controller through the internetwork to any other controller, regardless of subnetwork routers.

7.6.3.6(17) Energy Centre Network

7.6.3.6(17)(a) All central plant equipment associated with the Energy Centre will utilize programmable logic controllers (PLC) for increased reliability. Provide dual PLC central processing units for redundancy

complete with built-in UPS. Energy Centre controllers will communicate on a dedicated subnetwork to all I/O interfaces (hard-wired points).

7.6.3.6(17)(b) Provide a dedicated supervisory control and data acquisition (SCADA) system interface for control, trending, archiving. Provide interface from Energy Centre network to BMS BACnet/IP network. Provide graphics, dedicated server, on-site trend logging, and storage (historian).

7.6.3.6(17)(c) Heating plant, cooling plant, heat recovery plant, heat rejection plant, steam plant, domestic hot water generation plant and RO feed plant system for steam located in the Energy Centre will be controlled/monitored by this system. All PLC controlled/monitored plants will also be monitored through the DDC and BMS Platform, as well integrated with IBMP.

7.6.3.6(17)(d) Provide serial port network to pick up all network cards within all packaged equipment within Energy Centre, including VFDs, chillers, boilers, etc. for any points that are not required to be hard-wired.

7.6.3.7 Distributed Control Requirements

7.6.3.7(1) The loss of any one controller will not affect the operation of other systems, only for the points connected to the controller.

7.6.3.7(2) The system will be scalable in nature and will permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers, and operator devices.

7.6.3.7(3) System architecture will eliminate dependence upon any single device for alarm reporting and control execution. Each controller will operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection will not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

7.6.3.7(4) Controllers will be able to access any data from or send control commands and alarm reports directly to any other controller on the network without dependence upon a central processing device. Controllers will also be able to send alarms to multiple operator workstations without dependence upon a central or intermediate processing device.

7.6.3.7(5) Control panels will be mounted in the same mechanical room as the equipment being controlled, or an adjacent Utility room.

7.6.3.7(6) Remote sensors will be wired to the control panel of the equipment it is controlling, not across the network.

7.6.3.7(7) Signals to remote motor control centres will be hard wired to the control panel, not across the network.

7.6.3.7(8) As a minimum resiliency, robustness, redundancy and/or partial redundancy are overarching principles to be used for the design of BMS control system. At no point failure of single controller/power feed/and other BMS components/ hardware/ software/ network should result with any of the BMS monitored/controlled central mechanical/electrical/other systems critical for the Facility operations going down. In addition, failure of single controller/power feed/and other BMS components/ hardware/ software resulting in the loss of the departments crucial to Facility operations is not acceptable either.

7.6.3.8 Operator Interface

7.6.3.8(1) Operator workstations will be provided by the Authority. Design-Builder to design all BMS workstation requirements and provide these technical requirements to the Authority.

7.6.3.8(2) Software

7.6.3.8(2)(a) The Authority will provide an operating system within a virtualized server environment for installation of BMS software complete with AFDDR. Design-Builder to design all BMS server requirements and provide these technical requirements to the Authority. In addition to Authority provided servers with Design-Builder installed central BMS platform(s) (web-thin client), Design-Builder will install back-up BMS interface on dedicated (3 minimum) local OWS(s) installed within Energy Centre.

7.6.3.8(2)(b) All BMS software (not residing on system controllers) such as operator workstation software, BMS database and trend data will reside on Authority provided servers (maintained by FHA IM/IT group) and OWS(s) stations. There will be no silo vendor servers and/or computers except as approved by the Authority.

7.6.3.8(2)(c) System Graphics. The operator workstation software will be graphically oriented. The system

will allow display of up to 10 graphic screens at once for comparison and monitoring of system status. Provide a method for the operator to easily move between graphic displays and change the size and location of graphic displays on the screen. The system graphics will be able to be modified while online. An operator with the proper password level will be able to add, delete, or change dynamic objects on a graphic. Dynamic objects will include analog and binary values, dynamic text, static text, and animation files. Graphics will have the ability to show animation by shifting image files based on the status of the object.

7.6.3.8(2)(d) Custom Graphics. Custom graphic files will be created with the use of a graphics generation package furnished with the system. The graphics generation package will be a graphically based system that uses the mouse to create and modify graphics that are saved in industry standard formats. The graphics generation package also will provide the capability of capturing or converting graphics from other programs such as Revit or AutoCAD.

7.6.3.8(2)(e) Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators, and others are required for this Project. This library also will include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library will be furnished in a file format compatible with the graphics generation package program.

7.6.3.8(3) System applications. Each workstation will provide operator interface and off-line storage of system information. Provide the following applications at each workstation:

7.6.3.8(3)(a) Automatic system database save and restore. Each workstation will store on the hard disk a copy of the current database of each building controller. This database will be updated whenever a change is made in any system panel. The storage of these data will be automatic and not require operator intervention. In the event of a database loss in a building management panel, the first workstation to detect the loss will automatically restore the

database for that panel. This capability may be disabled by the operator.

7.6.3.8(3)(b) Manual database save and restore. A system operator with the proper password clearance will be able to save the database from any system panel. The operator also will be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.

7.6.3.8(3)(c) System configuration. The workstation software will provide a method of configuring the system. This will allow for future system changes or additions by users under proper password protection.

7.6.3.8(3)(d) Online help. Provide a context-sensitive online help system to assist the operator in operating and editing the system. Online help will be available for all applications and will provide the relevant data for that particular screen. Additional help information will be available through the use of hypertext.

7.6.3.8(3)(e) Security. Each operator will be required to log on to the system with a username and password in order to view, edit, add, or delete data. System security will be selectable for each operator. The system supervisor will have the ability to set passwords and security levels for all other operators. Each operator password will be able to restrict the functions accessible to viewing and/or changing each system application, editor, and object. Each operator will automatically be logged off of the system if no keyboard or mouse activity is detected. This auto logoff time period will be user adjustable. All system security data will be stored in an encrypted format.

7.6.3.8(3)(f) System diagnostics. The system will automatically monitor the operation of all workstations, printers, network connections, building management panels, and controllers. The failure of any device will be annunciated to the operator.

7.6.3.8(3)(g) Alarm processing. Any object in the system will be configurable to alarm in and out of normal state. The operator will be able to configure the alarm limits, alarm limit differentials, states, and reactions for each object in the system.

7.6.3.8(3)(h) Alarm messages. Alarm messages will use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying upon acronyms or other mnemonics.

7.6.3.8(3)(i) Alarm reactions. The operator will be able to determine (by object) what, if any, actions are to be taken during an alarm. Actions will include logging, printing, starting programs, displaying messages, dialing out to remote stations, paging, smart phone, providing audible annunciation, or displaying specific system graphics. Each of these actions will be configurable by workstation and time of day.

7.6.3.8(3)(j) Trend logs. The operator will be able to define a custom trend log for any data object in the system. This definition will include interval, start time, and stop time. Trend data will be sampled and stored on the building controller panel, be archived on the hard disk, and be retrievable for use in spreadsheets and standard database programs. Trend data will be exportable in a standard electronic format (e.g., .xls, .csv, .xml) for analysis external to the BMS.

7.6.3.8(3)(k) Alarm and event log. The operator will be able to view all system alarms and change of states from any location in the system. Events will be listed chronologically. An operator with the proper security level may acknowledge and clear alarms. All that have not been cleared by the operator will be archived to the hard disk on the workstation.

7.6.3.8(3)(l) Group trend time series plots.

- 7.6.3.8.3.(l).1 Provide user-selectable Y points.
- 7.6.3.8.3.(l).2 Provide user-editable titles, point names, and Y axis titles.
- 7.6.3.8.3.(l).3 Individual trended points will be able to be grouped in groups of up to five points per plot with up to four plots per page.

7.6.3.8(3)(m) X-Y Trend Plots

- 7.6.3.8.3.(m).1 User-selectable X and Y trend inputs
- 7.6.3.8.3.(m).2 User-editable titles, point names, and X and Y axis titles.
- 7.6.3.8.3.(m).3 User-selectable time period. The user will be able to select the beginning and ending

period for each X-Y chart, within the time domain of the database being used.

7.6.3.8.3.(m).4 User-selectable display of up to 6 plots per screen in 2 columns.

7.6.3.8(3)(n) Object and property status and control. Provide a method for the operator to view and edit if applicable, the status of any object and property in the system. The status will be available by menu, on graphics, or through custom programs.

7.6.3.8(3)(o) Reports and logs. Provide a reporting package that allows the operator to select, modify, or create reports. Each report will be definable as to data content, format, interval, and date. Report data will be archivable on the hard disk for historical reporting. Provide the ability for the operator to obtain real-time logs of all objects by type or status (e.g., alarm, lockout, normal). Reports and logs will be stored on the hard disk in a format that is readily accessible by other standard software applications, including spreadsheets and word processing. Reports and logs will be readily printed to the system printer and will be set to be printed either on operator command or at a specific time each day.

7.6.3.8(3)(p) Standard reports. The following standard BMS reports will be provided for the Facility. Provide ability for the Authority to readily customize these reports for the Project:

7.6.3.8.3.(p).1 All objects/points/variables: all system (or subsystem) objects, points, variables, configuration properties, and their current values;

7.6.3.8.3.(p).2 Alarm summary: all current alarms (except those in alarm lockout);

7.6.3.8.3.(p).3 Disabled objects/points: all objects/points that are disabled;

7.6.3.8.3.(p).4 Alarm lockout objects/points: all objects/points in alarm lockout (whether manual or automatic);

7.6.3.8.3.(p).5 Alarm lockout objects/points in alarm: all objects/points in alarm lockout that are currently in alarm; and

7.6.3.8.3.(p).6 Logs:

(p).6.1 Alarm history

(p).6.2 System messages

(p).6.3 System events

(p).6.4 Trends

(p).6.5 Operator Activity. At a minimum, system will log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System will date and time stamp logged activity.

7.6.3.8(3)(q) Custom reports. Provide the capability for the operator to easily define any system data into a daily, weekly, monthly, or annual report. The customized reports formats will be as approved by the Authority.

7.6.3.8(3)(r) Workstation applications editors. Each workstation will support editing of all system applications. Provide editors for each application at the workstation. The applications will be downloaded and executed at one or more of the controller panels.

7.6.3.8(3)(s) Controller. Provide a full-screen editor for each type of application that will allow the operator to view and change the configuration, name, control parameters, and set points for all controllers.

7.6.3.8(3)(t) Scheduling. An editor for the scheduling application will be provided at each workstation. Provide a method of selecting the desired schedule and schedule type. Exception schedules and holidays will be shown clearly on the calendar. Provide a method for allowing several related objects to follow a schedule. The start and stop times for each object will be adjustable from this master schedule. Schedules will be easy to copy to other objects and/or dates.

7.6.3.8(3)(u) Custom Application Programming. Provide the tools to create, modify, debug, and download custom programs. The operator will be able to create, edit, and download custom programs at the same time that all other system applications are operating. The BMS will be fully operable while custom routines are edited, compiled, and downloaded.

7.6.3.8(4) Provide software updates on all operator workstations at Substantial Completion to the most current commercially available software version.

7.6.3.9 Graphics

7.6.3.9(1) Provide interactive graphics for all systems interfaced, controlled and monitored by the BMS as indicated in Section 7.6.3. Show on each graphic all input and output points for the system and relevant calculated points such as setpoints.

7.6.3.9(2) Provide an overall Facility graphic.

7.6.3.9(3) Provide separate floor plan graphics of the Facility for each integrated, controlled, and monitored systems, and locate the graphics on the floor plan according to the devices physical location within the Facility.

7.6.3.9(4) Provide dedicated graphics for fire alarm system monitoring and smoke control management.

7.6.3.9(5) Provide dedicated graphics for Outbreak Control Zone control and monitoring.

7.6.3.9(6) Provide dedicated graphics for each system and sub-system with graphically representation of all equipment including all input and output points and relevant calculated points. Furthermore, provide each piece of plant equipment with a dedicated graphic, available via a link for the master system graphic including boilers, chillers, HRUs, AHUs, cooling towers, emergency generators, domestic hot water heaters and storage tanks. Equipment graphics will display all equipment sensor data in a single screen with embedded links to the individual sensor detail pages.

7.6.3.9(7) Provide graphic summary tables for all demand-based reset parameters.

7.6.3.9(8) Show terminal equipment information on a graphic summary table. Provide dynamic information for each point shown.

7.6.3.10 Alarms

7.6.3.10(1) Provide full integration of all alarms with the FMO level network, Div. 27 systems, and other networks as defined by the Authority for monitoring and acknowledgement of alarms. Alarms will be outputted to FMO portable pagers / handheld devices. Portable devices will show the same alarm information as displayed on the operator workstations and will be interactive. That is, the alarms will follow the same links as the workstations and be able to be silenced and acknowledged from the portable device, time stamping and recording the user ID.

7.6.3.10(2) All alarms will include a time/date stamp using real-time and date.

7.6.3.10(3) Each alarm will be configured in terms on level, latching (requires acknowledgement of a return to normal), non-latching (does not require acknowledgement of a return to normal), entry delay, exit deadband, and post-suppression period.

7.6.3.10(4) Operators will be able to sort alarms based on level, time and date, and current status.

7.6.3.10(5) Alarms will be reported with the following information:

7.6.3.10(5)(a) Date and time of the alarm;

7.6.3.10(5)(b) Level of the alarm;

7.6.3.10(5)(c) Description of the alarm;

7.6.3.10(5)(d) Equipment tags for the units in alarm;

7.6.3.10(5)(e) Possible causes of the alarm provided by the fault detection routines; and

7.6.3.10(5)(f) The source that serves the equipment in alarm.

7.6.3.10(6) Provide the following levels of alarm:

7.6.3.10(6)(a) Level 1: Life safety message;

7.6.3.10(6)(b) Level 2: Critical equipment message;

7.6.3.10(6)(c) Level 3: Urgent message; and

7.6.3.10(6)(d) Level 4: Normal message.

7.6.3.10(7) Maintenance mode. Operators will have the ability to put any device in/out of maintenance mode. All alarms associated with a device in maintenance mode will be suppressed except for life safety alarms. A daily Level 3 alarm will be issued at a scheduled time indicating that the device is still in maintenance mode.

7.6.3.10(8) Entry delays. All alarms will have an adjustable delay time such that the alarm is not triggered unless the alarm condition is true for the delay time. Default entry delays are as follows:

7.6.3.10(8)(a) Level 1 alarms: 1 second;

7.6.3.10(8)(b) Level 2 alarms: 10 seconds;

7.6.3.10(8)(c) Level 3 alarms: 1 minute; and

7.6.3.10(8)(d) Level 4 alarms: 5 minutes.

7.6.3.10(9) Exit Hysteresis

7.6.3.10(9)(a) Each alarm will have an adjustable time-based hysteresis to exit the alarm. Once set, the alarm does not return to normal until the alarm conditions have ceased for the duration of the hysteresis. Default hysteresis is 5 seconds.

7.6.3.10(9)(b) Each analog alarm will have an adjustable percent-of-limit-based hysteresis the alarmed variable required to exit the alarm. Alarm conditions have ceased when the alarmed variable is below the triggering threshold by the amount of the hysteresis.

7.6.3.10(10) Latching. Each alarm can be configured as latching or non-latching. A latching alarm requires acknowledgment from the operators before it can return to normal, even if the exit deadband has been met. A non-latching alarm does not require acknowledgment. Default latching status is as follows:

7.6.3.10(10)(a) Level 1 alarms: latching;

7.6.3.10(10)(b) Level 2 alarms: latching;

7.6.3.10(10)(c) Level 3 alarms: non-latching; and

7.6.3.10(10)(d) Level 4 alarms: non-latching.

7.6.3.10(11) Post-exit suppression period. To limit alarms, each alarm will have an adjustable suppression period such that, if the alarm is triggered, its post-suppression timer is triggered and the alarm will not trigger again until the post suppression timer has expired. Post-suppression only applies to a particular instance of an alarm. Default suppression periods are as follows:

7.6.3.10(11)(a) Level 1 alarms: 0 minutes;

7.6.3.10(11)(b) Level 2 alarms: 5 minutes;

7.6.3.10(11)(c) Level 3 alarms: 8 hours; and

7.6.3.10(11)(d) Level 4 alarms: 2 days.

7.6.3.10(12) For both latching and non-latching alarms, the operator will be able to acknowledge the alarm. Acknowledging an alarm clears the alarm, the exit deadband, and suppression period. A device can go right back into alarm as soon as the entry delay elapses.

7.6.3.10(13) Hierarchical Alarm Suppression

7.6.3.10(13)(a) For each piece of equipment and zone, define its relationship (if any) to other equipment in terms of “source”, “load” or “system”.

7.6.3.10(13)(b) A component is a “source” if it provides resources to a downstream component.

7.6.3.10(13)(c) A component is a “load” if it receives resources from an upstream component.

7.6.3.10(13)(d) The same component can be both a load (receiving resources from an upstream source) and a source (providing resources to a downstream load).

7.6.3.10(13)(e) A set of components is a “system” if they share a load in common.

7.6.3.10(13)(f) For each system, there will be a System OK flag, which is either true or false.

7.6.3.10(13)(g) System OK will be true when all of the following are true:

- 7.6.3.10.13.(g).1 The system is proven on;
- 7.6.3.10.13.(g).2 The system is achieving its temperature and/or pressure set point(s) for at least 5 minutes; and
- 7.6.3.10.13.(g).3 The system is ready and able to serve its load.

7.6.3.10(13)(h) SystemOK will be false while the system is starting up or when enough of the system’s components are unavailable to disrupt the ability of the system to serve its load. This threshold will be proposed for each system by the Design-Builder and reviewed for acceptance by the Authority.

7.6.3.10(13)(i) By default, Level 1 through Level 3 component alarms will inhibit SystemOK. Level 4 component alarms will not affect SystemOK.

7.6.3.10(13)(j) The operator will have the ability to individually determine which component alarms will and will not inhibit SystemOK.

7.6.3.10(13)(k) The BMS will selectively suppress alarms for load components if SystemOK is false for the source system that serves that load.

7.6.3.10(13)(l) If SystemOK is false for a cooling water system, then only high-temperature alarms from loads will be suppressed.

7.6.3.10(13)(m) If SystemOK is false for a heating water system, then only low-temperature alarms from loads will be suppressed.

7.6.3.10(13)(n) If SystemOK is false for an air-side system, then all alarms from the loads will be suppressed.

7.6.3.10(13)(o) Hierarchical suppression will cascade through multiple levels of load-source relationship such that alarms at downstream loads will also be suppressed.

7.6.3.10(13)(p) The following types of alarms will never be suppressed by this logic:

7.6.3.10.13.(p).1 Life safety and Level 1 alarms;
7.6.3.10.13.(p).2 Failure-to-start alarms;
7.6.3.10.13.(p).3 Failure-to-stop alarms; and
7.6.3.10.13.(p).4 All alarms associated with critical environment areas including: Planned OR(s), Procedure Rooms, Airborne Isolation Rooms, AIR Anterooms, Pharmacy, Oncology Pharmacy and cleanrooms.

7.6.3.10(14) Time-based suppression. Calculate a time-delay period after any change in setpoint based on the difference between the controlled variable and the time of the change and the new setpoint. The default time delay period will be as follows:

7.6.3.10(14)(a) For thermal zone temperature alarms: 10 minutes per °C of difference but no longer than 120 minutes;

7.6.3.10(14)(b) For thermal zone temperature cooling requests: 5 minutes per °C of difference but no longer than 30 minutes; and

7.6.3.10(14)(c) For thermal zone temperature heating requests: 5 minutes per °C of difference but no longer than 30 minutes.

7.6.3.11 Energy Sub-Metering Systems and Energy Reporting

7.6.3.11(1) Provide all required meters, sensors, and trend logging equipment at end uses within the Facility to meet the energy monitoring requirements outlined in Appendix 1P [Metering Matrix].

7.6.3.11(2) All meters will be connected to an integrated energy management system to monitor, record, report, and analyze energy consumption. Coordinate electrical metering and the energy management system with the requirements of Section 7.7 Division 26.

7.6.3.11(3) Provide complete digital metering systems.

7.6.3.11(4) Provide runtime logs on all compressors included freezers.

7.6.3.11(5) Metering intervals will be 15 minutes.

7.6.3.11(6) Provide meter as listed in Appendix 1P [Metering Matrix].

7.6.3.11(7) Refer to measurement and verification section for more information on metering data storing and reporting.

7.6.3.11(8) Energy Reports

7.6.3.11(8)(a) System will include an easily configured energy reporting tool that provides the capabilities described in this section.

7.6.3.11(8)(b) The energy reporting tool will be accessible through the same user interface (Web browser or operator workstation software) as is used to manage the BMS.

7.6.3.11(8)(c) The energy reporting tool will be preconfigured to gather and store energy demand and consumption data from each energy source that provides metered data to the BMS. Meter data will be stored at 15-minute intervals. This data will be maintained in an industry standard SQL database for a period of not less than three (3) years.

7.6.3.11(8)(d) The energy reporting tool will allow the operator to select an energy source and a time period of interest (day, week, month, year, or date range) and will provide options to view the data in a table, line graph, bar graph, or pie chart. The tool will also allow the operator to select two or more data sources and display a comparison of the energy used over this period in any of the listed graph formats, or to total the energy used by the selected sources and display that data in the supported formats.

7.6.3.11(8)(e) The energy reporting tool will allow the operator to select and energy source and two time periods of

interest (day, week, month, year, or date range) and display a graph that compares the energy use over the two time periods in any of the graph formats listed in the previous paragraph. The tool will also allow the operator to select multiple energy sources and display a graph that compares the total energy used by these sources over the two time periods.

7.6.3.11(8)(f) The energy reporting tool will allow the operator to easily generate the previously described graphs "on the fly," and will provide an option to store the report format so the operator can select that format to regenerate the graph at a future date. The tool will also allow the user to schedule these reports to run on a recurring basis using relative time periods, such as automatically generating a consumption report on the first Monday of each month showing consumption over the previous month. Automatically generated reports will be archived on the server in a common industry format such as Adobe PDF or Microsoft Excel with copies e-mailed to a user editable list of recipients.

7.6.3.11(8)(g) The energy reporting tool will be capable of collecting and displaying data from all the connected meter types.

7.6.3.11(8)(h) The user will have the option of using multiple unit types. All selected sources will be automatically converted to the selected units. The user will similarly have the option of entering Facility area and occupancy hours and creating reports that are normalized on an area basis, an annual use basis, or an occupied hour basis.

7.6.3.11(8)(i) The user will have the option of entering benchmark data for an individual facility or a group of facilities.

7.6.3.11(8)(j) The user will have the option of displaying any or all of the following data on any chart, line, or bar graph generated by the energy reporting tool:

- 7.6.3.11.8.(j).1 Low/High/Average value of the metered value being displayed;
- 7.6.3.11.8.(j).2 Heating and/or Cooling Degree Days for the time period(s) being displayed; and
- 7.6.3.11.8.(j).3 The Environmental Index for the facilities and time periods being displayed.

7.6.3.11(8)(k) Provide dashboard configured as per the energy breakdown requirements as defined in Schedule 5 [Energy Guarantee] to assist the independent energy consultant assess the energy performance of the Facility. Provide all required KPIs.

7.6.3.11(8)(l) Provide a dedicated energy report per department (per AHU). Report for each department will include end-use breakdown and KPIs.

7.6.3.11(8)(m) ASHRAE Standard 147 Report: provide a daily report that shows the operating conditions of each chiller as recommended by ASHRAE Standard 147.

7.6.3.12 Controller Software

7.6.3.12(1) Furnish the following applications for building and energy management. All software application will reside and operate in the system controllers. Applications will be editable through operator workstation, web browser interface, or engineering workstation.

7.6.3.12(2) Provide software update on all controllers at Substantial Completion to the most current commercially available software version.

7.6.3.12(3) System security. User access will be secured using individual security passwords and user names. Passwords will restrict the user to the objects, applications, and system functions as assigned by the system manager. User log on/log off attempts will be recorded. The system will protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time will be user adjustable.

7.6.3.12(4) System coordination. Provide a standard application for the proper coordination of equipment. This application will provide the operator with a method of grouping together equipment based on function and location. This group may then be used for scheduling or other applications.

7.6.3.12(5) Scheduling. Provide the capability to execute control functions according to a user created or edited schedule. Each schedule will provide the following schedule options as a minimum:

7.6.3.12(5)(a) Weekly Schedule. Provide separate schedules for each day of the week. Each schedule will be able to include up to 5 occupied periods (5 start-stop pairs or 10 events);

7.6.3.12(5)(b) Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule has executed, the system will discard and replace the exception schedule with the standard schedule for that day of the week; and

7.6.3.12(5)(c) Holiday Schedules. Provide the capability for the operator to define up to 24 special or holiday schedules. These schedules will be repeated each year. The operator will be able to define the length of each holiday period.

7.6.3.12(6) Binary Alarms. Each binary object will have the capability to be configured to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.

7.6.3.12(7) Analog Alarms. Each analog object will have both high and low alarm limits. The operator will be able to enable or disable these alarms.

7.6.3.12(8) Alarm Reporting. The operator will be able to determine the action to be taken in the event of an alarm. An alarm will be able to start programs, print, be logged in the event log, generate custom messages, and display on graphics.

7.6.3.12(9) Remote Communication. The system will have the ability to transmit the alarm/event using the BACnet control network.

7.6.3.12(10) Demand Limiting

7.6.3.12(10)(a) The demand-limiting program will monitor Facility power consumption from signals generated by a pulse generator mounted at the Facility power meter or from a watt transducer or current transformer attached to the Facility feeder lines.

7.6.3.12(10)(b) The demand-liming program will predict the probable power demand such that action can be taken to prevent exceeding the demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates the demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.

7.6.3.12(10)(c) Demand-limiting parameters, frequency of calculations, time intervals, and other relevant

variables will be based on the means by which the local power company computes demand charges.

7.6.3.12(10)(d) Provide demand-limiting prediction and control for any individual meter monitored by the system or for the total of any combination of meters.

7.6.3.12(10)(e) Any implemented demand-limiting will not compromise Patient care functions or Patient Care Area environmental and thermal comfort.

7.6.3.12(11) Maintenance Management. The system will monitor equipment status and generate maintenance messages based upon user-designated runtimes, starts, and/or calendar data limits. Configure and enable maintenance triggers sent to the CMMS system (Maximo) to trigger either PM or DM tasks based on equipment manufacturer recommended maintenance schedule.

7.6.3.12(12) Sequencing. Provide application software based upon the sequence of operation to properly sequence chillers, boilers, pumps and additional system equipment to provide orderly start-up, operation, and shut-down of equipment.

7.6.3.12(13) PID (proportional-integral-derivative) Control. System will provide direct- and reverse-acting PID algorithms. Each algorithm will have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm will calculate a time-varying analog value that can be used to position an output or to stage a series of outputs. The calculation interval, PID gains, and other tuning parameters will be adjustable by a user with the correct security level.

7.6.3.12(14) Will stagger controlled equipment restart after power outage. Operator will be able to adjust equipment restart order and time delay between equipment restarts.

7.6.3.12(15) Energy Calculations. Provide software to allow instantaneous power or flow rates to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window average (e.g., rolling average). The algorithm will be flexible to allow window intervals to be user specified (e.g., 15 min, 30 min, 60 min). provide an algorithm that calculates a fixed-window average. A digital input signal will define the start of the window period (e.g., signal from a utility meter) to synchronize the fixed-window average with that used by the energy service provider.

7.6.3.12(16) Anti-Short Cycling. All binary output objects will be protected from short cycling by means of adjustable minimum on-time and off-time settings.

7.6.3.12(17) On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a setpoint. The algorithm will be direct-acting or reverse-acting and incorporate an adjustable differential.

7.6.3.12(18) Runtime Totalization. Provide software to totalize runtime for each binary input and output. Operator will be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified.

7.6.3.13 Controller

7.6.3.13(1) Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in this Division. Every device in the system which executes control logic and directly controls HVAC equipment will conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hard-wired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

7.6.3.13(2) Building Controllers (BCs). Each BC will conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L, and will be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

7.6.3.13(3) Advanced Application Controllers (AACs). Each AAC will conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and will be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

7.6.3.13(4) Application Specific Controllers (ASCs). Each ASC will conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and will be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

7.6.3.13(5) Smart Sensors (SSs). Each SS will conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and will be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

7.6.3.13(6) Each piece of equipment will be controlled by a single controller to provide stand-alone control in the event of communication

failure. All I/O points specified for a piece of equipment will be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.

7.6.3.13(7) Provide a separate BC or ACC for each AHU or other HVAC system. A controller may control more than one system provided that all points associated with the system are assigned to the same controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.

7.6.3.13(8) All controllers will use the same programming language.

7.6.3.13(9) All controllers and software will be BTL listed at the time of shop drawing submission.

7.6.3.13(10) Controllers will maintain all BIOS and programming information in the event of a power loss for at least 30 days.

7.6.3.13(11) All controllers are to have HOA switch control points feature.

7.6.3.14 Packaged Equipment Controls

7.6.3.14(1) Electronic controls packaged with any equipment provided under this contract will communicate directly with the Facility BMS. The BMS will communicate with these controls to read the information and change the control setpoints. The information to be communicated between the BMS and the controls will be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers will communicate with other BACnet objects on the network using the read (execute) property service as defined in clause 15.5 of Standard 135.

7.6.3.14(2) Controllers will be capable of stand-alone operation and will continue to provide control functions if the network connection is lost.

7.6.3.14(3) Controllers will contain sufficient I/ O capacity to control the target system.

7.6.3.14(4) Controllers will have a physical connection for a laptop computer or a portable operator’s tool.

7.6.3.14(5) The hardware will be suitable for the anticipated ambient conditions. Controllers used outdoors and/or in wet ambient conditions will be mounted within waterproof enclosures and rated for be expected ambient temperature conditions. Controllers used in conditioned space will be mounted in dust-

proof enclosures and be rated for expected operating temperature conditions.

7.6.3.14(6) Provide diagnostic LEDs for power, communication, and processor. All wiring connections will be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.

7.6.3.14(7) Controllers will maintain all BIOS and programming information in the event of a power loss for at least 30 days.

7.6.3.14(8) Controllers will be able to operate at 90% to 110% of nominal voltage rating.

7.6.3.14(9) Power supply for the controllers will be rated at minimum of 125 % of ASC power consumption and will be fused or current limiting type.

7.6.3.14(10) Packaged controllers will not be used for air handling units (AHUs) and VAV's.

7.6.3.14(11) Packaged "Master Controllers" residing within equipment controlling multiple equipment are not permitted. (Typical example are packaged master controller within one of the boilers controlling multiple boilers, or similar).

7.6.3.14(12) Electrochromic glazing control system/network will be standalone control system/network complete with all necessary infrastructure, hardware and software.

7.6.3.14(13) This system will be integrated with BMS/IBMP to a level as required/approved by the Authority. Intent is to limit this system to only control glazing, despite system wide capabilities to control other Building Systems.

7.6.3.15 Input/output Interface

7.6.3.15(1) Hard-wired inputs and outputs may tie into the BMS through BCs, AACs, ASCs.

7.6.3.15(2) All input points and output points will be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points will be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.

7.6.3.15(3) Binary inputs will allow the monitoring of on/off signals from remote devices. The binary inputs will provide a wetting current of at least 12 mA to be compatible with commonly available control devices and will be protected against contact bounce and noise.

Binary inputs will sense dry contact closure without application of power external to the controller.

7.6.3.15(4) Pulse accumulation inputs will conform to all binary input requirements and will also accumulate up to 10 pulses per second.

7.6.3.15(5) Analog inputs will allow the monitoring of low-voltage (0–10 Vdc), current (4–20 mA), or resistance (thermistor or RTD) signals. Analog inputs will be compatible with and field configurable to commonly available sensing devices.

7.6.3.15(6) Binary outputs will provide for on/off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on BCs and AACs will have three-position (on-off-auto) override switches and status lights. Outputs will be selectable for normally open or normally closed operation.

7.6.3.15(7) Analog outputs will provide a modulating signal for the control of end devices. Outputs will provide either a 0–10 Vdc or a 4–20 mA signal as required to properly control output devices. Analog outputs on BCs and AACs will have status lights and a two-position (auto-manual) switch and manually adjustable potentiometer for manual override. Analog outputs will not drift more than 0.4 % of range annually.

7.6.3.15(8) The use of tri-state outputs are not permitted.

7.6.3.15(9) I/O points will be universal type, i.e. controller input or output may be designated (in software) as either binary or analog type point with appropriate properties. ASCs are exempted from this requirement.

7.6.3.15(10) The system size will be expandable to at least twice the number of input/ output objects required for this Project. Additional controllers (along with associated devices and wiring) will be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this Project will not require any hardware additions or software revisions in order to expand the system.

7.6.3.16 Hard-wired Points

7.6.3.16(1) All control points used for control or equipment will be hard-wired points and not rely on the network for control. Demonstrate compliance with this clause by providing generic list of typical hard-wired points.

7.6.3.16(2) All control and monitoring points for critical environment rooms such as labs, pharmacy, cleanrooms, operating rooms, AIR

anterooms, AIR (isolation rooms), and designated outbreak control zone areas, will also be hard-wired points.

7.6.3.16(3) All areas and spaces subject to outbreak control zones and areas of refuge, will have dedicated controllers (installed within their fire compartment) with all hard-wired points, to support critical integrity of controls, during fire and smoke control management mode.

7.6.3.17 Software Points

7.6.3.17(1) Integrate all software points available via equipment BACnet interface.

7.6.3.18 Power Supplies

7.6.3.18(1) All BMS and controls hardware will be connected to UPS to ensure continued availability during utility power disruptions.

7.6.3.18(2) Power Supplies. Control transformers will be approved for installation in Canada. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with CEC requirements. Limit connected loads to 80 % of rated capacity.

7.6.3.18(3) Power Line Filtering. Provide internal or external surge protective devices for workstations and controllers.

7.6.3.18(4) Immunity to power and noise. Controllers and control equipment will be able to operate at 90 % to 110% of nominal voltage rating. Operation will be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m.

7.6.3.18(5) Power-fail restart. Controllers and control equipment to have power fail auto restart to ensure proper safety during power failure and a safe orderly recovery after power restoration.

7.6.3.18(6) Maximum one (1) department and/or Patient sleeping zone fire compartment can be served by single dedicated controls low voltage transformer and dedicated power breaker/circuit.

7.6.3.18(7) Coordinate with the Authority for the controls power distribution of the PLC controlled plants. Resiliency and robustness, as well as back-up are required for these plants.

7.6.3.19 Wiring

7.6.3.19(1) All wiring installations will comply with the Canadian Electrical Code and all applicable governing codes, statutes and ordinances.

7.6.3.19(2) All line voltage wiring will be approved products in approved Raceway according to Canadian Electrical Code and Division 26 requirements.

7.6.3.19(3) All low-voltage wiring will meet CEC Class 2 requirements. Low-voltage power circuits will be sub-fused when required to meet Class 2 current limit.

7.6.3.19(4) All wiring (line and low-voltage) will be installed in accordance with the wiring methods specified in Divisions 26, 27 and 28 in all areas of the Facility.

7.6.3.19(5) Do not install Class 2 wiring in Raceways containing Class 1 or line voltage wiring. Boxes and panels containing line-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

7.6.3.19(6) All wiring within enclosures will be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

7.6.3.19(7) All wiring will be installed as continuous lengths, with no splices permitted between termination points.

7.6.3.19(8) Size of Raceway and size and type of wire type will be the responsibility of Design-Builder in keeping with the manufacturer’s recommendations and CEC requirements, except as noted elsewhere in this Schedule.

7.6.3.19(9) Use colour-coded conductors throughout with conductors of different colours.

7.6.3.19(10) Adhere to this Schedule’s Division 26 requirements where Raceway crosses Facility expansion joints.

7.6.3.19(11) Design-Builder will maintain updated (record) wiring diagrams with terminations identified at the Facility.

7.6.3.19(12) All insulated wire to be copper conductors, approved and labelled for 90°C minimum service.

7.6.3.19(13) Life safety wiring Raceways to be a distinctive colour different from other wiring types.

7.6.3.20 Communication Wiring

7.6.3.20(1) All communication wiring will be run in conduit in all areas of the Facility.

7.6.3.20(2) Verify the integrity of the entire network following cable installation.

7.6.3.20(3) When a cable enters or exits a building, a lightning arrestor will be installed between the lines and ground. The lighting arrestor will be installed according to the manufacturer's instructions.

7.6.3.20(4) All runs of communication wiring will be unspliced length when that length is commercially available.

7.6.3.20(5) All communication wiring will be labeled to indicate origination and destination data.

7.6.3.20(6) BMS communication wiring will be provided in a distinct colour from other Facility network wiring.

7.6.3.20(7) BACnet MS/TP communications wiring will be installed in accordance with ASHRAE/ANSI Standard 135.

7.6.3.20(8) Ethernet and MS/TP cabling can be run together.

7.6.3.20(9) Fibre optics can be run with Ethernet and MS/TP cabling as long as conduit is bent to fibre optic standards, fibre optic cable is protected from damage by a protective sheath, and junction boxes are sized for fibre optic use.

7.6.3.21 Sensors

7.6.3.21(1) Provide sensors to achieve end-to-end accuracy specified in Table 1; refer to Section 7.6.3.3(2).

7.6.3.21(2) Install sensors in accordance with the manufacturer's recommendations.

7.6.3.21(3) Mount sensors rigidly and adequately for the environment in which the sensor operates.

7.6.3.21(4) Room temperature sensors will be installed on concealed junction boxes properly supported by wall framing.

7.6.3.21(5) All wires attached to sensors will be air sealed in their Raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

7.6.3.21(6) Sensors used in mixing plenums and at air handling unit discharge air will be of the averaging type.

7.6.3.21(7) All pipe-mounted temperature sensors will be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

7.6.3.21(8) Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.

7.6.3.21(9) Piping to the pressure ports on all pressure transducers will contain a capped test port located adjacent to the transducer.

7.6.3.21(10) All pressure transducers, other than those controlling variable air volume (VAV) boxes, will be located in field device panels, not on the equipment monitor or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.

7.6.3.21(11) All air and water differential pressure sensors will have gauge tees mounted adjacent to the taps. Water gauges will also have shutoff valves installed before the tee.

7.6.3.21(12) Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches will be hard-wired to de-energize equipment as described in the sequence of operation. Switches will require manual reset. Provide contacts that allow BMS to monitor safety switch status.

7.6.3.21(13) Duct mounted humidity sensors are not acceptable.

7.6.3.21(14) Sensor range will be suitable for the specific application.

7.6.3.21(15) Humidity sensors will not drift more than 1 % of full scale annually.

7.6.3.21(16) Provide matched calibrated sensors for differential temperature measurement applications.

7.6.3.21(17) All zone thermostats will be adjustable type, combination thermostats / humidistats with temperature and relative humidity readouts / display. The BMS will control the manual adjustment temperature range, will match CSA Z317.2 Table 1 range, and be able to lock out user changes if necessary. Provide combination sensors with CO2 monitoring in high occupancy rooms only. Zone temperature, relative humidity and CO2 will feedback to the BMS.

7.6.3.21(18) Provide pressure sensors and end switches at infectious control isolation dampers in ductwork to ensure isolation has been achieved.

7.6.3.21(19) Provide sensors to monitor outdoor air volumes, space CO2 levels, indoor and outdoor VOC and NOx, and other levels as required.

7.6.3.21(20) Provide continuously operating pressure differential sensors in the following spaces at minimum: OR spaces, MDR sterile storage, OR Sterile Supply Core, clean storages, AIR's (including anterooms), PER Rooms, any Pharmacy (includes Oncology

pharmacy) clean rooms and anterooms, Cyclotron vault room, Cyclotron Hot Lab Clean Rooms and associated anterooms, Cyclotron Production cGMP spaces/rooms, all imaging rooms in Section 7.3.1.1(15)(a), spaces where CSA Z317.2 requires continuous monitoring of the room/space pressure in addition to other space thermal parameters and other spaces as determined by the Authority where continuous is critical for safe operation. Provide continuous monitoring of other space parameters in accordance with CSA Z317.2. Refer to HMI requirements in this Section 7.6. In addition, all OR's rooms will have occupancy sensors to provide feedback for potential unoccupied mode ventilation reduction strategies.

7.6.3.21(21) Provide particle count sensors downstream of all HEPA filter installations.

7.6.3.21(22) Provide combination type sensors (consisting of temperature, relative humidity and CO2 sensors) throughout the Facility. In addition to thermal zone sensors, each enclosed room (not including Patient washrooms, Patient Room ensuite washrooms, public washrooms and staff washrooms) will have dedicated combination sensor (regardless whether or not the thermal zone includes more than one room/space). Mercury-containing components are not permitted.

7.6.3.21(23) For the Secure Room, provide electronic, flat plate type (transducer) temperature sensor located flush mount on the ceiling surface. Temperature control for the Secure Room will be managed remotely at the nearby nursing station.

7.6.3.21(24) Provide combination temperature, humidity, CO2 sensors for all rooms/spaces listed as category C in Appendix 1H [Equipment and Furniture], requiring environmental parameters monitoring.

7.6.3.21(25) Provide local pressure control for each isolation room and anteroom. Provide a local annunciator panel located in the corridor outside each of these rooms. Refer to other pressure control requirements in this Section 7.6.

7.6.3.21(26) Occupancy sensors from the lighting control systems will be able to detect the presence of people within a room and indicate occupancy status to the BMS system, with this information accessible by any BMS controller in the system. Occupancy sensor delays and system responses to occupancy/vacancy will be software adjustable through the user interface and will not require manual adjustment at the sensor.

7.6.3.21(27) Outdoor air temperature sensors.

7.6.3.21(27)(a) Each building within the Facility will have a separate outdoor air temperature sensor.

7.6.3.21(27)(b) Each air handling unit processing outdoor air will have a dedicated outdoor air temperature sensor.

7.6.3.21(27)(c) Outdoor air sensors will be located on the north or east side of the Facility with a waterproof enclosure and sun shield to minimize the effects of solar loading.

7.6.3.21(28) Provide a human machine interface (HMI) for display, monitoring and adjustment of zone environment parameters in the following spaces at a minimum: OR spaces, surgical suites, MDR sterile storage, OR Sterile Supply Core, clean storages, AIR's, (including anterooms), PER Rooms, any Pharmacy (includes Oncology pharmacy), clean rooms and anterooms, Cyclotron vault room, Cyclotron Hot Lab Clean Rooms and associated anterooms, Cyclotron Production cGMP spaces/rooms, all imaging rooms in Section 7.3.1.1(15)(a) and spaces where CSA Z317.2 requires continuous monitoring of the room/space pressure in addition to other space thermal parameters, and other spaces as determined by the Authority such that real time data is available at the point of care. For each application provide display, monitoring and adjustment to the following parameters: space pressure, air change rate, temperature, humidity, door contact switch status, occupancy mode and lighting level. In addition to BMS integration, provide local audio and visual alarms (pressure differential setpoint loss) at the room entrance and Nursing Station, and at the local monitoring station if applicable. Users will be able to silence audio alarms through BMS and at the HMI and at the Nursing Station.

7.6.3.21(29) Sensors with a local display will be clearly visible while standing on the floor or from catwalks/platforms where provided.

7.6.3.22 Motorized Control Dampers

7.6.3.22(1) Type. Outdoor and return air mixing dampers and face-and-bypass dampers will be parallel-blade and will direct airstreams toward each other. Other modulating dampers will be opposed-blade. Two-position shut-off dampers will be parallel- or opposed-blade.

7.6.3.22(2) Leakage. Damper will be AMCA rated for leakage class 1A at 250 Pa static pressure differential.

7.6.3.22(3) All dampers will be modulating type, unless noted otherwise.

7.6.3.22(4) Floating actuators are not acceptable for modulating service.

7.6.3.22(5) All control dampers will have spring-return mechanism or electronic failsafe, configured for specified fail position.

7.6.3.22(6) Provide damper position feedback output for all motorized dampers.

7.6.3.22(7) Provide a visible and accessible indication of damper position on the drive shaft ends.

7.6.3.22(8) Dampers blades, axles, and linkages will operate without binding. On multiple assemblies, all sections will open and close simultaneously.

7.6.3.22(9) All dampers, damper actuators, manual operation handles, and linkages will be fully accessible to maintenance Staff by either Direct Access including pathway, platform or standard A-frame platform ladder.

7.6.3.23 Smoke Dampers

7.6.3.23(1) Smoke dampers will be UL/ULC approved for use in passive systems, smoke control systems, and smoke management systems.

7.6.3.23(2) Smoke dampers will be UL/ULC-rated leakage Class 1.

7.6.3.23(3) Actuators will be factory-mounted as required by UL 555S / ULC-S112.1.

7.6.3.23(4) Ensure smoke dampers function properly and respond to the proper fire alarm system general, zone, and/or detector trips.

7.6.3.23(5) All dampers, linkages and fusible links will be fully accessible to maintenance Staff by either Direct Access including pathway, platform or standard A-frame platform ladder.

7.6.3.24 Control Valves

7.6.3.24(1) Control valves will be installed so that they are accessible and serviceable and so that actuators may be serviced and removed without interference from structure or other pipes and/or equipment. All control valves serving major equipment (other than terminal units) should be installed within hand reach from floor level.

7.6.3.24(2) Isolation valves (upstream and downstream) will be installed so that the control valve body may be serviced without draining the supply/return side piping system. Unions will be installed at all connections to screw-type control valves. Where grooved components are used, install grooved end control valves.

7.6.3.24(3) Provide manual bypass valves around all control valves serving various equipment (except terminal units such as reheat coils, unit heaters, forced flow heaters, and similar) to allow uninterrupted operation during valve servicing.

7.6.3.24(4) All control valves will be modulating type, unless noted otherwise.

7.6.3.24(5) Provide valve position status output for all control valves.

7.6.3.24(6) All control valves will have spring-return mechanism or electronic failsafe configured for specified fail position with the exception of reheat coil, unit heater and force flow heater control valves.

7.6.3.24(7) Where three way valve functionality is needed, use a true three way valve and not a pair of ganged two way valves with connecting linkages.

7.6.3.24(8) For all AHUs, provide industrial grade control valves with extended rangeability of 200:1, turndown ratio of 100:1 and close off pressure of 1.5 times the dead head of system pump. In addition, all actuators will be waterproof. Provide 50% redundancy on all control valves serving AHU's.

7.6.3.24(9) Control valves will fail normally open or closed as follows:

- 7.6.3.24(9)(a) Zone valves – normally open last position;
- 7.6.3.24(9)(b) Heating coils at air handlers – normally open;
- 7.6.3.24(9)(c) Chilled water control valves at air handlers – normally closed;
- 7.6.3.24(9)(d) Steam control valves; and
- 7.6.3.24(9)(e) All other valves – normally open, or closed or last position as required to provide safe and reliable operation under failure situation.

7.6.3.24(10) Control Valves – Hydronic.

- 7.6.3.24(10)(a) In general, provide pressure independent control valves PICV. For two position 50 mm or less, use PICVs complete with characterized, equal percentage (EQM) control plug. Ball valves are not permitted for two-way applications. For 3-way valves 50 mm or less, use actuated ball type control valves. In grooved end system use an actuated Masterseal butterfly valve.
- 7.6.3.24(10)(b) Valve actuator and trim minimum close-off (differential) pressure rating will be 150% of total

system (pump) head for two-way valves and the greater of 300 % of pressure differential between ports A and B at design flow or 100% of total system (pump) head for 3-way valves.

7.6.3.24(10)(c) Sizing Criteria: Two-position service will be line size to minimize pressure drop, but maximum 14 kPa [2 PSI]. Modulating service will be sized to maintain adequate control valve authority to provide stable control of the load served, but maximum 21 kPa [3 PSI].

7.6.3.24(11) Control Valves – Steam.

7.6.3.24(11)(a) Valve actuator and trim minimum close-off (differential) pressure rating will be 150% of operating (inlet) pressure.

7.6.3.24(11)(b) Sizing Criteria.

7.6.3.24.11.(b).1 Two-position service: pressure drop 10% to 20% of inlet pressure.

7.6.3.24.11.(b).2 Modulating service (100 kPa or less): pressure drop 80 % of inlet pressure.

7.6.3.24.11.(b).3 Modulating service (101 kPa to 350 kPa): pressure drop 50% of inlet pressure.

7.6.3.24.11.(b).4 Modulating service (over 350 kPa): pressure drop 50% of inlet pressure.

7.6.3.25 Valve and Damper Actuators

7.6.3.25(1) Floating actuators are not acceptable for modulating service.

7.6.3.25(2) Stall Protection. Mechanical or electronic stall protection will prevent actuator damage throughout the actuator’s rotation.

7.6.3.25(3) Spring-return Mechanism. Actuators used for power-failure and safety applications will have an internal mechanical spring-return mechanism or an UPS.

7.6.3.25(4) Manual Positioning. Operators will be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators will have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity will have a manual crank.

7.6.3.25(5) Provide fast acting actuators on dampers serving following:

7.6.3.25(5)(a) Fume hood(s);

7.6.3.25(5)(b) Biosafety cabinet(s);

7.6.3.25(5)(c) AIR space(s) (including AIR OR) (exhaust air only);

7.6.3.25(5)(d) Anteroom(s) (exhaust air only);

7.6.3.25(5)(e) Clean Rooms (exhaust air only);

7.6.3.25(5)(f) Cyclotron Vault;

7.6.3.25(5)(g) Ventilated pass-thru chambers(s) (exhaust air only);

7.6.3.25(5)(h) Smoke/Fire dampers;

7.6.3.25(5)(i) Generator radiator discharge/recirculation/make-up air dampers; and

7.6.3.25(5)(j) Radioactive areas as defined by CNSC.

7.6.3.26 Airflow Monitoring

7.6.3.26(1) Provide airflow meters where required as part of the sub-metering system, where required for LEED prerequisites/credits, and where specified elsewhere in the Statement of Requirements. Refer to Appendix 1P [Metering Matrix].

7.6.3.26(2) Provide airflow monitoring of all outdoor air intakes except for underground parking outside air and supply air ventilation.

7.6.3.26(3) Provide airflow monitoring of supply air and return/exhaust air from all air handling units.

7.6.3.26(4) Provide airflow monitoring of all exhaust systems larger than 2,500 L/s except for the underground parking exhaust system.

7.6.3.26(5) All airflow monitoring stations will comply with minimum end-to-end accuracy requirements specified in Table 1.

7.6.3.26(6) Provide type of flow meter suitable for application and level of air contamination. Selected device will maintain specified accuracy throughout expected range of flow variation for specific system application.

7.6.3.27 Fluid Flow Meters

7.6.3.27(1) Provide fluid flow meters where required as part of the sub-metering system and as required for optimized system operation. Refer to Appendix 1P [Metering Matrix].

7.6.3.27(2) All fluid flow meters to comply with minimum end-to-end accuracy requirements specified in Table 1. Only ultrasonic or electromagnetic fluid flow meters are acceptable. Use of turbine type fluid flow meters is not permitted.

7.6.3.27(3) Each meter will be individually calibrated and tagged accordingly against the manufacturer's primary standards which will be accurate to within 0.1 % of flow rate and traceable to the National Institute of Standards and Technology (NIST).

7.6.3.27(4) All wetted metal parts will be stainless steel.

7.6.3.27(5) Required accuracy will be maintained through expected range of flow variation for specific system application.

7.6.3.27(6) Provide type of flow meter suitable for application and service fluid. For hydronic flow meters, provide electromagnetic flow-tube type or ultrasonic type, to reduce maintenance requirements.

7.6.3.27(7) Strap-on flow meters are not permitted.

7.6.3.28 Thermal Energy Meters

7.6.3.28(1) Provide thermal energy meters where required as part of the sub-metering system. Refer to Appendix 1P [Metering Matrix].

7.6.3.28(2) All thermal energy meters to comply with minimum end-to-end accuracy requirements specified in Table; refer to Section 7.6.3.3(2).

7.6.3.28(3) All meters will be factory calibrated and traceable to NIST with certification.

7.6.3.29 Auxiliary Control Devices

7.6.3.29(1) Flow switches

7.6.3.29(1)(a) Flow-proving switches will be paddle (water service only) or differential pressure type (air or water service). Switches will be ULC listed, single-pole double-throw (SPDT) snap-acting, and pilot duty rated (125 VA minimum). Paddle switches will have adjustable sensitivity. Differential pressure switches will have scale range and differential suitable for intended application.

7.6.3.29(1)(b) Use correct paddle for pipe diameter.

7.6.3.29(2) Relays

7.6.3.29(2)(a) Control relays will be plug-in type, ULC listed, and will have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage will be suitable for application.

7.6.3.29(2)(b) Time delay relays will be solid-state plug-in type, UL listed, and will have adjustable time delay. Delay will be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage will be suitable for application.

7.6.3.29(3) Override timers

7.6.3.29(3)(a) Unless implemented in control software, override timers will be spring-wound line voltage, ULC listed, with contact rating and configuration required by application. Provide 0–6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

7.6.3.29(4) Current transmitters

7.6.3.29(4)(a) AC current transmitters will be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4–20 mA two-wire output. Full-scale unit ranges will be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy will be ±1 % full-scale at 500-ohm maximum burden.

7.6.3.29(4)(b) Transmitter will meet or exceed ANSI/ISA S50.1 requirements and will be CSA approved.

7.6.3.29(5) Current transformers

7.6.3.29(5)(a) AC current transformers will be CSA approved and will be completely encased (except for terminals) in approved plastic material.

7.6.3.29(5)(b) Transformers will be available in various current ratios and will be selected for ±1 % accuracy at 5 A full-scale output.

7.6.3.29(6) Voltage transmitters

7.6.3.29(6)(a) AC voltage transmitters will be self-powered single-loop (two-wire) type, 4–20 mA output with zero and span adjustment.

7.6.3.29(6)(b) Adjustable full-scale unit ranges will be 100–130 Vac, 200–250 Vac, 250–330 Vac, and 400–600 Vac. Unit accuracy will be ±1 % full-scale at 500-ohm maximum burden.

7.6.3.29(6)(c) Transmitters will meet or exceed ANSI/ISA S50.1 requirements and will be UL/CSA recognized at 600 Vac rating.

7.6.3.29(7) Voltage transformers

7.6.3.29(7)(a) AC voltage transformers will be CSA approved and have built-in fuse protection.

7.6.3.29(7)(b) Transformers will be suitable for ambient temperatures of 4 °C–55 °C (40°F–130 °F) and will provide ±0.5 % accuracy at 24 Vac and 5 VA load.

7.6.3.29(8) Power monitors

7.6.3.29(8)(a) Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0 A current inputs or 0–0.33 V inputs.

7.6.3.29(8)(b) 1.0 % full-scale true root mean square (RMS) power accuracy, +0.5 Hz, voltage input range 120–600 V, and auto range select.

7.6.3.29(8)(c) Under voltage/phase monitor circuitry.

7.6.3.29(8)(d) Current transformers having a 0.5 % full scale accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

7.6.3.29(8)(e) Provide the same type and manufacturer that is used on the main electrical systems.

7.6.3.29(9) Current switches

7.6.3.29(9)(a) Current-operated switches will be self-powered, solid-state with adjustable trip current. Select switches to match application current and BMS system output requirements.

7.6.3.29(10) Pressure transducers

7.6.3.29(10)(a) Transducers will have linear output signal and field-adjustable zero and span.

7.6.3.29(10)(b) Transducer sensing elements will withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

7.6.3.29(10)(c) Water pressure transducer diaphragm will be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer will have 4–20 mA output, suitable mounting provisions, and block and bleed valves.

7.6.3.29(10)(d) Water differential pressure transducer diaphragm will be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure will be 2000 kPa (300psi.) Transducer will have 4–20 mA output, suitable mounting provisions, and 5-valve manifold.

7.6.3.29(11) Differential pressure switches

7.6.3.29(11)(a) Differential pressure switches (air or water service) will be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and will have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

7.6.3.29(12) Pressure-electric (PE) switches

7.6.3.29(12)(a) Will be metal or neoprene diaphragm actuated, operating pressure rated for 0–175 kPa (0–25 psig), with calibrated scale minimum setpoint range of 14–125 kPa (2–18 psig) minimum, UL listed.

7.6.3.29(12)(b) Provide one- or two-stage switch action as required by application. Electrically rated for pilot duty service (125 VA minimum) and/or for motor control.

7.6.3.29(12)(c) Switches will be open type (panel-mounted) or enclosed type for remote installation. Enclosed type will be NEMA 1 unless otherwise specified.

7.6.3.29(12)(d) Each pneumatic signal line to PE switches will have permanent indicating gauge.

7.6.3.30 Variable Frequency Drives

7.6.3.30(1) Provide complete VFDs for equipment and applications designated in Schedule 1. Standard of acceptance is ABB.

7.6.3.30(2) All VFDs and ancillary components will be procured by one supplier in order to assure an integrated system and one point of contact for service.

7.6.3.30(3) Manufacturer will have been engaged in the production of this type of equipment for a minimum of ten years. Manufacturer will have local representation that locally stocks standard drives, modification kits, and spare parts for the power input range of drives used in this Facility.

7.6.3.30(4) For VFD warranty requirements refer to Appendix 1X [Warranty Requirements].

7.6.3.30(5) Each VFD, with all standard and optional features, will be factory packaged in a ULC-rated and listed enclosure most appropriate for each application and location, completely assembled and tested by the manufacturer in an ISO9001 facility. VFD assembly, associated options and peripherals will comply with the applicable requirements of the latest standards of ANSI, IEEE, NEMA, and the Canadian Electrical Code.

7.6.3.30(6) The VFD will meet product standard EN 61800-3 for the First Environment restricted level (Category C2). Base drives that only meet the Second Environment (Category C3, C4) will be supplied with filters to bring the drive-in compliance with the First Environment levels.

7.6.3.30(7) The VFD assembly, including the bypass (bypass is required for all VFDs), will be seismically certified and label as such. Seismic importance factor of 1.5 rating is required and will based upon actual shake table test data as defined by ICC AC-156.

7.6.3.30(8) VFDs to be of the Pulse-Width Modulated (PWM) type with a full wave diode bridge converter to convert incoming fixed voltage/frequency to a fixed DC voltage. The PWM strategy will incorporate a microprocessor to handle all logic functions as well as the complex, sine-coded PWM generating algorithms that control output stage switching.

7.6.3.30(9) The variable frequency drives will convert three-phase, 60 Hz utility power to proportionally variable voltage and frequency, three-phase, AC power using the latest insulated-gate bipolar transistor (IGBT) technology for step less motor speed control of one or more three-phase induction motors. The VFD output waveform to be the PWM or Vector type waveform producing smooth torque at low frequencies and low motor current harmonics.

7.6.3.30(10) VFDs will be capable of controlling and setup for either variable or constant torque load as follows:

7.6.3.30(10)(a) Variable torque: loads such as centrifugal fans, pumps, and compressors.

7.6.3.30(10)(b) Constant torque: loads such as positive displacement pumps, reciprocating compressors, and screw compressors.

7.6.3.30(11) VFD will provide full rated output from voltages +/-10% of nominal voltage. Overload rating of the drive will be minimum 110% of its normal duty current rating for 1 minute in every 10 minutes.

7.6.3.30(12) VFDs will be capable of continuous full load operation under the installed environmental operating conditions.

7.6.3.30(13) All VFDs will have the same customer interface, including digital display, and keypad regardless of horsepower rating.

7.6.3.30(14) VFDs will have cooling fans. Fans will be replaceable without requiring VFD removal or removal of circuit boards. VFD cooling fans will cycle via thermal sensing and not operator continuously.

7.6.3.30(15) Loss-of-load (broken belt / broken coupling) relay output. The drive will be programmable to signal the loss-of-load condition via keypad warning, relay output, and / or over the serial communications bus.

7.6.3.30(16) If the input reference is lost, the VFD will give the user the option of: (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user.

7.6.3.30(17) VFDs will be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).

7.6.3.30(18) VFDs will have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts will be programmable.

7.6.3.30(19) VFDs will also be capable of DC injection braking that can be employed to stop a freewheeling motor before starting to prevent overvoltage nuisance tripping.

7.6.3.30(20) VFDs will be capable of automatically extending the ramp down time to keep the drive from tripping on overvoltage caused by regeneration of power by the load.

7.6.3.30(21) Line Conditioning and Filtering. Refer to harmonic filter requirements under Section 7.7.2.21(10). In addition to the requirements in Division 23 and Division 26:

7.6.3.30(21)(a) Provide a coordinated AC transient surge protection system consisting of 4 MOVs (phase to phase and phase to ground), a capacitor clamp, and internal chokes. The MOV's will have an energy dissipation capability rated for the potential surge exposure at the VFD inputs VFDs that do not include coordinated AC transient surge protection will include an external SPD (Surge Protective Device) at the VFD input.

7.6.3.30(21)(b) Provide EMI / RFI filters. VFD assembly to be CE Marked and comply with product standard EN 61800-3 for the First Environment restricted level (Category C2). Second environment (Category C3, C4) is not acceptable. Submit certified test reports with the shop drawing Submittal confirming compliance.

7.6.3.30(22) VFDs will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise. VFDs will have selectable software for optimization of motor noise, energy consumption, and motor speed control.

7.6.3.30(23) VFD Interface:

7.6.3.30(23)(a) Provide a backlit LCD display. The display will be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). All VFD faults will be displayed in English words.

7.6.3.30(23)(b) The keypad will include Hand-Off-Auto selections and manual speed control.

7.6.3.30(23)(c) The drive will incorporate "bump less transfer" of speed reference when switching between "Hand" and "Auto" modes.

7.6.3.30(23)(d) There will be a built-in time clock in the VFD keypad. The clock will have a battery backup with 10 years minimum life span. The clock will date and time stamp faults and record operating parameters at the time of fault. VFD programming will be held in non-volatile memory and is not dependent on battery power.

7.6.3.30(23)(e) All applicable operating values will be capable of being displayed in engineering (user) units. Minimum display values will be:

7.6.3.30.23.(e).1 Output Frequency;
7.6.3.30.23.(e).2 Motor Speed (RPM, %, or Engineering units);
7.6.3.30.23.(e).3 Motor Current;
7.6.3.30.23.(e).4 Motor Torque;
7.6.3.30.23.(e).5 Motor Power (kW);
7.6.3.30.23.(e).6 DC Bus Voltage; and
7.6.3.30.23.(e).7 Output Voltage.

7.6.3.30(23)(f) Provide a fireman's override input.

7.6.3.30(24) Serial Communications. All VFDs will have a TIA-485 (RS-485) port as standard for interface with Facility BACnet IP network. BACnet protocol will be certified with BTL listing. The use of non-certified protocols are not allowed.

7.6.3.30(24)(a) Serial communication minimum capabilities will include: run-stop controls; speed setpoint adjustment; output speed / frequency; current (in amps); percent torque; power (kW); kilowatt hours; operating hours; drive temperature; all diagnostic warming and fault information; monitoring of VFD relay output status, digital input status, and all analog input and output values; remote VFD fault reset.

7.6.3.30(24)(b) Serial communication minimum capabilities when in bypass mode will include: bypass run-stop control; monitoring bypass relay output status and all digital input status; all bypass diagnostic warning and fault information; remote bypass fault reset; control of bypass digital and analog outputs.

7.6.3.30(25) VFD Bypass. Bypasses will be furnished and mounted by the manufacturer as required for the application and specified in Division 22, 23, 25 or 26. All VFD with bypass configurations will be ULC listed by the manufacturer as a complete assembly and carry a UL508 label.

7.6.3.30(25)(a) A complete factory wired and tested bypass system consisting of a door interlocked; pad lockable circuit breaker, output contactor, bypass contactor, and fast acting VFD input fuses. UL Listed motor overload protection will be provided in both drive and bypass modes.

7.6.3.30(25)(b) Standalone keypad with LCD display.

7.6.3.30(25)(c) The VFD and bypass package will have a UL listed short circuit current rating (SCCR) of 100,000 Amps

and this rating will be indicated on the UL data label.

7.6.3.30(25)(d) Motor protection from single phase power conditions - the bypass system will be able to detect a single-phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single-phase input power indication.

7.6.3.30(25)(e) The bypass system will be designed for stand-alone operation and will be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications will remain functional even with the VFD removed. Bypass systems that do not maintain full functionality with the drive removed are not acceptable.

7.6.3.30(25)(f) Serial communications – the bypass will be capable of being monitored and / or controlled via serial communications that match the VSD.

7.6.3.30(25)(g) The bypass serial communications will allow control of the drive/bypass (system) digital outputs via the serial interface. This control will be independent of any bypass function or operating state. All system analog and digital I/O will be capable of being monitored by the BMS system.

7.6.3.30(25)(h) Provide manual or automatic transfer to bypass. Drive faults for automatic transfer to bypass mode will be user selectable for the following drive fault conditions:

7.6.3.30.25.(h).1 Over current;
7.6.3.30.25.(h).2 Over voltage;
7.6.3.30.25.(h).3 Under voltage; and
7.6.3.30.25.(h).4 Loss of analog input.

7.6.3.30(25)(i) The bypass will include the ability to select the operating mode of the system (VFD/Bypass) from either the bypass keypad or digital input.

7.6.3.30(25)(j) Provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks will remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact will operate in VFD and bypass modes. The terminal

strip will allow for independent connection of up to four (4) unique safety inputs.

7.6.3.30(25)(k) Fireman’s Override Mode: Programmable override input which will allow the user to configure the unit to acknowledge some digital inputs, all digital inputs, ignore digital inputs or any combination of the above to suit the governmental authorities. The Override action may be initiated via the serial communications link.

7.6.3.31 Identification

7.6.3.31(1) Provide permanent warning labels to all equipment that can be automatically started by the control system. Permanent warning labels will be affixed to all motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

7.6.3.31(2) Control equipment and device labelling.

7.6.3.31(2)(a) Permanently label or code each point of field terminal strips to show the instrument or item served.

7.6.3.31(2)(b) Identify all control panels. Install panel identification label on outside of panel door.

7.6.3.31(2)(c) Identify all other control components with permanent labels. All plug-in components will be labeled such that label removal of the component does not remove the label.

7.6.3.31(2)(d) Labels and tags will match unique identifiers shown on the record drawings.

7.6.3.31(2)(e) All sensors and actuators not in occupied areas will be tagged.

7.6.3.31(2)(f) Each device inside enclosures will be tagged.

7.6.3.31(3) Manufacturers' nameplates and certification/approval labels will be visible and legible after equipment is installed.

7.6.3.31(4) Identification of wires

7.6.3.31(4)(a) All wiring and cabling, including that within factory-fabricated panels will be labeled at each end of termination with control system address or termination number (and reflected in As-Built control shop drawings).

7.6.3.31(4)(b) Tag each network wire with a common identifier on each end.

7.6.3.31(4)(c) Tag each power source with the panel and breaker number it is fed from.

7.6.3.31(4)(d) Identify low voltage conduit runs as BMS conduit, power feeds not included.

7.6.3.31(4)(e) Identify each electric box, junction box, utility box with permanent label. Provide control company label.

7.6.3.31(4)(f) For conduit runs more than 2.4 m between junction boxes in one room, place identifier at least every 2.4 m.

7.6.3.31(4)(g) Place identify on each side where a conduit passes through a wall or other inaccessible path.

7.6.3.31(4)(h) Identify BMS communication conduits in same manner as above.

7.6.3.31(5) Provide tags for all control valves indicating service and number.

7.6.3.31(6) Provide tags for all motorized dampers indicating service and number.

7.6.3.32 Programming

7.6.3.32(1) Coordinate with the Authority to provide adequate servers internal memory for the specified sequence of operation and trend logging of all points at 5-minute intervals for a period of 2-years; some critical areas and departments (such as labs, pharmacies, cGMP areas) subject to regulatory certification as well as Operating Rooms and MDR will require 1-minute intervals, as approved by the Authority. Provide additional memory to support trend logs back-ups.

7.6.3.32(2) All equipment and point naming conventions for all BMS points will follow the ASHRAE 223P Building Interoperability with Bricks and Haystacks standard customized by Design-Builder for the Facility.

7.6.3.32(3) Provide all programming for each system to provide a fully operating system under all operating conditions.

7.6.3.32(4) Imbed into the control program sufficient comment statements to clearly describe each section of the program.

7.6.3.32(5) Use the appropriate programming types. All techniques used will provide actions for all possible situations and will be documented.

7.6.3.32(6) All setpoints, timers, deadbands, PID gains, etc. will be adjustable by the user with appropriate access level. Software points will be used for these variables. Fixed scalar numbers will not be embedded in programs except for physical constants and conversion factors.

7.6.3.32(7) Values for all points, including read (hardware) points used in control sequences will be capable of being overridden by the user with appropriate access level. If hardware design prevents this for hardware points, they will be equated to a software point, and the software point will be used in all sequences. Exceptions will be made for machine or life safety.

7.6.3.33 Automatic Fault Detection Diagnostics and Reporting

7.6.3.33(1) Provide BMS complete with AFDDR with following minimum features:

7.6.3.33(1)(a) Detection and diagnostics platform, capable of rule-based algorithms and pattern recognition techniques, with portfolio views, building and system-level interactive views, system performance auditing (including KPI's) and an actionable Insight management portal,

7.6.3.33(1)(b) Energy Information System (EIS) platform that has portfolio-level and building-level energy management capabilities, including powerful energy baselining, multiple resource metering and interactive views with flexible perspectives. Energy Management Information System (EMIS) will encompass Energy Monitoring, Targeting & Reporting with weather normalized baselining, benchmarking and other advanced energy features.

7.6.3.33(2) Configure the AFDDR software to ensure Facility Building Systems remain continuously optimized and the need for fault diagnosis by the Facility operator is minimized.

7.6.3.33(3) Ensure the AFDDR software will record and provide reports of the BMS controller database software modification instances, Facility air quality, key performance indication of central system HVAC equipment control loops, key performance indication of zone control loops, occupant comfort, energy performance, ability to create virtual metering utilizing the BMS points to allow drill down capability from the main metering points to facilitate the operators

in isolating poorly performing systems, operation / machine fault, manual override and other customizable web-accessible reports available to the Authority.

7.6.3.33(4) AFDDR software vendor will advise BMS of all points necessary to meter or build virtual meters that optimize AFDDR function.

7.6.3.33(5) AFDDR Software will provide customizable web-accessible reports available to the Authority, with rules and dashboard customized as required by the Authority.

7.6.3.33(6) Fault detection software will include prioritized troubleshooting steps in layman's terms for the operator to correct the faults with each alarm point; refer to Section 5.6.28.

7.6.3.34 Measurement and Verification (M&V)

7.6.3.34(1) Provide a complete measurement and verification (M&V) system for collection and storage of Facility energy and water consumption and performance to confirm Facility performance.

7.6.3.34(2) Provide all physical and virtual meters as required to meet the intent of the "metering matrix", Appendix 1P [Metering Matrix].

7.6.3.34(3) Provide a complete digital metering system to monitor and track electricity, thermal meter, and domestic water measurements of the Facility via the BMS.

7.6.3.34(4) File format. Meters and points will be read and stored every 15 minutes.

7.6.3.34(5) The software will allow the user to view instantaneous readings of voltage, current, energy, power, phase angle, present and peak demand from all electricity meters.

7.6.3.34(6) The software will allow the user to view all meter measurements in either metric or imperial units for any thermal or water meter.

7.6.3.34(7) The software will have the ability to export data into reporting applications (e.g. Web, Excel and notepad).

7.6.3.34(8) The software will store measurements for a minimum period of 36 months. Measurements will commence from the date of occupancy and be stored for the entire duration of the measurement and verification period.

7.6.3.34(9) The software will include service menus for diagnostic monitoring of the metering equipment.

7.6.3.34(10) The software will allow remote access through either a modem/telephone link or Internet access. Provide security access

control to assign permission levels for remote access. Software will reside on the Authority servers.

7.6.3.34(11) Integrate this system with BMS and IBMP.

7.6.3.34(12) Output file format and storage.

7.6.3.34(12)(a) Data will be recorded every hour.

7.6.3.34(12)(b) Data will be provided in comma separated value (.CSV) files.

7.6.3.34(12)(c) Each row in the output file will represent a successive sample time.

7.6.3.34(12)(d) Include a time stamp for each line in the file.

7.6.3.34(12)(e) Separate each field by a single comma character.

7.6.3.34(12)(f) Each required monitoring point will contain a unique and understandable identifier.

7.6.3.34(12)(g) Each required monitoring point will be identified with a unique and understandable column.

7.6.3.34(12)(h) All recorded data is to be stored on the Authority server(s).

7.6.3.34(12)(i) Provide data files to the Authority in electronic format.

7.6.3.34(13) The system will be capable of storing data for a minimum of all metering points for a period of no less than 36 months.

7.6.3.34(14) The BMS and IBMP will be utilized for the M&V process. All energy measurement points (mechanical and electrical) will be connected to the BMS for energy and water monitoring and calculation.

7.6.3.34(15) Division 22 and 23 energy metering devices will be connected directly to the BMS system. The BMS will provide for continuous monitoring of all related M&V metering points.

7.6.3.34(16) BMS system will connect separately to the main incoming electrical utility meter and other electrical sub-meters through BACnet interface connection to measure the total power consumption and subsystems of the Facility.

7.6.3.34(17) To reconcile actual energy use to predicted energy use, energy by end-use will be metered as indicated in Appendix 1P [Metering Matrix].

7.6.3.34(18) Energy metering for mechanical systems.

7.6.3.34(18)(a) Divisions 22 and 23 energy metering will include various thermal energy meters, domestic water flow meters, airflow stations, air and water temperature sensors, electrical power consumption of variable frequency drives (pumps and fans) from BACnet interface, start/stop status of pump, fan as well as CT's used for measuring mechanical equipment consumption, and other inputs indicated in the M&V Plan. All mechanical equipment not being supplied by packaged network interface card capable of recording energy consumption, will be equipped with dedicated CT's used for metering purposes.

7.6.3.34(18)(b) All variable frequency drives for fans and pumps will provide system status, speed (%) and power consumption (kW or kWh) information to the BMS.

7.6.3.34(18)(c) Configure VFDs such that they populate continuous power consumption data to the BMS. Any energy optimization capabilities available within the VFD will also be programmed and activated.

7.6.3.34(18)(d) Water meters other than the municipal meter will have a digital output to the BMS providing flow rate and instantaneous totalizing water volume/consumption information.

7.6.3.34(18)(e) Thermal energy meters will connect to the BMS providing instantaneous data for liquid flow rate, supply and return water temperatures, kW and kWh and load/energy information. Provide the Schneider Ion / Struxureware metering system.

7.6.3.34(19) Energy metering for electrical systems

7.6.3.34(19)(a) The electrical system metering will be capable to measure the power line through dedicated meter and CTs for interior lighting, exterior lighting, emergency lighting, plug load and mechanical circuits. Calculated values may also be used, as outlined in Section 7.7.9. The BMS will connect to the electrical systems meters through BACnet interface connection in accordance with Appendix 1P [Metering Matrix].

7.6.3.34(19)(b) CT's interval "energy" trending for lighting and plug loads will be minimum 15 minutes.

7.6.3.34(19)(c) Provide the Schneider Ion / Struxureware metering system.

7.6.3.34(20) Provide Commissioning of the metering system to the satisfaction of the Authority and demonstrate the proper functioning of the metering system on the BMS.

7.6.3.34(21) Calibrate and test all energy and water monitoring sensors. Provide a calibration report to verify that the meters have been installed and calibrated to read within acceptable limits of accuracy as specified in Division 22, 23, 25 and 26.

7.6.3.35 Start-Up and Checkout Procedures

7.6.3.35(1) Startup testing. All testing will be performed by the Design-Builder and will make-up part of the necessary verification of an operating control system. this testing will be completed before the Authority is notified of the system demonstration.

7.6.3.35(2) Start up, check out, and test all hardware and software and verify communication between all components.

7.6.3.35(3) Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

7.6.3.35(4) Verify that all input/output points read properly.

7.6.3.35(5) Verify all alarms and interlocks.

7.6.3.35(6) Verify operation of the integrated system.

7.6.3.35(7) Calibrate and prepare for service all instruments, controls, and accessory equipment furnished as part of the Project.

7.6.3.35(8) Verify calibration of all input devices individually. Perform calibration procedures according to manufacturer’s recommendations.

7.6.3.35(9) Verify that all binary output devices operate properly and that the normal positions are correct.

7.6.3.35(10) Verify that all analog output devices are functional, that start and span are correct, and that direction and normal positions are correct. Verify that all control valves and automatic dampers to ensure proper action and closure.

7.6.3.35(11) Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation. Tune all control loops.

7.6.3.35(12) Check each alarm separately to ensure correct annunciation.

7.6.3.35(13) Test all interlocks to check logic and ensure that the fail-safe condition is in the proper direction.

7.6.3.36 Control System Demonstration and Acceptance

7.6.3.36(1) Prior to acceptance, the control system will undergo a series of performance tests to verify operation and compliance with this specification. These tests will occur after installation is complete, Equipment has been started up, and system and equipment tests have been completed. System integration (for BMS, as well for IBMP) is to be mocked up and demonstrating during controls design in a computer lab setting to prove integration will work as required between various systems.

7.6.3.36(2) Provide the tests described in this section in addition to the tests required as a necessary part of the installation, start-up, and debugging process. The Authority's representative will be present to observe and review these tests. Provide at least 14 days notification in advance of the start of the testing procedures.

7.6.3.36(3) The demonstration process will follow that approved at part of the Commissioning procedures. Approved checklists and forms will be completed for all systems as part of the demonstration.

7.6.3.36(4) Demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Provide all test equipment required to prove proper operation.

7.6.3.36(5) Provide a log indicating the date, technician's initials, and any corrective action taken or needed for each control input and output.

7.6.3.36(6) Demonstrate compliance with "System Performance" section of Division 25.

7.6.3.36(7) Demonstrate compliance with sequences of operation through all modes of operation.

7.6.3.36(8) Demonstrate complete operation of operator interface.

7.6.3.36(9) Provide trend data output in a graphical form showing the step response of each BMS control loop. The test will show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25 % of its full range. The sampling rate of the trend will be from 10 seconds to 3 minutes, depending on the speed of the control loop. The trend data will show for each sample the setpoint, actuator position, and controlled

variable values. Provide all tuning necessary to ensure each loop operates in an optimally tuned manner.

7.6.3.36(10) Provide trend data output showing the action of demand limiting on a minute-by-minute basis over at least a 30-minute period. The trend will include kW, demand limiting setpoint, and the status of sheddable equipment outputs.

7.6.3.36(11) Provide trend data output showing the capability of optimum start/stop algorithms. The change-of-value or change-of-stage trends will include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

7.6.3.36(12) Demonstrate interface to the Facility fire alarm system.

7.6.3.36(13) Demonstrate compliance with smoke control sequences of operation through all modes of fire and smoke event response throughout the Facility.

7.6.3.36(14) Provide operational logs for each system that indicate all setpoints, operating points, valve positions, modes, and equipment status. These logs will cover three 48-hour periods and have a sample frequency of not more than 5 minutes.

7.6.3.36(15) Provide all necessary repairs or revisions to the hardware and software as required to successfully complete all tests.

7.6.3.36(16) All tests described in Division 25 will be performed to the satisfaction of the Authority prior to the acceptance of the control system as meeting the requirements of completion.

7.6.3.36(17) The system will not be accepted until all forms and checklists have been completed as part of the demonstration and are submitted and approved as required.

7.6.3.37 Training

7.6.3.37(1) Provide training for Facility Management Staff prior to FMO taking over the Facility. Training will be provided On-Site and be video recorded for future self-paced training. Provide a minimum of two of each training session, one week apart from each other, to ensure shift workers are able to attend one of the two sessions.

7.6.3.37(2) Train the designated FMO Staff to enable them to do the following:

7.6.3.37(2)(a) Day-to-day operators:

7.6.3.37.2.(a).1 Proficiently operate the system;

7.6.3.37.2.(a).2 Understand BMS architecture and configuration;
7.6.3.37.2.(a).3 Understand system components;
7.6.3.37.2.(a).4 Understand system operation, including BMS control and optimizing routines and algorithms;
7.6.3.37.2.(a).5 Operate the workstation and peripherals;
7.6.3.37.2.(a).6 Log on and off the system;
7.6.3.37.2.(a).7 Access graphics, point reports, and logs;
7.6.3.37.2.(a).8 Adjust and change system setpoints, time schedules, and holiday schedules;
7.6.3.37.2.(a).9 Recognize malfunctions of the system by observation of graphical visual signals;
7.6.3.37.2.(a).10 Understand system drawings and operating and maintenance manuals;
7.6.3.37.2.(a).11 Access data from controllers; and
7.6.3.37.2.(a).12 Operate portable operator's terminals.

7.6.3.37(2)(b) Advanced operators:

7.6.3.37.2.(b).1 Make and change graphics on the workstation;
7.6.3.37.2.(b).2 Create, delete, and modify alarms, including annunciation and routing of these;
7.6.3.37.2.(b).3 Create, delete, and modify point trend logs and graph;
7.6.3.37.2.(b).4 Create, delete, and modify reports;
7.6.3.37.2.(b).5 Add, remove, and modify system's physical points;
7.6.3.37.2.(b).6 Create, modify, and delete programming;
7.6.3.37.2.(b).7 Add panels when required;
7.6.3.37.2.(b).8 Add operator interface stations;
7.6.3.37.2.(b).9 Create, delete, and modify system displays, both graphical and others;
7.6.3.37.2.(b).10 Install net-new equipment (e.g. VAV box) onto the system, including configuring and Commissioning;
7.6.3.37.2.(b).11 Perform BMS field checkout procedures;
7.6.3.37.2.(b).12 Perform BMS controller unit operation and maintenance procedures;
7.6.3.37.2.(b).13 Perform workstation and peripheral operation and maintenance procedures;
7.6.3.37.2.(b).14 Perform BMS diagnostic procedures;
7.6.3.37.2.(b).15 Configure hardware including PC boards, switches, communication, and I/O points; and
7.6.3.37.2.(b).16 Maintain, calibrate, and replace system components.

7.6.3.37(2)(c) System managers and administrators:

7.6.3.37.2.(c).1 Maintain software and prepare backups;
7.6.3.37.2.(c).2 Interface with project-specific, third-party operator software; and
7.6.3.37.2.(c).3 Add new users and understand password security procedures.

7.6.3.37(3) The ‘sandbox’ environment, as set out in Section 2.7.9 will simulate all systems contained in Division 25, such as BMS, IBMP and fire alarm systems, and be used to:

7.6.3.37(3)(a) demonstrate performance of systems/devices integration, and

7.6.3.37(3)(b) training FMO on the use and troubleshooting of the BMS by a system expert provided by Design-Builder.

7.6.3.37(4) In addition to the requirements set out in Section 2.7.9.3, the Design-Builder, using the simulation lab (conducted during the Design stage) will demonstrate the following:

7.6.3.37(4)(a) Identification of various communication requirements for various FMO VLAN connected devices;
7.6.3.37.4.(a).1 This will define required network topology, required routers/gateways, etc.

7.6.3.37(4)(b) Prove/test various devices usability;
7.6.3.37.4.(b).1 Usability in terms of displaying data, processing data, pushing job tasks from the devices should be tested thoroughly.

7.6.3.37(4)(c) Various Network Levels Security Check;
7.6.3.37.4.(c).1 Test will prove that data is protected/encrypted when getting transferred from one device to the other.
7.6.3.37.4.(c).2 Password protected UI’s.

7.6.3.37(4)(d) Devices Connectivity Check;
7.6.3.37.4.(d).1 Connectivity, transfer of data, receiving job tasks from the devices should be seamless when the connection is up and running.
7.6.3.37.4.(d).2 “Connection down scenario”, need for having mechanism in the system which can store all the data in it during the offline period. Once the system comes online, all data will be propagated. Data loss will not be there in any condition.

7.6.3.37(4)(e) Devices/software performance testing;

7.6.3.37.4.(e).1 Pilot testing.

7.6.3.37(4)(f) Software(s) Upgrade Testing mode check;

7.6.3.37.4.(f).1 AS FMO VLAN will be a combination of multiple protocols, devices, operating systems, firmware, hardware, networking layers, etc. When an upgrade is performed, be it for the system or for any of the involved items as stated above, thorough regression testing will be carried out/strategy will be adopted to overcome upgrade related issues.

7.6.3.37(4)(g) Compatibility Testing;

7.6.3.37.4.(g).1 Testing items such as, multiple operating system versions, browser types and respective versions, generations of devices, communication modes, etc.

7.6.3.37(4)(h) End-user application testing.

7.6.3.37(5) Provide a BMS expert who has experience using the system in healthcare environments. The expert will assist in Commissioning the BMS, as well as programming and setting AFDDR(s) rules/routines and KPI's to assist the Commissioning process of the Facility and provide ongoing training and system development.

7.6.3.37(6) To ensure the Authority and Facility Management has a comprehensive understanding of the hardware and software, to ensure the ongoing development of KPI's (at the BMS level), and energy optimization, Design-Builder will employ and make available to the Authority all required resources such as an On-Site, fulltime MSI contractor and BMS expert for one (1) year from the Substantial Completion Date. The Authority will provide dedicated space within the Facility for these individuals during the one (1) year period.

7.6.3.37(7) Design-Builder will employ an MSI contractor who has experience using the IBMP and BMS systems in healthcare environments. The MSI contractor will lead the design and configuration consultations of the integrated automation system and assist in developing and programming the AFDDR rules/routines for the Facility, as well as provide ongoing training and optimization services; refer to Section 5.5.6.1 for additional requirements on Commissioning and training.

7.6.4 Electrical Systems

7.6.4.1 System Overview

7.6.4.1(1) Electrical systems requiring BMS interfaces include:

7.6.4.1(1)(a) Generators;

7.6.4.1(1)(b) Lighting controls;

7.6.4.1(1)(c) Load management system;

7.6.4.1(1)(d) Electrical metering;

7.6.4.1(1)(e) Switchgear;

7.6.4.1(1)(f) ATS / HVATS;

7.6.4.1(1)(g) EVSE;

7.6.4.1(1)(h) UPS;

7.6.4.1(1)(i) Fire alarm system;

7.6.4.1(1)(j) Clock system; and

7.6.4.1(1)(k) Elevators.

7.6.4.1(2) Applicable Area

7.6.4.1(2)(a) Applies to the Facility.

7.6.4.1(3) System Responsibilities

7.6.4.1(3)(a) Authority will:

7.6.4.1.3.(a).1 Provide design feedback to the Design-Builder.

7.6.4.1(3)(b) Design-Builder will:

7.6.4.1.3.(b).1 Provide BMS interfaces for the control, data and alarm points listed under “Performance Requirements” below, and as noted in Division 26 sections;

7.6.4.1.3.(b).2 Design, supply and install all system infrastructures;

7.6.4.1.3.(b).3 Design, supply and install all system equipment; and

7.6.4.1.3.(b).4 Integrate the system to the following systems:

(b).4.1 Integrated building management platform.

7.6.4.1(4) Performance Criteria

7.6.4.1(4)(a) Generators (for each generator):

7.6.4.1.4.(a).1 Generator trouble points (all available points);

7.6.4.1.4.(a).2 Generator run status;

7.6.4.1.4.(a).3 Coolant temperature;
7.6.4.1.4.(a).4 Battery voltage; and
7.6.4.1.4.(a).5 Fuel level for each tank.

7.6.4.1(4)(b) Lighting controls:
7.6.4.1.4.(b).1 Refer to requirements in Section 7.7.14.

7.6.4.1(4)(c) Load management system:
7.6.4.1.4.(c).1 Refer to requirements in Section 7.7.

7.6.4.1(4)(d) Electrical metering:
7.6.4.1.4.(d).1 Refer to requirements in Section 7.7.9.

7.6.4.1(4)(e) Switchgear:
7.6.4.1.4.(e).1 Refer to requirements in Section 7.7.

7.6.4.1(4)(f) ATS / HVATS:
7.6.4.1.4.(f).1 Refer to requirements in Section 7.7.

7.6.4.1(4)(g) EVSE:
7.6.4.1.4.(g).1 Charge status and kW output; and
7.6.4.1.4.(g).2 Alarm / trouble points (all available points).

7.6.4.1(4)(h) UPS:
7.6.4.1.4.(h).1 Refer to requirements in Section 7.7.8.

7.6.4.1(4)(i) Fire alarm system:
7.6.4.1.4.(i).1 Refer to requirements in Section 7.9.3.

7.6.4.1(4)(j) Clock system:
7.6.4.1.4.(j).1 Alarm for loss of central time signal; and
7.6.4.1.4.(j).2 Synchronization of BMS system time and all alarm inputs with central time signal.

7.6.5 FMO Network and Infrastructure

7.6.5.1 Basic Requirements

7.6.5.1(1) System Overview

7.6.5.1(1)(a) The FMO network will be VLAN network converged on the Authority network.

7.6.5.1(1)(b) All connections to the Authority network will comply with the requirements as set out in Division 27.

7.6.5.1(2) Applicable Area

7.6.5.1(2)(a) Applies to the Facility.

7.6.5.1(3) System Responsibilities

7.6.5.1(3)(a) The system will be selected by the Authority.

7.6.5.1(3)(b) Design-Builder will:

7.6.5.1.3.(b).1 Provide the Authority with all required information to fully configure the FMO VLAN on the Authority IM/IT network; and

7.6.5.1.3.(b).2 Design, supply, install and Commission all BMS/IBMP integrated system(s) and their associated infrastructure, hardware and software which are being installed, connected to or residing on the FMO (Authority) VLAN network.

7.6.5.2 Performance Criteria

7.6.5.2(1) General

7.6.5.2(1)(a) The Facility FMO (VLAN) Network and infrastructure will be designed and implemented in a manner consistent and appropriate for the critical nature of 24/7 acute care Facility operations.

7.6.5.2(1)(b) Design-Builder will provide a dedicated software application actively monitor, report and troubleshoot all BACNet/IP device traffic on the Authority/VLAN BMS network.

7.6.5.2(1)(c) Design-Builder will provide all necessary Project management, qualified technical expertise, infrastructure design, installation coordination, labour, materials, equipment, services and other items required to fulfill its scope of work as defined in this section.

7.6.5.2(1)(d) The FMO Network is a critical component for the Commissioning of Facility Building Systems. Design-Builder will ensure the network is operational, Commissioned, and connected to FMO networked Facility Building Systems prior to Commissioning those systems.

7.6.5.2(1)(e) Design-Builder will provide all software licensing associated with the FMO (VLAN) network for two (2) years.

7.6.5.2(2) FMO (VLAN) Network Structured Cabling

7.6.5.2(2)(a) Adhere to all standards and specifications identified in the FHA Communications Infrastructure Standards and Specifications when designing,

supplying installing, and Commissioning FMO VLAN Network Structured Cabling systems.

7.6.5.2(2)(b) Intrabuilding backbone Structured Cabling will be provided as part of the Structured Cabling system defined in Section 7.8 Communications (Division 27).

7.6.5.2(2)(c) All horizontal and Structured Cabling jacketing for the FMO VLAN network will be blue in colour.

7.6.5.2(2)(d) Design-Builder will provide all cabling infrastructure including horizontal Structured Cabling, connectors, pathways, supports, patch cords, jacks, faceplates, labels required to connect all systems and field devices that are not part of Division 27 or Division 28 to the Authority Network.

7.6.5.2(2)(e) Provide all Structured Cabling, power peripherals and accessories required for a functional end-to-end system.

7.6.5.2(3) Intrabuilding Structured Cabling Backbone

7.6.5.2(3)(a) Intrabuilding backbone Structured Cabling will be provided as part of the IM/IT Structured Cabling System defined in Division 27.

7.6.5.2.3.(a).1 Provide complete Category 6A horizontal cabling for each device that requires Ethernet/IP access to the integrated automation system as identified in Division 25.

7.6.5.2(3)(b) Provide rack mounted patch panels for FMO network equipment in each TR.

7.7 Electrical (Division 26)

7.7.1 Design Principles

7.7.1.1 Provide electrical systems that meet the requirements of this Agreement in an efficient manner with optimal utilization of space, Staff and equipment resources, and provide a comfortable and safe working environment for Patients, Staff and visitors.

7.7.1.2 Electrical systems will be:

7.7.1.2(1) Of a type and quality intended for use in a Class A-2 Acute Care health care facility;

7.7.1.2(2) Functional, new and using the latest proven technologies in the design of equipment and systems;

7.7.1.2(3) Integrated where integration provides efficiency, operational and cost advantage to the Authority;

7.7.1.2(4) Efficient;

7.7.1.2(5) Reliable;

7.7.1.2(6) Adaptable and expandable for future needs;

7.7.1.2(7) Configured with redundancy to allow flexible operation and concurrent maintenance; and

7.7.1.2(8) Located to allow equipment to be serviced conveniently.

7.7.1.3 Incorporate into the Design and Construction the principle that change will be a constant and inevitable fact within the Facility. Completed electrical systems will permit change while minimizing the cost of change and the extent of interruption to regular Facility operations.

7.7.1.4 Lighting

7.7.1.4(1) Provide lighting schemes that support functional needs and activities and enhance safety for Patients, Staff and visitors.

7.7.1.4(2) Design lighting with the objective of creating a comfortable working environment and an environment conducive to healing and recovery.

7.7.1.4(3) Utilize a combination of natural light, luminaries and controls to optimize daylight.

7.7.2 Basic Requirements

7.7.2.1 The electrical systems and equipment will be designed and installed for post-disaster operation, meeting the performance requirements of Section 5.2.

7.7.2.2 Provide all safety and control conduits, wiring and devices such as beam stops, last-person-out button, beam indicators, audio-video devices, emergency stop buttons and “Laser-In-Use”/”Radiology-In-Use” lights to meet:

7.7.2.2(1) The standards and guidelines set out in Section 2.4 such as;

7.7.2.2(1)(a) Canada Nuclear Safety Committee (CNSC) Standard GD-52;

7.7.2.2(1)(b) CSA Z8000;

7.7.2.2(2) EPS DG Laser Design Standard and

7.7.2.2(3) Any other applicable Provincial Occupational Health and Safety Guidelines and Regulations.

7.7.2.3 Power Distribution Equipment:

7.7.2.3(1) Will be located indoors in unsprinklered Electrical Rooms unless noted otherwise;

7.7.2.3(2) Such as MCCs, starters, and harmonic filters associated with mechanical loads are permitted to be located in mechanical service rooms; and

7.7.2.3(3) Where located in sprinklered sub-electrical rooms (SERs) will use sprinkler-proof construction with features such as:

7.7.2.3(3)(a) Drip shields;

7.7.2.3(3)(b) Angled overhanging drip-proof louvres at ventilation openings; and

7.7.2.3(3)(c) Watertight fittings on exposed top-entry Raceways and cables.

7.7.2.3(4) Such as equipment or boxes which are exposed to rain or washdown, will be provided with waterproofing methods including EYS fittings, watertight fittings, watertight boxes and/or duct seal to prevent water ingress.

7.7.2.3(5) Will minimize EMI in the installation of Electrical Rooms and equipment.

7.7.2.4 Equipment placement and installation will facilitate easy access for inspection and/or regular maintenance.

7.7.2.5 Provide electrical distribution schemes that are sized and configured to achieve service continuity in the event of equipment failure. Failure of any electrical equipment, feeder or circuit will neither impair Facility operation nor deprive any area of electrical power.

7.7.2.6 Size and configure equipment to permit routine testing and servicing of power generation and distribution equipment without impairing Facility operation or depriving any area of electrical power.

7.7.2.7 Utilize power distribution equipment that is robust, reliable, easily operated and maintained.

7.7.2.8 Provide all systems with protection, grounding, isolation and control to address the functional requirements where they are located.

7.7.2.9 Provide power distribution systems at the following nominal voltage levels:

7.7.2.9(1) 25kV, 3-phase, 3-wire systems for BCH primary power distribution;

7.7.2.9(2) 12.47 kV, 3-phase, 3-wire systems for high voltage power distribution and emergency power generation;

7.7.2.9(3) 600 V, 3-phase, 3-wire systems for distribution within the Facility;

7.7.2.9(4) 600Y/347V or 208Y/120V, 3-phase, 4-wire systems for exterior and underground parking lighting loads;

7.7.2.9(5) 208 Y/120 V, 3-phase, 4-wire systems for distribution to branch circuit panels, lighting, receptacles, and small equipment loads;

7.7.2.9(6) Other voltages where required to match utilization voltages of specialty Equipment (e.g. CT, MRI, EVSE); and

7.7.2.9(7) For equipment not available in the required voltages, the Authority will accept 480V distribution for specific equipment in consultation with the Authority during design on a case-by-case basis. The Design-Builder may be asked to demonstrated equipment is not available in required voltages.

7.7.2.10 Incorporate energy management systems to maximize the useable capacity of the Facility power systems and minimize Utility electrical demand costs.

7.7.2.11 Provide electrical infrastructure for the parking, private roadway and exterior Site areas including lighting, signage, receptacles, equipment power and vehicle charging infrastructure. Refer to Section 4.14.12 for lighting requirements on public roadways.

7.7.2.12 Electrical Rooms for the Energy Centre

7.7.2.12(1) Provide separate rooms in the EC for:

7.7.2.12(1)(a) the BCH Service Entrance Switchgear;

7.7.2.12(1)(b) the 25kV-12.5kV power transformers, 12.5kV utility switchgear, Conditional ATS and Conditional 12.5kV switchgear;

7.7.2.12(1)(c) the 12.5kV generator synchronization switchgear;

7.7.2.12(1)(d) the Vital ATS, Delayed Vital ATS, 12.5kV Vital switchgear, and the12.5kV Delayed Vital switchgear;

7.7.2.12(1)(e) the Energy Centre Vital and Delayed Vital 12.5kV-600V power transformers, and the associated 600V MDPs;

7.7.2.12(1)(f) the Energy Centre Vital and Delayed Vital 600V-120/208V transformers and associated 120/208V CDPs (FERs);

7.7.2.12(1)(g) the fire pump distribution equipment.

7.7.2.12(2) Install at least one FER per floor in the Energy Centre (EC). Each FER will contain a 600V overcurrent device for each system required on that floor, 600V to 120/208V distribution transformers and 120/208V CDPs for each power system serviced on that floor and 120/208V 3-phase 4-wire panelboards.

7.7.2.12(3) Provide a dedicated room for BCH Utility entrance equipment with Direct Access to the exterior.

7.7.2.12(4) Provide a minimum 2-hour fire resistance rated separation between all Energy Centre electrical equipment rooms as identified in Section 7.7.2.12(1), such that in the event of a catastrophic failure in one room, full power can be restored to the Facility using the equipment in the other rooms. If any of the rooms identified in Section 7.7.2.12(1) will contain dielectric-liquid-filled electrical equipment, it will be constructed as a vault with fire resistance rating as required by CSA C22.1 and the BCBC.

7.7.2.12(5) Provide a dedicated room for normal power and conditional power MDPs and 25kV-12.5kV power transformers.

7.7.2.13 Electrical Rooms for the CH and CC

7.7.2.13(1) Provide one (1) Building Electrical Room (BER) for the Facility. The BER will contain high voltage primary overcurrent protection device for each power transformer, 12.5kV to 600V power transformers for vital, delayed vital and conditional power and 600V Main Distribution Panelboards (MDP) for each system. Equipment transformers, such as linear accelerator power conditioners, will be located in FERs on the floor they serve. High voltage feeders from the Energy Centre to the BER will be concrete encased throughout the building and achieve a 2-hour fire resistance rating. The BER will be stacked vertically with the FER below and above. Provide a 600V conditional feed from the BER conditional distribution to the Energy Centre for conditional loads located in the Energy Centre. If the BER will contain dielectric-liquid-filled electrical equipment it will be constructed as an electrical vault as defined in the BCBC with a minimum 3-hr fire resistance rating of solid masonry or concrete construction. Otherwise, the BER is to be constructed as a service room as defined in the BCBC.

7.7.2.13(2) Install at least one (1) FER per floor to supply loads on that floor. FERs will be stacked vertically with at least three walls vertically aligned between floors to allow continuous risers. Each FER will contain a 600V overcurrent device and 600V to 120/208V distribution transformers for vital and conditional, 120/208V CDPs and 120/208V 3 phase 4-wire panelboards for all systems as required (vital, delayed vital, conditional and clinical UPS). The FERs are to be constructed as service rooms as defined in the BCBC with a minimum of 2-hr fire resistance rating. A FER is not required on mezzanine levels, SER(s) on mezzanine levels may be served from FER(s) on the associated floor.

7.7.2.13(3) Unless otherwise approved by the Authority based on the Design, install at least one (1) Sub Electrical Room (SER) per zone or Component on each floor; mechanical levels will have panelboards installed throughout the floor spaces, as required. SERs will contain panelboards servicing equipment in the Component or Sub-Component and will adhere to the zoning requirements of Section 7.7.2.16(1). Do not locate SER's where access to the SER requires passage through an Outbreak Control Zone not associated with the Component served by the SER.

7.7.2.13(4) Provide a dedicated room for the UPS units (Clinical and IM/IT), batteries and associated electrical equipment on the mechanical floor. The UPS rooms will be constructed as service rooms as defined in the BCBC with a minimum of 2-hr fire resistance rating.

7.7.2.14 Electrical Room Requirements

7.7.2.14(1) Locate electrical equipment and feeder routes to minimize the risk to service continuity resulting from fire, flood, adverse weather, seismic events, construction activities and vandalism.

7.7.2.14(2) To minimize the risk of flooding, no Major Electrical Equipment, Major Mechanical Equipment or critical power system components will be located below the elevation as set out in Section 5.2.1. Where electrical circuits and equipment are located below grade, provide protection against the risk of flooding.

7.7.2.14(3) Locate Electrical Rooms and power distribution equipment to minimize the distances for feeder runs, to provide easy access for equipment replacement and to avoid interference with other services and equipment.

7.7.2.14(4) Where fire rated protection is required for conductors, provide 2-hour rated cabling or vertically stacked fire rated shafts located within Floor Electrical Rooms (FERs); shafts or enclosures will

not be used to achieve the wiring fire protection required by the BCBC outside of FERs.

7.7.2.14(5) Electrical Rooms will not contain plumbing or other unrelated components unless they are essential for the room functions (including fuel lines, gas lines, hydronic, sprinkler, or drain piping). Hydronic equipment will not be located in Electrical Rooms, including fan coils and hydronic unit heaters.

7.7.2.14(6) Install equipment, Raceways, supports, ductwork, and all other components in Electrical Rooms such that a minimum clear height of 2.14 m AFF is available.

7.7.2.14(7) Protect electrical equipment from the risk of flooding due to sprinkler or mechanical piping leaks, using partitions, distance, elevation, containment curbs, tanking, or other methods as appropriate.

7.7.2.14(8) All floor-mounted or ground-mounted electrical equipment will be placed on concrete housekeeping pads, refer to Section 6.3.1.2(6). This requirement is applicable to all spaces, including mechanical rooms, underground parking and exterior areas.

7.7.2.14(9) Design the Electrical Rooms to be readily accessible, secure, well ventilated and free of corrosive or explosive fumes, gases or any combustible material.

7.7.2.14(10) Provide oil containment for FR3 oil filled power transformers where FR3 oil filled power transformers are used.

7.7.2.15 Equipment Replacement Strategy

7.7.2.15(1) Provide clear aisle ways and efficient routes, including doors and openings sized to permit removal of Major Electrical Equipment from the Facility as well as to bring in new equipment into the Electrical Rooms without impacting Facility operation and site access.

7.7.2.15(2) The replacement pathways will allow new equipment to be brought into the Facility and its respective Electrical Room as an entire unit after factory testing, without being broken down into subcomponents requiring assembly On-Site. On-Site assembly of equipment shipping splits is acceptable if reassembly and installation are vendor supported to ensure equipment performance meets manufacturer specifications. Dismantling equipment into smaller components, such as switchgear sections smaller than a single vertical cubicle, dividing transformer cores into sections, or decoupling generator engines and alternators, is not acceptable. Pathways will allow for replacement of

transformers without core and coil disassembly. Assembly of replacement transformer enclosures On-Site is acceptable.

7.7.2.16 Zoning

7.7.2.16(1) Zone the power distribution systems with precise boundaries to restrict the extent of an outage, provide certainty for maintenance, and identify the limits of spare capacities. Circuits across zone boundaries are not permitted except for the source feeders necessary to supply power to the zone, and emergency lighting branch circuits. Emergency lighting panelboards may serve more than one zone if located in the FER. Zone boundaries will coincide with floor levels and fire compartments.

7.7.2.16(2) Zoning and sizing of power distribution systems and locations of Major Electrical Equipment and Major Mechanical Equipment will be as noted in the sections below.

7.7.2.16(3) The Energy Centre will be sized to accommodate all the power generation and distribution equipment necessary to serve the Facility, except where noted otherwise, with space and capacity allowances for future development.

7.7.2.16(4) The Energy Centre will feed multiple power transformers within the CC and CH with dedicated feeders to each. Power transformers will be located above grade.

7.7.2.16(5) The following equipment will be located in the Energy Centre:

7.7.2.16(5)(a) Diesel generator paralleling switchgear and controls;

7.7.2.16(5)(b) High Voltage Automatic Transfer Switches (HVATS) for the vital, delayed vital and conditional power branches;

7.7.2.16(5)(c) Main High Voltage switchgear (25kV and 12.5kV) for the Utility, normal vital, delayed vital and conditional power branches;

7.7.2.16(5)(d) Power transformers including 25 kV-12.47 kV step-down transformers and 12.5kV-600V step-down transformers serving the Energy Centre;

7.7.2.16(5)(e) Power distribution systems and ancillary equipment needed to serve the Energy Centre; and

7.7.2.16(5)(f) All electrical distribution equipment required for electrical supply of the fire pumps in accordance with NFPA 20 and CSA C22.1.

7.7.2.16(6) Power transformers for the CC and CH will be fed directly from the Energy Centre. The BER will include high-voltage transformer disconnect switches, 12.47 kV-600 V step-down transformers, and main 600V switchgear MDPs. This room may also include CDPs, distribution transformers, panelboards, and ancillary equipment such as capacitors and meters.

7.7.2.17 Integrated Controls for High Voltage Equipment

7.7.2.17(1) The control system for the following equipment will be integrated by a common vendor, and this integrated control system will be designed, supplied and Commissioned by the control system integrator as a single package:

7.7.2.17(1)(a) High-voltage Utility power switchgear;

7.7.2.17(1)(b) High-voltage diesel generators;

7.7.2.17(1)(c) Generator master control systems;

7.7.2.17(1)(d) High-voltage generator paralleling switchgear;

7.7.2.17(1)(e) High-voltage automatic transfer switches;

7.7.2.17(1)(f) High-voltage essential power switchgear; and

7.7.2.17(1)(g) DC control system including station batteries and chargers.

7.7.2.17(2) Integrated Control System will:

7.7.2.17(2)(a) Be compliant with the emergency power requirements of Section 7.7.4;

7.7.2.17(2)(b) Include two (2) fully redundant master control systems with PLC controllers, power supplies, HMI touchscreen display panels, redundant I/O connections for each device;

7.7.2.17(2)(c) Be designed to have no single point of failure;

7.7.2.17(2)(d) Be designed such that the addition of future generators and feeder breakers will not require the replacement, upgrade or retrofit of the system. Include bus links and/or terminal lugs to match the bus such that any piece of distribution equipment has a means of extending or refeeding with minimal downtime; and

7.7.2.17(2)(e) Remotely operate all circuit breakers in each item of equipment listed above.

7.7.2.18 Provisions for Future

7.7.2.18(1) Provide a minimum of 25% spare capacity in the ampacity ratings of:

7.7.2.18(1)(a) Each distribution transformer;

7.7.2.18(1)(b) Each 600 V MDP;

7.7.2.18(1)(c) Each 600 V or 208 V CDP;

7.7.2.18(1)(d) Each 600-V MCC;

7.7.2.18(1)(e) Each 347/600 V or 120/208-V branch panelboard; and

7.7.2.18(1)(f) Each feeder.

7.7.2.18(2) Any spare capacity requirements in Section 7.7 will be calculated as a percentage of the initial installed continuous load capacity. This spare capacity will be provided in addition to the calculated continuous load during the first year of Facility operation. For example, if a 100-A, 80% rated breaker is provided, the spare capacity required is 100 A x 80% x 25% = 20 A continuous load for a maximum initial installed continuous load of 64 A. Size all feeders for less than 2% voltage drop at the continuous load rating of the associated overcurrent device, with a maximum 5% voltage drop from service to point of utilization when all feeders and branch circuits are loaded to 125% of the calculated feeder continuous load. Submit load calculations before equipment is procured, to verify this is provided for all of the equipment noted above.

7.7.2.18(3) Provide clear physical space equal to the footprint of one (1) vertical switchgear section beside each low-voltage switchgear lineup and MDP for spare capacity. Where low-voltage switchgear or MDPs are arranged in continuous configurations with tie breakers, provide the clear physical space on both ends of the lineup, with space for a quantity of vertical sections equal to the number of power branches in the lineup. For example, a lineup with vital, delayed vital and conditional branches requires space for three (3) future vertical sections, with the ability to connect the centre section of the lineup to one of the spaces on the end using overhead bus duct.

7.7.2.18(4) In addition to the equipment provided under this Agreement, provide each FER and SER with sufficient empty floor and wall space to allow an additional 25% of each type of equipment initially installed to be added in the future. Clear physical space required by other part of this Agreement at the ends of low-

voltage switchgear and MDP lineups may be counted toward this requirement, and transformers with high voltage primary windings are exempt from this requirement.

7.7.2.18(5) In order to minimize downtime during future renovations, all distribution equipment with required adjacent physical space provisions will be provided with bus links and/or terminal lugs to match/extend the equipment bus. The end of the enclosure will have a cut-out with a separate cover in line with the existing bus to prevent metal cutting in future. Bolt bus links inside last cubicle and note their locations on the record drawings.

7.7.2.18(6) Provide adequate physical space to facilitate the future installation of feeders that will utilize the spare electrical capacity. Space provided will allow the installation of future feeders without disruption to Facility operations. Reserve 20% of the useable cross-sectional area of electrical risers and shafts as spare for future. Where electrical sleeves are grouped, reserve 20% of their useable cross-sectional area as spare for future.

7.7.2.18(7) At each CDP and branch panelboard:

7.7.2.18(7)(a) Provide a minimum of 10% spare breakers (rounding up) of the total number of installed breakers in that panel. Rating and features of the spare breaker(s) will match the most common breaker installed in the panel.

7.7.2.18(7)(b) Equip the panel with fully prepared space(s) throughout, reserving at least 25 % of the total panel spaces for future in addition to the spare breaker requirements above. Each prepared space will include all of the hardware and connectors necessary to add circuit breakers into the panel in the future.

7.7.2.18(8) Where other Sections require equipment sizing based on load during the first year of Facility operation, this load will be evaluated as the peak demand load during the first consecutive twelve (12) month period with all Facility systems and Components fully functional and Commissioned.

7.7.2.19 Protective Device Coordination

7.7.2.19(1) The protective devices in the electrical distribution system will be coordinated to provide selective tripping under any fault condition for the available short-circuit currents in the following scenarios:

7.7.2.19(1)(a) When the electric Utility service is supplying the loads;

7.7.2.19(1)(b) When emergency generators are supplying the loads; and

7.7.2.19(1)(c) When both electric Utility service and generators are paralleled and supplying the loads.

7.7.2.19(2) The coordination of protective devices will achieve fully selective tripping from the Utility's service protection or any generator main breaker up to and including the circuit breaker feeding the final (branch) panelboard to localize an overcurrent condition to restrict outage to the final feeder or Equipment that is affected. Fully selective coordination requirements include selective tripping throughout the instantaneous region, as well as ground fault coordination, where applicable for 4-wire systems, with downstream phase trip settings. The final feeder breaker and the branch circuit breaker will be selectively coordinated in all areas of the time-current curves except in the instantaneous region.

7.7.2.19(3) Coordination will be achieved through the choice of manufacturer-listed selective combinations of protective devices, the use of time and current trip settings, zone-selective interlocking, and through the reduction of fault levels through the system impedance.

7.7.2.19(4) Rate all distribution devices to handle available fault duty at line terminals based on maximum Utility available fault level at 25 kV. Perform and implement a short circuit and Coordination Study to ensure that all protective devices provide selective coordination to ensure tripping of the downstream device nearest the fault and not a cascading effect involving upstream devices. All feeder breakers will be fully selective and set so that they will not trip on equipment inrush currents.

7.7.2.19(5) Provide circuit-breaker-type power distribution equipment fully rated for the calculated fault current level. Series-rated or integrated equipment-rated device combinations will not be permitted.

7.7.2.19(6) The Design-Builder's Electrical Engineer-of-Record, or a third-party Electrical Engineer who is registered in British Columbia, will provide a signed and sealed detailed protective device Coordination Study of the electrical system. The protective device Coordination Study will include all distribution equipment to and including final panelboards, refer to Section 2.5.8.34. The electrical systems studies will be iterative and used to inform the electrical design during the design process.

7.7.2.20 Arc Flash Hazard Reduction

7.7.2.20(1) Incorporate design features to reduce available incident arc flash energy on electrical systems such that maintenance operations on live equipment will not expose workers to arc flash incident energy levels greater than 12 cal/cm2. Typical maintenance operations include racking in/out of breakers, thermal scanning of feeder terminations, and installation of breach circuit conductors on emergency power panels. Arc flash energy levels may be higher than 12 cal/cm2 during normal operation of equipment (not during maintenance). Specific acceptable arc flash energy levels during normal operation are as follows:

7.7.2.20(1)(a) 4 cal/cm2 for 120/208V panels;

7.7.2.20(1)(b) 8 cal/cm2 for 347/600V panels;

7.7.2.20(1)(c) 25 cal/cm2 for CDPs and conditional bus duct taps; and

7.7.2.20(1)(d) 40 cal/cm2 for 600V MDPs.

7.7.2.20(2) Utilize technologies for arc flash hazard reduction, such as the following:

7.7.2.20(2)(a) thermal imaging ports;

7.7.2.20(2)(b) bus differential protection;

7.7.2.20(2)(c) arc-overcurrent protection relays;

7.7.2.20(2)(d) transformer differential protection;

7.7.2.20(2)(e) zone-selective interlocking protection;

7.7.2.20(2)(f) limiting available fault current from transformers;

7.7.2.20(2)(g) maintenance mode settings of circuit breakers;

7.7.2.20(2)(h) remote control of switching;

7.7.2.20(2)(i) fibre optic arc detection; and

7.7.2.20(2)(j) motorised racking devices.

7.7.2.20(3) Submit to the Authority a detailed Arc Flash Study signed and sealed by an Electrical Professional Engineer as per CSA Z462, refer to Section 2.5.8.33.

7.7.2.20(4) In accordance with the approved Arc Flash Study, provide equipment labelling indicating the available incident energy levels at each switchgear lineup, panelboard, MCC, or stand-alone

switch or protective device where workers may be exposed to live parts during servicing, adjustment and/or maintenance.

7.7.2.20(5) Provide a single line drawing of the power distribution system indicating the let-through energy level of each protective device and the required PPE at each piece of equipment under clear polycarbonate cover for posting in all Electrical Rooms in the Energy Centre and the Facility.

7.7.2.20(6) Provide arc flash hazard stickers on all electrical distribution equipment indicating incident energy levels and listing the required PPE to work on the equipment live.

7.7.2.21 Power Quality

7.7.2.21(1) The electrical distribution system will be protected from the disruptive effects of

7.7.2.21(1)(a) Lightning strikes;

7.7.2.21(1)(b) Current surges;

7.7.2.21(1)(c) Over/under frequency;

7.7.2.21(1)(d) Voltage surges;

7.7.2.21(1)(e) Overvoltage;

7.7.2.21(1)(f) Undervoltage;

7.7.2.21(1)(g) Harmonic currents;

7.7.2.21(1)(h) Electromagnetic interference;

7.7.2.21(1)(i) Radio frequency interference;

7.7.2.21(1)(j) Ferroresonance; and

7.7.2.21(1)(k) Switching transients.

7.7.2.21(2) Provide equipment and systems that assure the electrical equipment and systems will not be harmed or impaired either by external events or conditions, such as lightning and disturbances on the Utility service, or by internal events or conditions generated within the Facility.

7.7.2.21(3) Establish and maintain an overall power quality that assures suitable conditions for operation of all electrical and electronic equipment throughout the Facility.

7.7.2.21(4) Provide equipment, such as filters, SPDs, shielding, etc., specifically designed to control and remove all adverse power

quality conditions that could damage or impair function of electronic equipment used in the Facility. Adverse power quality conditions include voltage spikes, dips and droops, transients, harmonics, EMI and radio frequency interference. Systems will be designed and installed in accordance with recommended practices for powering and grounding electronic equipment, including IEEE 1100 and the equipment manufacturer's recommendations.

7.7.2.21(5) To prevent interference, locate EMI- and radio-frequency interference-producing equipment and vibrating equipment at a sufficient distance from spaces with sensitive Equipment such as medical imaging, EEG and lab areas.

7.7.2.21(6) Conduct full load EMF test for each power transformer and provide the results to the Authority for review. Mitigate any EMF issues or concerns found from the test.

7.7.2.21(7) Provide station-class lightning arrestors at the first high-voltage switch connected to the Utility service and at each generator output located in the generator synchronization switchgear.

7.7.2.21(8) Provide RC snubber networks at the primary of 25 kV-12.5 kV and 12.47 kV-600 V transformers to prevent circuit breaker switching-induced transients from damaging the transformers.

7.7.2.21(9) Provide SPD at:

7.7.2.21(9)(a) Each MDP;

7.7.2.21(9)(b) Each CDP;

7.7.2.21(9)(c) Each motor control centre; and

7.7.2.21(9)(d) All panelboards.

7.7.2.21(10) Surge Protective Devices (SPDs):

7.7.2.21(10)(a) Will be in accordance with UL 1449 Edition 5;

7.7.2.21(10)(b) Will be connected to the bus by a circuit breaker on the line side for isolation and overcurrent protection;

7.7.2.21(10)(c) Will be internally mounted; and

7.7.2.21(10)(d) Provide monitoring of all alarm and trouble conditions of the SPDs by the BMS.

7.7.2.21(11) Harmonic Mitigation

7.7.2.21(11)(a) Motors rated 7.5 HP or greater and provided with VFDs, or single point connection packaged units containing VFDs, will use one of the following methods to limit the THD at the bus feeding the VFD to than 5% of the full load fundamental current and less than 8% THD under 30% loading:

- 7.7.2.21.11.(a).1 An individual passive harmonic filter connected on the line side of the VFD.
- 7.7.2.21.11.(a).2 12-pulse VFD type.
- 7.7.2.21.11.(a).3 Active front end VFD type.
- 7.7.2.21.11.(a).4 Active harmonic correction at the bus feeding the VFD.

7.7.2.21(11)(b) Passive Harmonic Filters:

- 7.7.2.21.11.(b).1 Will treat all of the characteristic low frequency harmonics generated by a 3-phase, diode bridge rectifier load (5th, 7th, 11th, 13th, etc.).
- 7.7.2.21.11.(b).2 Will suppress the characteristic harmonics without the need for individual tuning or the requirement to phase shift against other harmonic sources.
- 7.7.2.21.11.(b).3 Will achieve harmonic mitigation by a passive inductor and capacitor network. Active electronic components will not be used.
- 7.7.2.21.11.(b).4 Will never introduce a capacitive reactive power (kVAR) that is greater than 20% of its kVA rating to ensure compatibility with engine generators. Filters will be disconnected from the system when their associated loads are off if needed to achieve this result.
- 7.7.2.21.11.(b).5 Will neither resonate with system impedances in the power distribution system nor attract harmonic currents from other harmonic sources.

7.7.2.21(11)(c) Input line reactors and/or DC link chokes associated with VFDs will not be acceptable in-lieu of passive harmonic filters.

7.7.2.21(11)(d) Provide load reactors on VFDs where needed to keep output peak voltage and dV/dt below the specified insulation limits of the VFD output conductors and motor windings. Load reactors will have enclosures rated for wet locations when installed in proximity to fluid filled equipment.

7.7.2.21(11)(e) Perform a computerized harmonics analysis of the Facility electrical system based on the final single

line diagram. Analysis will illustrate the effect of all VFDs and other power conversion equipment on system harmonics. Provide additional harmonic mitigation measures as needed to keep harmonic distortion levels below IEEE 519 recommended limits at each 600V or 208V switchgear, MDP, CDP and MCC bus in the Facility, treating each bus as the point of common coupling for the purposes of this analysis. Where this harmonics analysis has demonstrated at the conclusion of the 70% Design and Construction Document phase that the IEEE 519 limits will be met, based on verifiable equipment characteristics matching the final equipment selections, the design may vary from the prescriptive options required by Section 7.7.2.21(10)(a).

7.7.2.21(11)(f) Provide the ability to demonstrate to the Authority at any time that there are no potentially harmful power conditions present and that Equipment intended to guard against such conditions is in proper working order.

7.7.2.21(11)(g) For all motors with VFDs, provide a means to safely dissipate common-mode electrical charge on the rotor and prevent electrically-induced bearing damage.

7.7.2.22 Magnetic Field Strength

7.7.2.22(1) Provide magnetic shielding at select Equipment locations as required to limit magnetic fields from electrical distribution equipment to the following levels:

7.7.2.22(1)(a) 10 milligauss in any occupied area, or in any area containing computer or communications equipment (areas of mechanical and Electrical Rooms without computer or communications equipment are exempt from this requirement);

7.7.2.22(1)(b) 5 milligauss in any Patient Care Area or any area where cathode ray tube displays are to be used, and

7.7.2.22(1)(c) 2 milligauss in any area where medical electrical equipment is to be tested (e.g. biomedical workshop) or very sensitive medical electrical equipment is to be used (e.g.:

electroencephalograph (EEG), electrocardiograph (ECG/EKG).

7.7.2.22(2) Where extremely sensitive equipment is to be used, the room will likely require magnetic shielding, and the maximum permissible magnetic field strength will be obtained from the equipment manufacturer.

7.7.2.22(3) For the purposes of controlling magnetic field strength, an "area" will be from wall to wall and from the finished floor to the greater of 2.25 m above the finished floor or the maximum height that medical electrical equipment can reach, either fixed or arm mounted.

7.7.2.23 Future Underground Parking

7.7.2.23(1) Fire Alarm

7.7.2.23(1)(a) Provide fire alarm system devices in the future underground parking area as required by the standards set out in Section 2.4.6 and in accordance with the requirements of Section 7.9.3.

7.7.2.23(2) Lighting

7.7.2.23(2)(a) Provide lighting of future underground parking area in accordance with the requirements of Section 7.9.11.

7.7.2.23(2)(b) Provide lighting with an average of 25lux with 4:1 average to minimum uniformity in future underground parking area.

7.7.2.23(3) Lighting Control

7.7.2.23(3)(a) Provide manual lighting control for lighting in future underground parking area at all access points.

7.7.2.23(3)(b) The requirements of Section 7.7.14.2(33) do not apply to the future underground parking area.

7.7.2.23(4) Emergency Lighting

7.7.2.23(4)(a) Provide emergency lighting in future underground parking area as required by the standards set out in Section 2.4.6.

7.7.2.23(5) Exit Signs

7.7.2.23(5)(a) Provide exit signs in future underground parking area as required by the standards set out in Section

2.4.6 and in accordance with the requirements of Section 7.7.13.2(44).

7.7.2.23(6) Wiring Devices

7.7.2.23(6)(a) Provide conditional duplex receptacles on columns such that no location in the underground parking area exceeds 30m from a receptacle.

7.7.2.23(6)(b) Provide receptacles or hard-wired connections in the future underground parking area for all fixed and moveable equipment required by other provisions of this Agreement.

7.7.3 Utility Power supply

7.7.3.1 Basic Requirements

7.7.3.1(1) BCH to supply two (2) new dedicated 25kV services fed from physically diverse substations. Services will terminate in Utility switchgear in the Energy Centre. There will be no vistas switch(es) On-Site. Services will be routed in a physically diverse manner into the Energy Centre, exact routing on Site is to be coordinated with BCH.

7.7.3.1(2) The two (2) services will be arranged in a dual supply configuration, with a dedicated running circuit supplied from BCH McLellan substation and a dedicated standby circuit supplied from BCH Fleetwood substation.

7.7.3.1(3) Coordinate with BCH for underground civil standards, protective device coordination, and other service requirements. Provide electrical service information and submit service applications, interconnect studies, and protection information, as required.

7.7.3.1(4) Provide dedicated underground concrete encased duct banks for each BCH service from the property line to the BCH service entrance room in the Energy Centre.

7.7.3.1(5) Provide a dedicated BCH service entrance room for power service terminations. The service entrance room will contain high-voltage Utility incoming switchgear (service box) complete with service termination compartment, main circuit breaker, surge arrester and revenue metering instrument transformer compartment, as required by BCH for a dual supply for each service.

7.7.3.1(6) Provide 25 kV high voltage main feeders between the service entrance room and the 25 kV-12.47 kV power transformers in the Energy Centre.

7.7.3.1(7) The Design-Builder will be responsible for providing all On-Site civil, architectural and ancillary infrastructure required by BCH to accommodate the service connection to the BCH service entrance room in the Energy Centre. All infrastructure and equipment for the incoming services will be in conformance with the requirements of BCH and subject to BCH approvals.

7.7.3.1(8) The Authority, as the BCH customer for the Project, will be responsible for the cost of all off-site work which will be completed by BCH. The Design-Builder will be responsible for coordinating all work with BCH and providing all on-site civil work to enable BCH to service the Facility.

7.7.3.2 Performance Criteria

7.7.3.2(1) All high voltage components of the Facility power systems will be rated for operation at 25 kV. Where voltage conversion power transformers are provided to step Utility voltage down from 25kV to 12.47kV, equipment on the secondary side of these power transformers or connected to the alternate source of an HVATS on the secondary side may be rated for 12.47kV only. Where voltage conversion transformers are provided to step Utility voltage down from 25kV to 12.47kV, the following requirements apply:

7.7.3.2(1)(a) Step-down 25kV-12.47kV transformers will be provided in the Energy Centre connected downstream of the BCH service entrance switchgear, each sized with a base MVA rating for the total capacity for an entire BCH circuit;

7.7.3.2(1)(b) Power transformers will be either cast coil, Epoxy Vacuum Impregnation (E.V.I.), or FR3 oil filled; and

7.7.3.2(1)(c) Bus links and adjacent switchgear space provisions will be provided at the 25kV switchgear to allow additional Utility capacity to be tapped from these points in the future without extended outages to the transformers or primary switchgear.

7.7.3.2(2) Comply with all applicable BCH requirements, including:

7.7.3.2(2)(a) Requirements for Customer-Owned Primary Services Supplied at 4 kV to 35 kV (Primary Guide);

7.7.3.2(2)(b) Interconnection Requirements for Closed-Transition Transfer of Standby Generators for an Extended CTT system; and

7.7.3.2(2)(c) Requirements for Manually Read Primary Service Voltage Revenue Metering (4 kW to 35 kV).

7.7.3.2(3) Design the electrical Utility services and Electrical Rooms to be accessible to authorized personnel only. On-Site underground services will be in concrete-encased duct banks sloped away from the Facility and drained to the site drainage system. Pull boxes (manholes/maintenance holes) will have lockable hasps and will not be located in secure areas, on roadways, or in areas accessible to Patients.

7.7.3.2(4) Feeders from the service entrance room to the Energy Centre normal/conditional Electrical Room will be sized to carry at least 13 MVA at 25 kV based on the method of installation.

7.7.3.2(5) Main Utility feeders will terminate at the Utility power switchgear located within the Energy Centre, as close as practicable to the point where the main Utility feeders enter the Energy Centre.

7.7.3.2(6) The 25kV Utility incoming switchgear will be metal-enclosed type rated for 600 A minimum comprising:

7.7.3.2(6)(a) Two draw-out vacuum circuit breaker main breakers;

7.7.3.2(6)(b) Two dedicated compartments for Utility metering instrument transformers;

7.7.3.2(6)(c) Station class surge arresters conforming to BCH service entrance requirements;

7.7.3.2(6)(d) Separate service entrance compartments conforming to BCH service entrance requirements;

7.7.3.2(6)(e) 3-phase digital multi-function type protective relay at the main breakers with ANSI protective functions 50/51, 50/51N, 86, 47, differential protection on 25kV buss and additional protective functions as required; integral digital metering capable of displaying real-time V, A, kVA, kW with peak demand registers, and a communication port integrated with the BMS to indicate breaker load values and switching status;

7.7.3.2(6)(f) Redundant 120 V AC IM/IT UPS for protective relays and controls. Power supply wiring between the UPS and the switchgear room will fire rated cables rated for no less than 1h;

7.7.3.2(6)(g) A draw-out vacuum circuit breaker tie breaker downstream of Utility metering;

7.7.3.2(6)(h) Two draw-out vacuum circuit breaker feeder breakers to supply 25kV-12.5kV power transformers; and

7.7.3.2(6)(i) Provisions for future 25kV loads by either:

7.7.3.2.6.(i).1 bus links with physical space for one (1) additional cell to be added to both utility bus 1 and utility bus 2; or,

7.7.3.2.6.(i).2 prepared space within utility bus 1 and utility bus 2 switchgear for one (1) future draw out vacuum circuit breaker connected to each bus.

7.7.4 Emergency Power

7.7.4.1 Basic Requirements

7.7.4.1(1) Provide an Emergency Power Generation System that has the capability to restore and sustain a supply of electricity to essential loads if the normal Utility supply is lost.

7.7.4.1(2) Emergency Power System will include four (4) 12.47 kV prime power rated diesel generator sets of equal capacity, minimum 2750 kW each. The total generator capacity will be sufficient to supply power to 100% of the Facility vital and delayed vital peak power demand, including motor starting requirements, with 20% of nameplate capacity reserved as spare (10% for Future growth plus 10% reserve capacity). Refer to Sections 7.7.4.2(1) and 7.7.4.2(2) for related Emergency Power requirements.

7.7.4.1(3) The Energy Centre will be constructed with sufficient undeveloped adjacent space to accommodate a future HV synchronization board in the future, sized identically to the synchronization board initially installed, and associated ancillary equipment. Space and systems will be arranged such that the future addition can occur without disruption to the continued operation of the Emergency Power System. Indicate the location of this adjacent space on Energy Centre floor plans.

7.7.4.1(4) The Emergency Power System will include a common double-ended generator paralleling switchgear that is configured for the parallel operation of four (4) diesel generators split evenly between two (2) buses to accommodate Emergency Power System maintenance. The paralleling switchgear will have provisions to allow for connection to additional future generator paralleling switchgear with additional generators connected to it.

The space required for the future generator paralleling switchgear will match the requirements of Sections 7.7.4.2(5)(a) through 7.7.4.2(5)(f).

7.7.4.1(5) The system will be designed and arranged in such a way that a failure, maintenance shutdown, or replacement of any generator or ancillary equipment will not jeopardize the continued operation of the other generator(s).

7.7.4.1(6) Generators will be located in self-contained outdoor rated enclosures. Enclosures will include vital, UPS (clinical) panels, vapour tight lighting, heating, power and fire alarm initiation and signal (audio and visual) devices, generator annunciator panels and analog fuel gauges to allow for maintenance within the enclosure. Provide temperature BMS monitoring within the enclosure. Refer to PART 5.

7.7.4.1(7) Provide double walled sub-base diesel fuel tanks under each generator with leak detection and other monitoring required by CSA B139 and CSA 282. Refer to Division 25 for additional requirements.

7.7.4.1(8) Provide a connection for a load bank on the generator paralleling bus. Load bank will automatically disconnect from the generator paralleling bus on loss of Utility power.

7.7.4.1(9) Provide a connection for a temporary generator (power and controls) to the high voltage synchronization board on the exterior of the EC. The temporary generator will be capable of connection to the synchronization board and added seamlessly to the emergency power generation system such that, in the event of one generator failure, the temporary generator can replace the failed generator in the system until the failed generator can be repaired. The connection point for the temporary generator will be located to allow for the physical space required for the temporary generator.

7.7.4.1(10) Provide controls on the synchronization board to allow the Facility load (full or partial) to simulate a load on any one generator for testing purposes. The load will be transferable in 1% increments from generator to generator without interruption to the load.

7.7.4.1(11) Communication cabling between the generators and the synchronization board will be fibre, not copper, to eliminate potential EMF conflicts.

7.7.4.1(12) Provide an alternator with permanent magnet generator driven voltage regulator. Provide integrated protective relay for alternator protection for regulation of fault currents within the

thermal damage curve of the alternator. Provide thermal differential protection to establish a zone of protection to preserve the internal integrity of the alternator windings and monitor alternator winding temperature. The protective relay is to adjust the generator shut down time to:

7.7.4.1(12)(a) Line to Ground (L-G) and Line to Neutral (L-N) - 2 seconds.

7.7.4.1(12)(b) Line-Line (L-L) - 5 seconds.

7.7.4.1(12)(c) 3-Phase (L-L-L) - 10 seconds.

7.7.4.2 Performance Criteria

7.7.4.2(1) With one generator offline, the remaining generator capacity will be sufficient to supply power to 100% of the peak vital and delayed vital power demand for the Facility, including motor starting requirements, with 20% of nameplate capacity reserved as spare (10% for Future growth plus 10% reserve capacity).

7.7.4.2(2) With two (2) generators offline, the remaining generator capacity will be sufficient to supply power to 100% of the designated post-disaster systems and operational areas for the Facility, including motor starting requirements, with 20% of nameplate capacity reserved as spare (10% for Future growth plus 10% reserve capacity). Designated post-disaster systems and operational areas include all equipment served from or serving:

7.7.4.2(2)(a) Vital and UPS power branches;

7.7.4.2(2)(b) Generator auxiliary systems;

7.7.4.2(2)(c) Smoke control and smoke venting systems;

7.7.4.2(2)(d) Fire alarm and fire suppression/extinguishing systems;

7.7.4.2(2)(e) Fire Pump;

7.7.4.2(2)(f) Emergency Department;

7.7.4.2(2)(g) External Ambulance Canopy/Vehicle Bay;

7.7.4.2(2)(h) 12 Bed High Acuity Units

7.7.4.2(2)(i) Two (2) Operating Rooms;

7.7.4.2(2)(j) Two (2) 24-Bed Units of Inpatient Units located on one (1) floor; and

7.7.4.2(2)(k) Command Centre.

7.7.4.2(3) The generator paralleling switchgear will be metal-clad type rated for at least 600 A and operation at 12.47 kV.

7.7.4.2(4) The double-ended paralleling switchgear design will be devoid of single points of failure and configured as two (2) physically separate switchgear lineups interconnected by two (2) tie-breakers through a cable tie. Install these two switchgear lineups to be physically separate; do not install them in a contiguous manner.

7.7.4.2(5) Each half of the double-ended generator paralleling switchgear will have:

7.7.4.2(5)(a) Two (2) generator main breakers;

7.7.4.2(5)(b) One (1) tie-breaker;

7.7.4.2(5)(c) Two (2) feeder breakers to supply conditional and delayed vital from one bus, and vital and the load bank from the other bus;

7.7.4.2(5)(d) One (1) prepared space that will accept a draw-out vacuum circuit breaker in the future for an additional paralleling switchgear connection;

7.7.4.2(5)(e) One (1) temporary generator connection breaker; and

7.7.4.2(5)(f) One (1) spare prepared space that will accept a draw-out vacuum circuit breaker in the future for a future load connection.

7.7.4.2(6) Each circuit breaker position in the generator paralleling switchgear will be equipped with a draw-out vacuum circuit breaker including:

7.7.4.2(6)(a) 3-phase digital multi-function type protective relay with ANSI protective functions 50/51, 50N/51N, and additional protective functions as required;

7.7.4.2(6)(b) Integral digital metering capable of displaying V, A, KVA, KW with peak demand registers; and

7.7.4.2(6)(c) A communication port integrated with the BMS to indicate breaker load values and switching status.

7.7.4.2(7) Two (2) fully redundant master control systems will be provided, each arranged to control four (4) engine-generators. The master

control systems will be designed to have no single point-of-failure and will include:

7.7.4.2(7)(a) Redundant PLC controllers operating in a hot/standby arrangement;

7.7.4.2(7)(b) Redundant power supplies;

7.7.4.2(7)(c) Separate enclosures to accommodate redundant control equipment; and

7.7.4.2(7)(d) Redundant HMI touchscreen display panels located in the Energy Centre Control Room and paralleling the switchgear room, arranged such that if either one fails, or is taken out of service, the other seamlessly continues to provide full control of the system.

7.7.4.2(8) Master control systems will include paralleling controls and load management controls. Paralleling controls may be distributed and integrated into genset-mounted control systems only if they provide the same level of redundancy as controls integrated into a central master control system.

7.7.4.2(9) Generators to each be provided with dual starters.

7.7.4.2(10) The generators will normally operate in parallel and provide features including load sharing and base loading. It will be possible to select a pair of generators and use the Facility load as a base load for annual load testing of either generator.

7.7.4.2(11) The BMS will monitor and record emergency loads and provide alarms and systems status associated with the generator plant and transfer switch system.

7.7.4.2(12) Locate the generators outdoors close to the Energy Centre to enable routine and emergency maintenance activities to be performed quickly and efficiently. Removal of the generators from the Site will be simple and will require neither disassembly of the Facility or its systems.

7.7.4.2(13) As the generators will be located outdoors or where they are subject to damage from vandalism, falling objects or debris, road traffic, fire, flood or adverse weather conditions provide physical protection by means of fencing, lighting, bollards, curbing or other suitable means.

7.7.4.2(14) Provide easy access for refuelling truck and generator load bank truck as well as ease of removal of a generator should it be necessary.

7.7.4.2(15) Provide aesthetically pleasing landscaping wrap on generator enclosures in consultation with the Authority.

7.7.4.2(16) Diesel generators to have engine-driven radiators for cooling the engine. The cooling airflow path to be designed such that overall static pressure loss from intake to exhaust through louvres, silencers and dampers does not exceed the external static pressure capability of the engine-driven radiator fan.

7.7.4.2(17) Design the emergency power generation plant so that the sound levels that it will create at exterior spaces associated with the Facility (such as walkways, entryways, balconies or patios) will meet the requirements of Appendix 1D [Acoustic, Vibration, and Noise Control Measures].

7.7.4.2(18) Diesel generator exhaust emissions at full load on 100% diesel fuel will not exceed the Environmental Protection Agency Non-Road ‘Tier 2’ limits and Metro Vancouver Ambient Air Quality Objectives. Locate the diesel generator exhaust outlet above roof level and away from Facility openings to prevent re-entrainment of emissions into air-intakes of buildings.

7.7.4.2(19) Essential power branches will serve emergency loads as defined by CSA Z32 and as required to meet the Appendix 1A [Clinical Specifications and Functional Space Requirements] and Appendix 1N [Electrical and Communications Matrix], including:

7.7.4.2(19)(a) Vital branch loads:

- 7.7.4.2.19.(a).1 Exit signs;
- 7.7.4.2.19.(a).2 Medical gas alarm panels;
- 7.7.4.2.19.(a).3 Medical vacuum system;
- 7.7.4.2.19.(a).4 Fire fighters' elevators;
- 7.7.4.2.19.(a).5 At least one elevator per bank;
- 7.7.4.2.19.(a).6 Elevator cab and machine room lighting;
- 7.7.4.2.19.(a).7 Fire alarm and EVAC paging system;
- 7.7.4.2.19.(a).8 Communications systems;
- 7.7.4.2.19.(a).9 Smoke control systems;
- 7.7.4.2.19.(a).10 Automated dispensing cabinets for medication;
- 7.7.4.2.19.(a).11 Path of egress lighting including lighting at all Facility entrances;
- 7.7.4.2.19.(a).12 50% of stair and ramp lights;
- 7.7.4.2.19.(a).13 50% of receptacles and lights in all Patient care rooms;
- 7.7.4.2.19.(a).14 50% of receptacles in all common Patient areas including Dining/Activity Areas and lounges;
- 7.7.4.2.19.(a).15 Minimum 25 % of main lighting in each room corridor and interior area;

7.7.4.2.19.(a).16	Selected lighting and receptacles in generator room, maintenance shops, medication, and Care Team Stations;
7.7.4.2.19.(a).17	Pharmacy and Oncology Pharmacy dispensing areas, mechanical and electrical service rooms;
7.7.4.2.19.(a).18	Clinical UPS bypasses refer to Sections 7.7.8.2(2)(b) and 7.7.8.2(2)(c);
7.7.4.2.19.(a).19	IM/IT UPS bypasses refer to Sections 7.7.8.2(2)(b) and 7.7.8.2(2)(c);
7.7.4.2.19.(a).20	Receptacles for computers not on UPS power;
7.7.4.2.19.(a).21	Equipment with emergency power as required to support the Equipment listed in Appendix 1H [Equipment and Furniture] and Appendix 1J [Equipment List IM/IT], or as determined during final Equipment selection with the Authority; and
7.7.4.2.19.(a).22	Mechanical equipment associated with Life Safety Systems.

7.7.4.2(19)(b) Delayed vital branch loads:

7.7.4.2.19.(b).1	Rectifier inputs for Clinical UPS and IM/IT UPS refer to Section 7.7.8.2(2)(a);
7.7.4.2.19.(b).2	Fume hoods;
7.7.4.2.19.(b).3	All elevators not on vital, with at least one (1) elevator per bank of multiple elevators on delayed vital;
7.7.4.2.19.(b).4	Two (2) CC linear accelerators;
7.7.4.2.19.(b).5	One (1) CC CT Sim;
7.7.4.2.19.(b).6	One (1) CC PET/CT;
7.7.4.2.19.(b).7	CC cyclotron and all associated equipment;
7.7.4.2.19.(b).8	One (1) of the larger cyclotron production area Clean Rooms (and all equipment within the Clean Room);
7.7.4.2.19.(b).9	One (1) cyclotron production area Quality Control Room associated with the Clean Room (and all equipment within the room);
7.7.4.2.19.(b).10	All imaging equipment in Emergency Satellite Imaging (Imaging Room – Gen Rad (C7.05) and Imaging Room – CT (C7.07));
7.7.4.2.19.(b).11	Two (2) CH Medical Imaging MRIs (Imaging Room – MRI (F6.12));
7.7.4.2.19.(b).12	One (1) CH Medical Imaging CT (Guided Interventional Room – CT (F5.10));
7.7.4.2.19.(b).13	One (1) CH General Rad (Imaging Room – Gen Rad (F4.07)); and

7.7.4.2.19.(b).14 The Multipurpose IR (Imaging Room – Multipurpose IR (F4.23)).

7.7.4.2(19)(c) Conditional branch loads:

7.7.4.2.19.(c).1 Food service equipment;

7.7.4.2.19.(c).2 50% of stair and ramp lights;

7.7.4.2.19.(c).3 50% of receptacles and lights in all Patient care rooms;

7.7.4.2.19.(c).4 50% of receptacles in all common Patient areas including Dining/Activity Areas and lounges;

7.7.4.2.19.(c).5 EVSE;

7.7.4.2.19.(c).6 Equipment without emergency or UPS power requirements as required to support the Equipment listed in Appendix 1H [Equipment and Furniture] and Appendix 1J [Equipment List IM/IT],, or as determined during final Equipment selection with the Authority; and

7.7.4.2.19.(c).7 Loads not included in other power branches.

7.7.4.2(20) Mechanical equipment to be connected to electrical power distribution branches in accordance with CSA Z32 at a minimum. Provide critical mechanical systems with bypass means or connections to multiple power branches to allow systems to remain operational while any single electrical component is de-energized for maintenance. This will include at least one half (1/2) of the heating plant capacity and one third (1/3) of the cooling plant capacity remaining operational during upstream electrical maintenance.

7.7.4.2(21) All elevators will be capable of simultaneous operation when all generators are online. Load management system will include a load-shedding step with input to the elevator controllers limiting elevators to sequential operation when two (2) generators are offline, while still allowing one (1) elevator from each bank to operate simultaneously.

7.7.5 High-Voltage Distribution

7.7.5.1 Basic Requirements

7.7.5.1(1) The high-voltage distribution will consist of two (2) source branches (Utility power branch and generator power) and three (3) load branches (vital, delayed vital, and conditional power).

7.7.5.1(2) Provide separate 12.47 kV distribution systems for each source and load branch.

7.7.5.1(3) All high voltage distribution, cables and breakers will be sized for 13MVA minimum with breaker/relay trip settings sized to accommodate the connected load excepting breakers, feeders and power transformers specifically feeding the Facility.

7.7.5.1(4) Breakers, feeders and power transformers for the Facility will be sized to accommodate the two largest loads so that any one branch feeder is sized to feed any two branch loads.

7.7.5.1(5) All load branches will be capable of being automatically restored from the emergency generators if Utility power is lost.

7.7.5.1(6) Each source and load branch will be arranged such that a failure or maintenance shutdown on any part of one branch, including tie breakers and transfer switch arrangements, will not cause an outage of the whole branch nor deprive any area of electrical power.

7.7.5.1(7) Provide metal clad electrical equipment for the high-voltage distribution systems, except the Utility incoming switchgear, which may be metal-enclosed construction.

7.7.5.1(8) Provide a continuous white lamacoid mimic bus riveted to the front of switchgear, HVATS, paralleling equipment and high voltage and 600V MDPs, clearly indicating the functions in each cell of the distribution equipment.

7.7.5.1(9) The exterior finish of high-voltage distribution equipment will be colour coded as follows: royal red for vital, navy blue for delayed vital, yellow for conditional, grey for Utility power, and green for generator power. The colour of each piece of equipment will match the colour of the source of power that normally feeds the equipment.

7.7.5.1(10) Provide anti-reflective infrared (IR) windows on all HV switchgears. The IR windows are to be factory assembled such that the cable connections and bus connections are visible through the IR window for thermal scanning.

7.7.5.2 Performance Criteria

7.7.5.2(1) Normal power branch A will receive power input from the 25kV-12.47kV power transformer A (fed from Utility switchgear) via a main breaker. The normal power branch A switchgear will contain draw out vacuum circuit breakers including: a main breaker and load breakers for separate high-voltage automatic transfer switches (HVATS) to serve HVATS-V and HVATS-C. The preferred source input of the HVATS will be directly fed from normal power branch A; the alternate source input of the HVATS will be the associated load breaker on the generator paralleling

switchgear bus. In addition to the above feeder breakers, provide an interlocking tie breaker to branch B normal power switchgear and provisions for one (1) future normal power branch A draw out breaker either as prepared space within the switchgear or via bus links with physical space for one additional cell to be added.

7.7.5.2(2) Normal power branch B will receive power input from 25kV-12.47kV power transformer B (fed from Utility incoming switchgear) via a main breaker. The normal power branch B switchgear will contain draw out vacuum circuit breakers including: a main breaker and load breakers for separate HVATS to serve HVATS-DV and a spare load breaker. The preferred source input of the HVATS will be directly fed from normal power branch B; the alternate source input of the HVATS will be the associated load breaker on the generator paralleling switchgear bus. In addition to the above feeder breakers, provide an interlocking tie breaker to branch A normal power switchgear and provisions for a future normal power branch B draw out breaker either as prepared space within the switchgear (in addition to the spare provided) or via bus links with physical space for one additional cell to be added.

7.7.5.2(3) High-voltage automatic transfer switches (HVATS) will be:

- 7.7.5.2(3)(a) A complete assembly that is purpose-built as automatic transfer switch equipment and listed to CSA 178.3 and/or UL 1008A;
- 7.7.5.2(3)(b) Metal-clad switchgear construction consisting of four (4) draw-out vacuum circuit breakers and able to bypass and isolate the automatic transfer breaker-pair on both sides of the dual incoming sources;
- 7.7.5.2(3)(c) Capable of closed-transition transfer (make-before-break transfer), extended certified closed transition, between the incoming sources, preventing interruption to downstream loads during weekly testing or when retransferring to the Utility source after a power outage; and
- 7.7.5.2(3)(d) Rated for 600 A, including vacuum circuit breakers, internal bus and sensors.

7.7.5.2(4) High-voltage vital power switchgear will receive its input directly from HVATS-V. This switchgear will be 600-A rated and configured with a quantity of breakers as required to accommodate each of the following loads:

7.7.5.2(4)(a) One 12.47 kV breaker for a 12.47 kV-600 V main power transformer for vital power in the Facility;

7.7.5.2(4)(b) One 12.47kV breaker for a 12.47kV-600V main power transformer for vital power in the Energy Centre;

7.7.5.2(4)(c) One 12.47kV main incoming feeder;

7.7.5.2(4)(d) One 12.47kV tie breaker to the delayed vital switchgear;

7.7.5.2(4)(e) One 12.47kV tie breaker to the Conditional switchgear;

7.7.5.2(4)(f) In addition to the above feeder breakers, include one (1) prepared space that will accept a draw-out vacuum circuit breaker in the future to serve future renovations or additions;

7.7.5.2(4)(g) In addition to the above breakers, provide bus link provisions and available space to add one (1) additional breaker cell on one end of the switchgear.

7.7.5.2(5) High-voltage delayed vital power switchgear will receive its input directly from HVATS-DV. This switchgear will be 600-A rated and configured with a quantity of breakers as required to feed each of the following loads:

7.7.5.2(5)(a) One 12.47 kV-600 V power transformer for delayed vital power in the Facility;

7.7.5.2(5)(b) One 12.47kV-600V power transformer for delayed vital power in the Energy Centre;

7.7.5.2(5)(c) One 12.47kV main incoming feeder;

7.7.5.2(5)(d) One 12.47kV tie breaker to the vital switchgear;

7.7.5.2(5)(e) One 12.47kV tie breaker to the Conditional switchgear;

7.7.5.2(5)(f) In addition to the above feeder breakers, include one (1) prepared space that will accept a draw-out vacuum circuit breaker in the future to serve future renovations or additions;

7.7.5.2(5)(g) In addition to the above feeder breakers, provide bus link provisions and available space to add one

(1) additional breaker cell on one end of the switchgear lineup.

7.7.5.2(6) High voltage conditional power switchgear will receive its input directly from HVATS-C. This switchgear will be 600-A rated and configured with a quantity of breakers as required to feed each of the following loads:

7.7.5.2(6)(a) One 12.47 kV-600 V power transformer for conditional power in the Facility;

7.7.5.2(6)(b) One 12.47kV main incoming feeder;

7.7.5.2(6)(c) One 12.47kV tie breaker to the vital switchgear;

7.7.5.2(6)(d) One 12.47kV tie breaker to the delayed vital switchgear;

7.7.5.2(6)(e) In addition to the above feeder breakers, include one (1) prepared space that will accept a draw-out vacuum circuit breaker in the future to serve future renovations or additions.

7.7.5.2(6)(f) In addition to the above feeder breakers, provide bus link provisions and available space to add one (1) additional breaker cell on one end of the switchgear lineup.

7.7.5.2(7) Each circuit breaker position in the high voltage distribution will have:

7.7.5.2(7)(a) 3-phase digital multi-function type protective relay with ANSI protective functions 50/51, 50N/51N, and additional protective functions as required for closed-transition interconnection protection;

7.7.5.2(7)(b) Remote operation capability;

7.7.5.2(7)(c) Integral digital metering capable of displaying V, A, KVA, KW with peak demand registers and harmonic parameters; and

7.7.5.2(7)(d) A communication port integrated with the BMS to indicate breaker load values and switching status.

7.7.5.2(8) The tie breakers between vital, delayed vital and conditional switchgear will be key interlocked with the source breakers to prevent paralleling of multiple incoming power sources.

7.7.5.2(9) The high voltage feeders fed from vital, delayed vital and conditional branches will be kept entirely independent of each

other and will not occupy the same maintenance hole, pull pit, junction box, pull box, cable tray, fire rated shaft, enclosure, etc., except where required to connect power sources at tie breakers and transfer switches.

7.7.5.2(10) Provide redundant 120 V AC IM/IT UPS circuits for protective relays and controls. Power supply wiring between the UPS the switchgear room will be fire rated cable rated for no less than 2h.

7.7.5.2(11) Power Transformers

7.7.5.2(11)(a) Will be cast coil or FR 3 oil filled with copper windings, delta connected primary and delta or wye connected secondary;

7.7.5.2(11)(b) kVA capacity indicated will be based on Class 220 degree C insulation, 150 degree C rise;

7.7.5.2(11)(c) Will have cooling fans that will provide a minimum additional 33 % capacity over the base rating;

7.7.5.2(11)(d) Monitoring for pressure sensors if applicable;

7.7.5.2(11)(e) Will have tested minimum efficiency meeting the U.S. Department of Energy (DoE) 2016 final rule (CFR Title 10 Part 431) and NRCan 2019 requirements; and

7.7.5.2(11)(f) Will be sized to provide power to load connected directly downstream and the next largest power transformer’s load connected via tie breakers.

7.7.6 Buried Duct Bank System for Electrical Campus Distribution

7.7.6.1 Basic Requirements

7.7.6.1(1) Provide buried concrete encased and reinforced electrical duct bank systems for all feeders not located within the Facility. Duct bank systems are required for incoming Utility high voltage services, inter-building electrical wiring, generator wiring as well as wiring and spare duct provisions to/from the Energy Centre. Physically diverse duct banks will not take parallel horizontal routes from start to end points with a 1.8m separation. A physical separation of 1.8 m will be maintained at shared duct bank start and end points.

7.7.6.1(2) Provide physically separated maintenance holes along each buried concrete encased duct bank system including provisions to facilitate connections of two (2) separate groups of power branches to the following locations from the Energy Centre:

7.7.6.1(2)(a) BER room;

7.7.6.1(2)(b) Generators;

7.7.6.1(2)(c) Future Expansion; and

7.7.6.1(2)(d) Future spare.

7.7.6.1(3) Vital and conditional power feeders from the EC to the BER may be routed together. Delayed vital feeders will not follow the same route, nor occupy the same duct bank maintenance hole or pull pit, as the vital and conditional feeders. One (1) of the Utility power feeders may be routed in the same ductbank as the vital and conditional feeders provided separate maintenance holes or pull pits are included for the Utility feeder.

7.7.6.1(4) All underground duct banks will be identified at the point they enter/exit the perimeter of any building. The markers will be located directly over the buried ducts and indicate the type and depth of each duct bank.

7.7.6.1(5) The concrete encased and reinforced electrical duct bank system entering/exiting the Facility will be designed with Site specific seismic provisions.

7.7.6.2 Performance Criteria

7.7.6.2(1) The Facility will receive a minimum of two (2) physically separated concrete-encased duct bank systems originating at the Energy Centre, each consisting of at least four (4) 103 mm ducts and 50% spare capacity.

7.7.6.2(2) The generator feeders will be routed in two (2) concrete encased duct banks from the generators to the Energy Centre. The feeders for generators connected to the same paralleling bus will be in a shared duct bank. The duct banks for each paralleling bus will be routed in a physical diverse manner from each other. Each generator duct bank will consist of at least four (4) 103 mm ducts and 50% spare capacity.

7.7.6.2(3) Provision for Future Expansion 2 generators is included in the duct banks described in Section 7.7.6.2(2). Generator feeders connecting to the future paralleling bus will be split into the two existing paralleling bus duct banks.

7.7.6.2(4) Provisions for Future Expansion and Spare construction will include a minimum of two (2) physically separated concrete-encased duct bank systems per location, originating at the Energy Centre, each consisting of at least four (4) 103 mm ducts, capped at the edges of the Facility closest to these

developments. Duct banks may terminate closer to the Energy Centre if undeveloped routes sufficient to extend the duct banks to the edges of the Facility are reserved for future installation.

7.7.6.2(5) Maintenance holes to be minimum 4.2 m long x 2.4 m wide x 2.25 m high with cast-iron covers.

7.7.6.2(6) Provide a maintenance hole with a drained sump immediately before each duct bank enters (or exits) the Facility. Slope all ducts towards maintenance holes or install T-drains at low points in ducts where this is not possible.

7.7.7 Distribution Equipment – 600 Volts and Below

7.7.7.1 Basic Requirements

7.7.7.1(1) A minimum of three (3) power transformers in the BER will derive and distribute 600 V locally. Each will feed a 600 V Main Distribution Panel (MDP) lineup (vital, delayed vital, conditional), and all of the lineups will be interconnected with interlocked tie breakers such that each MDP lineup can be powered from either of the other two lineups while the transformer normally powering it is fully isolated for maintenance. Each power transformer is to be sized to supply power to it’s corresponding MDP plus the larger of the two remaining MDPs.

7.7.7.1(2) A minimum of two (2) power transformers in the Energy Centre will derive and distribute 600 V locally. Each will feed a 600 V Main Distribution Panel (MDP) lineup (vital, delayed vital), and the two lineups will be interconnected with interlocked tie breakers such that either MDP lineup can be powered from the other lineup while the transformer normally powering it is fully isolated for maintenance. Each power transformer is to be sized to supply power to it’s corresponding MDP plus the remaining MDP.

7.7.7.1(3) All MDPs and CDP (including 600 V and 208 V equipment) will have prepared bus links or a set of spare lugs to easily extend the bus to a future section. This also allows for temporary connections should they be needed in future. Links will be bolted to the inside lower portion of the cubicle from which they will be extending the bus.

7.7.7.1(4) If Utility power is lost, all vital, delayed vital and conditional distribution will be automatically restored from generator power. Conditional distribution will automatically disconnect from generator power in the event of a generator failure but will be configured for manual transfer back to generator power if so desired.

7.7.7.1(5) Provide separate 600 V distribution branches to serve each load category indicated below, with additional distribution branches permitted to be used for UPS units. Connect the distribution branches to the main 600 V MDP as follows:

7.7.7.1(5)(a) Vital branches to serve loads classified as vital;

7.7.7.1(5)(b) Delayed vital branches to serve loads classified as delayed vital; and

7.7.7.1(5)(c) Conditional branches to serve all other loads.

7.7.7.1(6) Life safety loads, as defined by the CEC, will be included in the vital branches and delayed vital branches as permitted by CSA Z32.

7.7.7.1(7) All distribution branches will be arranged such that any part of one (1) branch can be safely isolated for maintenance without affecting another branch or depriving any area of electrical power.

7.7.7.1(8) Provide a minimum clear physical space (or spare section) equal to one (1) complete/full size vertical MDP section at each lineup to allow expansion in the future. Such future sections will be provided sufficient space for an easy installation.

7.7.7.1(9) Provide automatic power factor correction to ensure that the overall power factor for each Utility service does not fall below 95% lagging and the generator buses are not loaded with a leading power factor under any conditions.

7.7.7.1(10) In accordance with Section 7.7.9 Metering, separate the Facility electrical loads into ‘metered load category groupings’ and ‘non-metered load category groupings’. Provide dedicated panelboards, motor control centres, CDPs, and feeders as needed to segregate the electrical load category groupings for metering. Alternatively, metering information may be obtained from individual circuit metering, equipment data or calculated values where explicitly permitted.

7.7.7.1(11) Switch gear: 600V and below electrical distribution equipment will be Schneider as follows: [NOTE TO PROPONENT: If the Proponent proposes an Acceptable Equivalent under the RFP, the Proponent should provide information regarding the capital cost and minimum requirements for the electrical distribution equipment equivalent to the above listed system including integration to other Facility systems as required by this Agreement.]

7.7.7.1(11)(a) MDPs Schneider PowerZone 4 series;

7.7.7.1(11)(b) CDPs in the EC, BER and downstream of the UPS - Schneider QED series;

7.7.7.1(11)(c) CDPs in FERs – Schneider I-Line series; and

7.7.7.1(11)(d) Panelboards – Schneider NF or NQ series.

7.7.7.2 Performance Criteria

7.7.7.2(1) 600 V Main Distribution Panels:

7.7.7.2(1)(a) 600V Switchgear connected directly to the secondary side of the power transformers will be considered Main Distribution Panels (MDP);

7.7.7.2(1)(b) In the Core Hospital and Cancer Centre 600 V distribution will be derived from three (3) main 12.47 kV-347/600 V transformers dedicated to vital, delayed vital, and conditional branches;

7.7.7.2(1)(c) In the Energy Centre 600 V distribution will be derived from two (2) main 12.47 kV-347/600 V transformers dedicated to vital and delayed vital;

7.7.7.2(1)(d) Each of the main power transformers at the same voltage level in the same Electrical Room will be of identical characteristics and sized with a minimum rating equal to the largest peak demand of any two (2) of the associated power branches during the first year of Facility operation. Each transformer will be equipped with cooling fans and have a minimum fan-cooled rating of 133% of its base rating to allow for future load growth;

7.7.7.2(1)(e) Will have each power branch (vital, delayed vital, and conditional) normally fed from the dedicated main power transformer associated with it. Each 600 V MDP for each power branch will consist of a physically separate metal-enclosed switchgear lineup and have a normally open tie breaker connected to every other MDP switchgear lineup. The 600 V MDP switchgear, main breaker and tie breakers for each branch will be of the same characteristics and capable of carrying the full nameplate load of one power transformer;

7.7.7.2(1)(f) Will have each 600 V MDP lineup complete with: main and tie breakers, a quantity of feeder breakers as required by the sections below and prepared spaces. Prepared spaces to be determined by the

leftover space available in any vertical sections, but will never be less than one per branch; and

7.7.7.2(1)(g) Will have key interlocks in place between the main breakers and tie breakers in each 600 V MDP branch to prevent interconnection of transformer secondaries.

7.7.7.2(2) 600 V MDPs will:

7.7.7.2(2)(a) Directly feed all vital, delayed vital, and conditional CDPs or MCCs, conditional bus duct risers, UPS systems, chillers fed from the MDP at 600 V. Directly feed in this context means feeder circuits will not have intermediate terminations, splices, splitters, taps, or protective devices between the feeder breaker and the terminations at the equipment being fed. Notwithstanding this requirement, conditional 600-V CDPs or conditional 600-V MCCs may be directly fed from a bus duct riser tap instead of being directly fed from the MDP;

7.7.7.2(2)(b) Directly feed automatic harmonic and power factor correction systems (where provided);

7.7.7.2(2)(c) Consist of draw out power circuit breakers for all protective devices, approved and labeled for continuous operation at 100% of rated current, with provisions for remote racking. All breakers will be equipped with solid-state trip units with adjustable LSI elements and, where required, adjustable ground fault protection;

7.7.7.2(2)(d) Be designed, factory-assembled and tested in accordance with CSA C22.2 No.31 and ANSI C37.20.1;

7.7.7.2(2)(e) Be connected to the IBMP system to indicate operational status, position, trip events and ground fault protection for each breaker;

7.7.7.2(2)(f) Have breakers sized and set to coordinate with the distribution equipment that they will feed, achieving selective coordination of protective devices (for phase and ground elements) and minimizing arc flash incident energy levels. Utilize zero sequence relaying on the vital and delayed vital MDPs to achieve a fully coordinated system;

7.7.7.2(2)(g) Have one (1) spare 1600 A frame power circuit breaker in each the 600 V vital and delayed vital MDP lineup. The Conditional 600 V MDP lineup will have a minimum of one (1) prepared space;

7.7.7.2(2)(h) Have a continuous white lamacoid mimic bus riveted to the front of the enclosure, clearly indicating the functions in each cell of the distribution equipment; and

7.7.7.2(2)(i) Have the exterior finish colour coded as follows: royal red for vital, navy blue for delayed vital, yellow for conditional, and orange for UPS. The colour of each piece of equipment will match the colour of the source of power that normally feeds the equipment.

7.7.7.2(3) Low Voltage Manual Transfer Switch (MTS)

7.7.7.2(3)(a) Will be approved to CSA C22.2, No.178.1; and

7.7.7.2(3)(b) Will be closed-transition soft transfer type, except for ambulance EVSE supply which may be open-transition type.

7.7.7.2(4) CDPs:

7.7.7.2(4)(a) All breakers to be molded case type with electronic trip units having field-adjustable LSI elements (and ground fault protection where applicable), except as follows:

7.7.7.2.4.(a).1 CDPs that have an LSI breaker protecting the CDP source feeder may use molded case switches or other types of disconnecting means without protective functions as the main disconnecting means instead of a breaker. Devices with fixed short-time trip settings may not be used on CDP mains;

7.7.7.2.4.(a).2 Feeder breakers where both the largest breaker downstream (at its highest settings) and the smallest breaker upstream (at its lowest settings) are selective throughout their entire time and fault current ranges (including for times less than 0.01s) may use an LI type breaker with adjustable instantaneous settings instead of LSI;

7.7.7.2.4.(a).3 Tie breakers where the largest breaker downstream (at its highest settings) is selective throughout its entire time and fault

current range (including for times less than 0.01s) may use an LI type breaker with adjustable instantaneous settings instead of LSI; and

7.7.7.2.4.(a).4 Branch circuit breakers do not require LSI type breakers.

7.7.7.2(4)(b) Each vital, delayed vital and UPS CDP or MCC will be connected via manual transfer switches or tie breakers to a conditional CDP or MCC serving the same level, to permit isolation and maintenance of upstream components. UPS CDPs are excluded from this requirement where all downstream 208V panels can by powered through manual transfer switches or tie breakers at the 208V level. Bypass connections to delayed vital instead of conditional are permitted.

7.7.7.2(4)(c) Each conditional CDP will be of equal or larger ampacity to any equipment connected to it via manual transfer switches or tie breakers.

7.7.7.2(4)(d) Each CDP will be equipped with a lockable disconnecting means within the same room.

7.7.7.2(4)(e) CDPs will be a minimum of 915 mm (36”) wide.

7.7.7.2(5) Distribution Transformers:

7.7.7.2(5)(a) UPS transformers will be harmonic mitigating type.

7.7.7.2(5)(b) Conditional distribution transformers will be sized for their peak conditional load, plus the largest peak load of any CDP connected to the transformer secondary via manual transfer switch or tie breaker, in addition to 20% spare based on this combined load.

7.7.7.2(5)(c) Capable of being individually isolated for maintenance purposes without outages to any loads other than the ones directly served by that transformer.

7.7.7.2(5)(d) Class H 180 °C insulation with temperature rise not exceeding 125 °C maximum in 40 °C ambient.

7.7.7.2(5)(e) High-efficiency type, with tested minimum efficiency meeting the U.S. Department of Energy (DoE) 2016 final rule (CFR Title 10 Part 431) and NRCan 2019 requirements.

7.7.7.2(5)(f) Distribution transformers will be K-13 rated at a minimum.

7.7.7.2(6) Panelboards:

7.7.7.2(6)(a) Neutral with double ampere rating as mains unless noted otherwise. Provide double neutral bars for branch circuit wiring. Provide double bond bus bars in all non Back-of-House locations.

7.7.7.2(6)(b) Branch circuit breakers will be bolt-on style.

7.7.7.2(6)(c) Provide integral SPD for all panelboards required in Sections 7.7.2.21(9) and 7.7.2.21(10).

7.7.7.2(6)(d) Do not daisy-chain or sub-feed panelboard feeders. All panelboard feeders will be directly fed from a CDP on the same floor.

7.7.7.2(6)(e) Hinged door with two-point latch and locks. Panelboards will be a minimum of 510 mm (20") wide.

7.7.7.2(6)(f) Panelboards are not to be fed from below. All feeders will be routed down from the ceiling for top entry into the panelboard.

7.7.7.2(6)(g) Select, configure, locate and install all components of power distribution systems to minimize the transmission of noise, vibration or unwanted heat into other parts of the Facility. Provide shielding, isolation, grounding, bonding, harmonic filtration, or other means to prevent interference between systems or degradation of performance of an individual system.

7.7.7.2(6)(h) All electrical distribution equipment will be located in service rooms, unless noted otherwise. All panelboards will be located in Electrical Rooms or mechanical spaces (such as the mechanical floor or penthouse closets). Panelboards for the ORs are not required to be located in an Electrical Room but will be located, flush mounted, in the non-sterile corridor.

7.7.7.2(6)(i) Sprinkler heads will be located such that the spray deflector of any sprinkler head within 1.83 m of electrical equipment will not have an unshielded direct path to any enclosure openings or electronic

components of MCCs, transformers, meters, harmonic filters, etc.

7.7.7.2(6)(j) Branch panelboards will only feed branch circuits on the same floor and department where they are located.

7.7.7.2(6)(k) Provide at least one (1) vital and one (1) UPS panelboard in each Communications Room to service equipment loads including planned future cabinets. Size these panelboards to carry any automatically switched loads such as dual-corded power supplies in the event of an outage to one of the power branches.

7.7.7.2(6)(l) Provide one (1) conditional branch panelboard, minimum 200 A, 600 V / 3-phase, 42-circuit, within each retail Shelled Space, dedicated to the future retail uses. Provide 600V-120/208V 75kVA transformer and 400A 120/208V/3-phase, 4-wire, 60-circuit panelboard. Panels to be fed with a breaker and feeder matching the panelboard ampacity, with the future retail load included in distribution equipment load calculations before spare capacity is calculated.

7.7.7.2(6)(m) Provide one (1) vital feed, minimum 60A, 600V, 3-phase, 4-wire and terminate in a local main fused disconnect, in the Shop-Electrical for future equipment testing provisions. Additionally, provide the following equipment provisions in the Shop-Electrical. Locations of the equipment will be as determined by the Authority:

7.7.7.2.6.(m).1 One (1) 100A, 600V rated splitter trough;

7.7.7.2.6.(m).2 One (1) 30A, 600V, 3-phase circuit and disconnect for motor testing purposes; and

7.7.7.2.6.(m).3 One (1) 600V-120/208V 3-phase transformer and 125A, 120/208V 3-phase, 4-wire 42-circuit panelboard.

7.7.7.2(6)(n) In each Workshop, including Machine Shop, Electronics Shop provide minimum 60A 600V 3-phase disconnect, minimum 45kVA 600V-120/208V transformer and minimum 225A 120/208V 3-phase 4-wire 42 circuit panel.

7.7.7.2(6)(o) In the Radiation Therapy Machine Shop and Carpentry Workshop provide keyed lockout to disconnect power to receptacles within the room.

7.7.7.2(6)(p) Painted exterior cover with colour to match the upstream CDP.

7.7.7.2(6)(q) Label each branch circuit with a unique descriptor on typewritten directory.

7.7.7.2.6.(q).1 Provide 25% spare physical space and 25% spare capacity for future loads.

7.7.7.2(7) Motor Starters and MCCs:

7.7.7.2(7)(a) Provide individual enclosed motor starters for individual motors unless noted otherwise. Provide MCCs for groups of four (4) or more motors that require individual motor starters if located within a 30-m radius and on the same power branch and the same floor.

7.7.7.2(7)(b) Provide combination starters for all motors 1/2 HP and larger that are not controlled by variable frequency drive or include an integral control package. All motors of 1/2 HP or more will be 600 V, 3-phase.

7.7.7.2(7)(c) Combination motor starters to include magnetic MCP type short circuit protection, overload protection, integral control power transformers, HOA or start/stop control and at least two (2) auxiliary contacts in addition to seal-in contacts. Include under voltage and single phase dropout protection functions. Provide “power on” and “running” LED type indicators on each starter.

7.7.7.2(7)(d) Provide localized disconnect for VFDs and mount VFDs together near equipment they serve. Provide line isolators if the VFD does not come with line isolators.

7.7.7.2(7)(e) Provide 20% physical space and calculated spare capacity in each MCC.

7.7.7.2(7)(f) MCCs will be painted to match the system power they are connected too.

7.7.7.2(8) Power Factor Correction Equipment:

7.7.7.2(8)(a) Will provide automatic and dynamic correction of the CC and CH building and the Energy Centre power factor to ensure that the overall power factor as well as the power factor on each 600-V MDC

does not fall below 95 % lagging or become leading.

7.7.7.2(8)(b) Will consist of automatic switched capacitor banks with 25 kVAR steps for each 600-V MDC and integral power factor controllers that constantly measure the reactive power at the mains and controls the connection and disconnection of capacitor steps.

7.7.7.2(8)(c) Will be anti-resonant (de-tuned) for application in the electrical system containing non-linear loads.

7.7.7.2(8)(d) Provide monitoring of all alarm and trouble conditions of the power factor correction system by the BMS.

7.7.7.2(9) Unless otherwise specified, all receptacles accessible to Patients requiring GFCI protection will have the GFCI protection incorporated into the branch circuit breaker.

7.7.7.2(10) Power distribution will include:

7.7.7.2(10)(a) Directly fed CDP/MCC feeder risers or conditional bus duct risers with tap boxes that directly feed conditional 600V CDPs and 600V MCCs. Where bus duct risers are used, they will have a minimum of one (1) tap box space available at each FER that the bus duct serves, in addition to the tap boxes initially required. The tap boxes will use breakers only and will only feed CDPs in the same FER or MCCs on the same floor, and reserved spaces will be able to accommodate a breaker up to 400A. Bus ducts are not permitted for UPS, vital, or delayed vital distribution;

7.7.7.2(10)(b) At least one (1) 600V vital and conditional CDP on every floor in each vertically-stacked FER. Provide a minimum of six (6) 150 mm diameter re-penetrable fire rated sleeves interconnecting each FER in addition to any other future provisions;

7.7.7.2(10)(c) MCCs and delayed vital CDPs will be located as required by the design;

7.7.7.2(10)(d) 600V Clinical UPS CDPs on at least every third floor in each vertically-stacked FER riser;

7.7.7.2(10)(e) 208V vital, conditional, and Clinical UPS CDPs on every floor in each vertically-stacked FER;

7.7.7.2(10)(f) At least one step down distribution transformer for each 600V CDP, located within the same Electrical Room as the CDP that it feeds. Distribution transformers will only feed a single CDP, except where there is no 600V CDP for that branch in adjacent vertically-stacked FERs, in which case 208V CDPs in adjacent vertically-stacked FERs may be sub-fed from the FER where the transformer is located;

7.7.7.2(10)(g) Provide Mobile Medical Units (MMU) shore power connection points at the Facility exterior adjacent to the MMU deployment location, consisting of one (1) 200A, 120/208V, 3-phase, 4-wire vital power circuit serving the MMU, and one (1) 60A, 120/208V, 3-phase, 4-wire vital power circuit serving the site trailer. Neutral and grounding conductor sizing will match current carrying conductor sizes. Connection points will be in a lockable, above ground weatherproof enclosure and use Crouse–Hinds Cam-Lok J Series connectors and local disconnect switches. Enclosure will be protected by bollards where exposed to vehicle impact or snow removal equipment;

7.7.7.2(10)(h) 480V 3-phase 60Amp connection at the loading dock for mobile cooler truck connection. Confirm connection type (pin and sleeve, cam lock etc.) with the Authority during the design phase; and

7.7.7.2(10)(i) Provide one (1) 240V/50A 14-50R electrical outlet c/w weatherproof in-use cover on conditional power located near the compactors for Authority use during periodic repairs.

7.7.7.2(11) No splitters or fused switches will be used except where feeding a single equipment package with multiple power connections and power system redundancy is not required.

7.7.8 UPS Systems

7.7.8.1 Basic Requirements

7.7.8.1(1) Provide two (2) central UPS systems and distribute UPS power to all areas, equipment and systems that require an uninterrupted source of power during Utility outages as required by this Schedule and all its applicable Appendices.

7.7.8.1(2) Locate in a secure, dedicated service room designed to mitigate risk of fire, flood, seismic effect, vandalism, and equipment failure. Room to have 2-hour fire rating and environmental controls suitable for UPS and battery equipment.

7.7.8.1(3) Both UPS systems to be designed and installed such that they are certified as post-disaster rated.

7.7.8.1(4) Distributed individual UPS systems for specialized medical equipment are exempt from the central UPS requirement where noted below.

7.7.8.1(5) Provide specialized individual UPS systems for each imaging system in the Operating Room, fed from vital power; locate in the same fire compartment as the Operating Rooms. These UPS systems will be fully compatible with the imaging systems and have sufficient capacity to permit uninterrupted fluoroscopy and table control for at least five (5) minutes following a power outage. Where UPS power is required for imaging systems in other areas, the associated controls, workstations and displays of the imaging system will be supplied from the central clinical UPS system to prevent system restarts during Utility power outages, with other components fed from vital power. Where these controls, workstations and displays are not compatible with the central UPS system, provide specialized individual UPS systems meeting the manufacturer's recommendations, fed from vital power.

7.7.8.1(6) Two separate central UPS systems will be provided for UPS loads. One of these systems will be exclusively reserved for IM/IT systems loads, while the other will be for clinical areas and other uses. Each UPS system will be of expandable modular design for both the UPS capacity and battery modules with N+1 module redundancy for both the UPS and battery modules. A minimum of 2 hours of fire separation is to be provided between the IM/IT UPS and Clinical UPS systems.

7.7.8.1(7) Critical UPS power modules to be removable and field replaceable when the UPS is in bypass, and power is provided by the generator, in case of failure. Each battery string will include an isolation device to allow replacement while the UPS remains running with remaining battery strings providing 15 minute “N” runtime.

7.7.8.1(8) Each UPS will have a complete and separated wrap-around bypass that allows for the entire UPS unit, including frame, to be removed without interruption to the UPS loads.

7.7.8.1(9) Breakers, feeders and other equipment feeding and directly fed by the UPS units will be sized for the maximum load rating of the UPS rather than the calculated load such that, should the UPS be fully loaded in the future, electrical revisions to cabling, breakers and electrical equipment will not be required. Trip settings for upstream and downstream breakers to be set as needed for the calculated connected load.

7.7.8.1(10) Provide a permanent resistive load bank, conduits and cabling to allow for testing of each UPS system from one UPS room to the roof of level 5. Terminate load bank conduit and cabling in splitter to allow local cable connection of either UPS for testing.

7.7.8.1(11) The IM/IT UPS panelboards will only be located within Communications Rooms for the express purpose of providing power to:

7.7.8.1(11)(a) Equipment racks and server cabinets except those provided by telecommunications carriers. Refer to Sections 7.8.9.7(4), 7.8.9.9, and 7.8.9.10 for further details.

7.7.8.1(11)(b) Active wall mounted equipment installed in Communications Rooms where the provision of back-up power is specified as a requirement in this Agreement.

7.7.8.1(11)(c) Energy Centre control systems, BMS, lighting controls, and all other control systems without dedicated battery backup unless otherwise approved by the Authority.

7.7.8.1(12) Power from the IM/IT UPS branch will not be used for any other purposes other than those stated in Section 7.7.8.1(11) unless otherwise approved by the Authority.

7.7.8.1(13) All areas, equipment and systems requiring central UPS power and not supplied by the IM/IT UPS systems will be supplied from the clinical UPS systems, including:

7.7.8.1(13)(a) Items in Attachment 1J [Equipment List IM/IT] and Appendix 1H [Equipment and Furniture] requiring UPS power, as determined in consultation with the Authority and the Design-Builder’s Equipment consultant, except for items requiring dedicated individual/local UPS systems as approved by the Authority;

7.7.8.1(13)(b) Items identified in Appendix 1N [Electrical and Communications Matrix];

7.7.8.1(13)(c) 90% of Command Centre U6.01 and U6.04 lighting (remaining 10% will be on vital). All U6.07 Storage - Radio/Equip - EOC lighting. General receptacles and Command Centre equipment connections in U6.01, U6.04, and U6.07. The Design-Builder will provide an additional 10% of receptacles on vital for redundancy in these rooms located in consultation with the Authority.

7.7.8.1(13)(d) All receptacles for Patient physiological monitoring Equipment;

7.7.8.1(13)(e) Lighting at corridor intersections and stairwell entrance landings, in addition to emergency lighting required by BCBC and CSA Z32;

7.7.8.1(13)(f) 10% of workstations in clinical areas;

7.7.8.1(13)(g) Lighting, receptacles, and equipment in clinical and support areas noted in other sections as requiring UPS power;

7.7.8.1(13)(h) Control and communication consoles/modules for all medical imaging and treatment equipment;

7.7.8.1(13)(i) All automatic door operators for medical imaging and treatment rooms;

7.7.8.1(13)(j) Mechanical control systems not associated with Life Safety Systems;

7.7.8.1(13)(k) The cyclotron control computer, the gamma spec MCA and associated computer, and the FDG hotcells that supply synthesis modules;

7.7.8.1(13)(l) Multimedia equipment as per Section 7.8.15.2(2)(f);

7.7.8.1(13)(m) Digital wayfinding equipment as per Section 7.8.16.8; and

7.7.8.1(13)(n) Lighting control system.

7.7.8.1(14) Provide the clinical UPS system with two (2) or more hot swappable UPS modules to provide N+1 redundancy, sized to ensure the UPS supports 100% of the Day 1 load when one UPS module is unavailable. Allow for future growth of the clinical UPS loads to the ‘ultimate build out’. The ‘ultimate build out’ is defined as the calculated load with no diversity at service commencement plus 25%. The clinical UPS will still retain N+1 redundancy at ‘ultimate build out’, this may be achieved by either:

7.7.8.1(14)(a) Providing space in the UPS frame for future UPS module(s); or

7.7.8.1(14)(b) Providing UPS module(s) sized to support the ‘ultimate build out’ load.

7.7.8.1(15) Provide all the clinical UPS supporting infrastructure, such as transformers, feeder cables, breakers, and mechanical cooling capacity sized for continuous operation at the ‘ultimate build out’ load.

7.7.8.1(16) Provide the clinical UPS with dedicated hot swappable battery string(s) for the UPS system with N+1 redundancy. Provide required space for future batteries to support the ‘ultimate build out’.

7.7.8.1(17) Provide IM/IT UPS system with expansion provisions that include UPS room space, mechanical cooling capacity, associated feeders, transformers, CDPs, mounting racks, paralleling buses, and spare breakers for connecting future modules. These expansion provisions will be in accordance with Section 7.8.9.7(4).

7.7.8.1(18) The IM/IT UPS system will be provided with sufficient UPS and battery modules, and mechanical cooling capacity for continuous operation as follows:

7.7.8.1(18)(a) In accordance with Section 7.8.9.7(4); and

7.7.8.1(18)(b) One (1) redundant module for N+1 operation.

7.7.8.1(19) The design of the IM/IT Rooms UPS and mechanical systems will meet the following requirements:

7.7.8.1(19)(a) Provide a minimum of 6,000 BTUs of cooling for each equipment rack within a Communications Room, with future capacity of 12,000 BTUs for each rack within the room including spare or future racks. At a minimum, ductwork to each room and chilled water or condenser water piping to terminal units will be sized for future cooling loads. Additionally, space will be allocated in the ceiling for future terminal units as required to serve future loads.

7.7.8.1(19)(b) The design of the UPS and mechanical systems will provide the ability to add additional UPS and mechanical cooling load without requiring downtime on any of the systems installed in the Communication Rooms.

7.7.8.1(20) All equipment racks and server cabinets located in Communications Rooms will have one (1) electrical supply feed from the central IM/IT UPS system and one (1) feed from vital. In each Communications Room, provide at least one (1) 120/208-V IM/IT UPS panelboard and one 120/208-V vital panelboard, each sized to supply all connected load for redundancy during single-source outages. Panelboards in Communications Rooms to be sized to support 8kW per rack and 10kW per server cabinet in the room without applying demand factors.

7.7.8.1(21) Dedicated individual/local UPS' for specific equipment are to be minimized. Equipment is to be connected to the appropriate centralized UPS system, where possible.

7.7.8.2 Performance Criteria

7.7.8.2(1) Central UPS systems:

7.7.8.2(1)(a) Will have modular architecture with no single, system-level point of failure;

7.7.8.2(1)(b) Will have multiple UPS modules connected in parallel, with provisions for future growth as indicated in Section 7.7.8.1(14) for the Clinical UPS and Section 7.7.8.1(15) and 7.7.8.1(16) for the IM/IT UPS. Each UPS module will be replaceable without interrupting power to the remaining modules.

7.7.8.2(1)(c) Will have multiple lithium ion battery strings connected in parallel, with a minimum one (1) empty battery module space per system reserved for future growth, with a combined capacity that can provide 15 minutes of back up time when the UPS system is carrying its full ('N') rated load plus one (1) additional module to provide N+1 capacity. Refer to Section 7.7.8.1(14) for the Clinical UPS and Section 7.7.8.1(15) and 7.7.8.1(16) for the IM/IT UPS additional battery requirements;

7.7.8.2(1)(d) Will be online, double-isolation type having a minimum 98% energy efficiency;

7.7.8.2(1)(e) Will have passive harmonic filters on the source side of each UPS system to limit the total harmonic current distortion to 5% at the filter line terminals when the UPS modules are carrying 100% rated load;

7.7.8.2(1)(f) Will have static bypasses to automatically bypass the UPS system in the event of failure;

7.7.8.2(1)(g) Will have double wrap-around maintenance bypass switches to allow servicing the UPS system, including paralleling boards and transformers, without requiring an outage to the UPS loads;

7.7.8.2(1)(h) Will be located in dedicated rooms, containing only UPS modules, batteries, transformers, paralleling equipment, bypass equipment and ancillary systems. UPS components will not be located in Communications Rooms or Electrical Rooms with equipment on other branches of power; and

7.7.8.2(1)(i) Be in environmentally controlled space limiting temperature to 25 degrees C.

7.7.8.2(2) Each central UPS system will be supplied as follows:

7.7.8.2(2)(a) UPS rectifier input connected to delayed vital;

7.7.8.2(2)(b) UPS static bypass connected to vital with a dedicated feeder; and

7.7.8.2(2)(c) UPS wrap-around maintenance bypass connected to vital with a dedicated feeder.

7.7.8.2(3) Provide an audible warning on BMS workstations indicating when any UPS system battery supply has less than 75 % battery charge remaining. Provide adequate labelling to determine which UPS system is in alarm.

7.7.8.2(4) Provide an audible warning on BMS workstations indicating when any UPS or battery module had failed or has any trouble signal indicated.

7.7.8.2(5) IM/IT UPS to be connected to the IM/IT network for monitoring by PHSA. Both the Clinical UPS and the IM/IT UPS are to be connected to the BMS network for monitoring by FMO.

7.7.8.2(6) Provide monitoring of all alarm and trouble conditions of the UPS systems by the IBMP. Activate a countdown timer on BMS workstations to display alarms triggered at 75%, 50%, and 25 % battery life. Provide additional stand alone IM/IT UPS countdown timers in the following locations:

7.7.8.2(6)(a) MER;

7.7.8.2(6)(b) Workroom - Configuration Lab (W5.01); and

7.7.8.2(6)(c) Workroom - Command Centre (U6.01).

7.7.8.2(7) UPS systems will be capable of providing 2000-A fault clearing current for downstream circuit breakers without operation of the static bypass switches.

7.7.9 Metering

7.7.9.1 Basic Requirements

7.7.9.1(1) Provide a networked digital metering system that will provide detailed information about the power system parameters at specified points in the power distribution system.

7.7.9.1(2) The metering system will include the following:

7.7.9.1(2)(a) Electrical energy, power and power quality meters;

7.7.9.1(2)(b) Digital protective relays or electronic trip units with integral metering functions, associated with circuit breakers;

7.7.9.1(2)(c) Mechanical or lighting controls equipment with metering capabilities;

7.7.9.1(2)(d) Device communication interface hardware;

7.7.9.1(2)(e) Ancillary equipment including CTs, PTs, servers, terminals, and displays; and

7.7.9.1(2)(f) Software, licensing and programming.

7.7.9.1(3) All components of the digital metering system will be fully compatible with each other and integrated into a single seamless EPMS network, which aggregates and stores all electrical meter data for the Facility indefinitely, with software included to enable remote viewing and analysis of meter data. The EPMS network may be a stand-alone system, or a fully-integrated feature of the IBMP or BMS systems.

7.7.9.1(4) EPMS will be capable of displaying information dashboards with all available real-time, trend, and event log data from the meter points as follows:

7.7.9.1(4)(a) Energy dashboard to display peak, average, real-time, and trend values of kWh energy consumption, with minimum 15-minute intervals, for each meter point, department-level grouping and load category grouping.

7.7.9.1(4)(b) Power dashboard to display peak demand, average, real-time, and trend kW/kVA values for each meter point, department-level grouping and load category grouping, and for each branch of power (UPS, vital, delayed vital, conditional).

7.7.9.1(4)(c) Power quality dashboard to display voltage levels, flicker, power factor, frequency, voltage/current harmonics, voltage surge and sag information for each power quality type meter point, including events, statistics, real-time, and trend values.

7.7.9.1(5) Revenue metering (Measurement Canada approved) to be installed for the following points and load category groupings:

7.7.9.1(5)(a) Each retail tenant panel feeder.

7.7.9.1(6) Power quality metering capable of measuring individual voltage and current harmonics (up to 31st), total harmonic distortion, fast transient surges, and event waveform capture to be installed for the following points and load category groupings:

7.7.9.1(6)(a) Utility incoming service;

7.7.9.1(6)(b) Each generator feeder;

7.7.9.1(6)(c) Each HVATS output;

7.7.9.1(6)(d) Each power transformer secondary output;

7.7.9.1(6)(e) Each distribution transformer secondary output;

7.7.9.1(6)(f) Each UPS system output (paralleled UPS outputs may be metered as a group);

7.7.9.1(6)(g) Each CDP mains;

7.7.9.1(6)(h) Each MCC mains;

7.7.9.1(6)(i) Elevators (metering will be capable of directional power measurements);

7.7.9.1(6)(j) Imaging equipment;

7.7.9.1(6)(k) Cyclotron and Orthovoltage equipment; and

7.7.9.1(6)(l) IM/IT Equipment.

7.7.9.1(7) Energy information metering to be installed for the following points and load category groupings:

7.7.9.1(7)(a) Each panelboard feeder;

7.7.9.1(7)(b) Each chiller feeder;

7.7.9.1(7)(c) Cooling (including cooling towers, split systems, CRAC units, hydronic cooling circulation pumps);

7.7.9.1(7)(d) Heat recovery (including heat recovery chillers, heat recovery loop circulation pumps);

7.7.9.1(7)(e) Heating (including boilers, electric heating, heat tracing, hydronic heating circulation pumps);

7.7.9.1(7)(f) Ventilation (including supply, return, exhaust, make-up and pressurization fans);

7.7.9.1(7)(g) Pumps;

7.7.9.1(7)(h) MDR (including bedpan disinfectors);

7.7.9.1(7)(i) Patient Food Services kitchen (including all outlets and equipment within Kitchen and other Food Service areas);

7.7.9.1(7)(j) Interior lighting;

7.7.9.1(7)(k) Exterior lighting;

7.7.9.1(7)(l) Electric vehicle charging – general use;

7.7.9.1(7)(m) Ambulance charging; and

7.7.9.1(7)(n) Plug loads (including all outlets not included in other load categories).

7.7.9.1(8) Energy information metering will use meters with voltage and current measurements on each phase, 0.5 % ANSI energy accuracy class, except for these load category groupings, which may use calculated values based on control system data, single-phase current-only measurements, or addition/subtraction of multiple meter points:

7.7.9.1(8)(a) Interior lighting;

7.7.9.1(8)(b) Cooling;

7.7.9.1(8)(c) Heat recovery;

7.7.9.1(8)(d) Heating;

7.7.9.1(8)(e) Ventilation;

7.7.9.1(8)(f) Pumps;

7.7.9.1(8)(g) Imaging equipment;

7.7.9.1(8)(h) IM/IT Equipment;

7.7.9.1(8)(i) Electric vehicle charging; and

7.7.9.1(8)(j) Plug loads.

7.7.9.1(9) The following load categories will be sub-divided into department-level groupings of their energy and power consumption in the EPMS network analytics:

7.7.9.1(9)(a) Interior lighting;

7.7.9.1(9)(b) Plug loads;

7.7.9.1(9)(c) MDR;

7.7.9.1(9)(d) Kitchen; and

7.7.9.1(9)(e) Electrical panelboard loads.

7.7.9.1(10) All types of meters except those integrated into EV chargers, lighting controls, or mechanical controls equipment will locally display the measured values at each of the above-noted equipment in addition to transmitting the measured values for data aggregation and long-term storage.

7.7.9.1(11) Provide to the Authority sufficient device licenses to enable remote terminal access to the EPMS system. These licences will enable the Authority to access real-time, peak demand, trend data, etc., to produce custom reports on:

7.7.9.1(11)(a) Energy performance optimization;

7.7.9.1(11)(b) Power demand, reliability and availability;

7.7.9.1(11)(c) Sustainability metrics; and

7.7.9.1(11)(d) Power quality.

7.7.9.1(12) The metering system will have alerts to Facility Maintenance Staff via the BMS network of abnormal conditions.

7.7.9.2 Performance Criteria

7.7.9.2(1) Comply with the detailed metering, measurement and verification requirements included in Appendix 1P [Metering Matrix].

7.7.9.2(2) Mechanical equipment with nameplate ratings less than 100 W or emergency-only operation such as VAV boxes, fire pumps, stairwell pressurization fans, etc., may be excluded from metering

and included in the plug load grouping where fed from the same panel.

7.7.10 Wiring Methods, Materials and Devices

7.7.10.1 Basic Requirements

7.7.10.1(1) Use wiring methods, materials and devices that result in safe, reliable and flexible electrical power, lighting, IM/IT and Life Safety Systems.

7.7.10.1(2) Install all wiring in a neat and secure manner so that it is protected from damage, is not in conflict with mechanical or architectural components and allows for future changes and additions. Access is required at all pullboxes, junction boxes, outlet boxes, conduit stub-ups, and lay-in Raceways. Lay-in Raceways where any section of the Raceway is inaccessible in excess of 2 m will be deemed inaccessible.

7.7.10.1(3) Seal Raceways, luminaires, boxes, penetrations, wiring and other electrical components in all exterior partitions as well as interior partitions for spaces where compartmentalization and pressurization are required. These spaces and partitions include isolation rooms, anterooms, Operating Rooms, Treatment/ Procedure rooms, Sterile Supply Core, Pharmacy area cleanrooms, Patient relocation compartments, Areas of Refuge, Contained Use Areas, and any other areas subject to pressure differential monitoring. Ensure that the sealing forms part of a continuous air barrier around each compartment, coordinated with architectural, mechanical, and all other trades. Sealing is to be done with only certified products approved for the intended use.

7.7.10.1(4) CSA Z32 classification for each Patient Care Area in the Facility as shown in Appendix 1N [Electrical and Communications matrix] will be confirmed in consultation with the Authority based on the Design. The Authority will confirm the classification of Patient Care Areas as basic, intermediate or critical care. The minimum circuit and receptacle requirements for each Patient Care Area type will be the quantities identified in CSA Z32, unless noted otherwise.

7.7.10.1(5) The Room Template Index list provided in Appendix 1N [Electrical and Communications Matrix] is to illustrate the classification of Patient Care Areas described in Appendix 1A [Clinical Specifications and Functional Space Requirements], according to their relationship to the CSA Z32 criteria. In the electrical sections of this schedule and related appendices, the term “critical care area” refers to all of the room types with that

CSA Z32 Patient Care Area classification, and not the Component names in Appendix 1A [Clinical Specifications and Functional Space Requirements]. The list may not be exhaustive and may be altered during the Design Process by the Authority.

7.7.10.1(6) This Schedule and Appendix 1N [Electrical and Communications Matrix] identify specific and general receptacle types and quantities, branch circuit quantities, outlet power branches and device location requirements for key area types but do not include Appendix 1H Attachment 1 [Equipment and Furniture] and Appendix 1J [Equipment List IM/IT] requirements. Additionally, provide receptacles and connections for Design-Builder provided equipment.

7.7.10.1(7) Refer to Appendix 1J [Equipment List IM/IT] IM/IT EUD Power and Data Business Rules for receptacle requirements in all spaces throughout the Facility for workstations, computers, printers and phones which have not be identified in Appendix 1N [Electrical and Communications Matrix] or this Section.

7.7.10.1(8) Where Appendix 1N [Electrical and Communications Matrix] specifies quantities at headwalls, these quantities apply to each Patient location where there are multiple Patient locations within the space.

7.7.10.1(9) Where Appendix 1N [Electrical and Communications Matrix] specifies quantities at booms, these quantities apply to each boom where there are multiple booms within the space.

7.7.10.1(10) Where Appendix 1N [Electrical and Communications Matrix] specifies quantities for headwalls, quantities will be doubled in the inpatient bariatric spaces only, to allow treatment of two (2) patients in the space during surge or infectious outbreak situations.

7.7.10.1(11) To ensure Staff can charge phones, tablets, etc. provide duplex receptacles with integrated USB charging ports at various locations throughout the Facility including Care Team Stations, Workrooms, Observation Alcoves, Clinician workstations, Meeting rooms (Multimedia Rooms), Staff Lounges, On-call Rooms, workstations on Command Centre and as indicated in Appendix 1N [Electrical and Communication Matrix].

7.7.10.1(12) Provide receptacles, hard-wired connections, conduits, controls, equipment and devices for all Design-Builder provided equipment, every item of fixed and moveable Equipment in Appendix 1H Attachment 1 [Equipment and Furniture] including moveable Equipment for the department that is shared between multiple spaces, and as required by Appendix 1J [Equipment List

IM/IT] in addition to receptacle quantities listed in this Schedule and Appendix 1N [Electrical and Communications Matrix].

7.7.10.1(13) Provide a minimum of one (1) conditional duplex receptacle per 3m of wall length in all areas not described in this section or otherwise identified in Appendix 1N [Electrical and Communications Matrix].

7.7.10.1(14) Where the receptacle quantities in this Schedule and Appendix 1N [Electrical and Communications Matrix] are sufficient for all the moveable Equipment that will be used in a space, including moveable Equipment for the department that is shared between multiple spaces, with one additional general use duplex receptacle per headwall, boom and room wall, no additional receptacles are required for the moveable Equipment. To determine receptacle and connection details, fixed equipment includes plug-in equipment permanently mounted to Facility components or infrequently moved such as printers and desktop computers. Provide all necessary electrical equipment components as required to complete an installation in accordance with manufacturers installation recommendations and make all connections for Authority-supplied equipment.

7.7.10.1(15) Provide receptacles or hard-wired connections for every item of fixed and moveable equipment required by other provisions of this Agreement, including the following:

7.7.10.1(15)(a) Kitchen equipment;

7.7.10.1(15)(b) Mechanical systems;

7.7.10.1(15)(c) Authority Supplied equipment;

7.7.10.1(15)(d) Design-Builder supplied equipment;

7.7.10.1(15)(e) IM/IT systems;

7.7.10.1(15)(f) Elevators; and

7.7.10.1(15)(g) Pneumatic tube systems.

7.7.10.1(16) Provide a 'receptacle bank' allowance in addition to the other requirements of this Schedule, as follows:

7.7.10.1(16)(a) A total of 350 additional CSA 5-20R duplex receptacles and the associated circuiting and power distribution equipment will be provided, to account for any additional functional and operational requirements of the Authority.

7.7.10.1(16)(b) Should the Authority decide to delete receptacles required by this Schedule, Attachment 1 [Equipment List], Appendix 1H [Equipment and Furniture], Appendix 1J [IM/IT Equipment List] or Appendix 1N [Electrical and Communications Matrix], an equal quantity of receptacles will be added to the bank for allocation elsewhere in the Facility.

7.7.10.1(16)(c) Each receptacle in the bank will include all labour and material costs for locating it anywhere in the Facility and on any power branch that the Authority decides.

7.7.10.1(17) Final power receptacle types and quantities, branch circuit quantities, outlet power branches, IM/IT device types and quantities, and locations of each device for each space in the Facility will be as determined in consultation with the Authority. The Authority will review these details and confirm the requirements prior to installation of these elements.

7.7.10.1(18) Provide all required conduits, wiring and equipment required for all FHA supplied equipment, including for manufacturer's equipment. Such requirements include 'In-Use' signs, equipment cameras and displays, Last-person-out controls, safety devices and controls, testing conduits, intercom and security devices.

7.7.10.2 Performance Criteria

7.7.10.2(1) Utilize non-alloyed copper for conducting components of electrical equipment including switchgear buses and transformer windings.

7.7.10.2(2) Utilize non-alloyed copper for all conductors that form part of the Facility's wiring system, unless noted otherwise. Minimum conductor size will be #12 AWG. Conductors greater than #12 may be stranded. Aluminum conductors may be used for 600 V and 208 V feeders with ampacities greater than 120 A, except for the bonding conductors in feeders serving Patient Care Areas, which will be copper. Splices in electrical feeders are not permitted.

7.7.10.2(3) Power wiring will have insulation of chemically cross-linked thermosetting polyethylene unless noted otherwise.

7.7.10.2(4) The Design-Builder may use Teck cable in mechanical plant rooms and service rooms for connection to equipment located in the same room, only where the entire length of cable is accessible for inspection and replacement. Teck cable will be

installed in perpendicular runs and will be neatly strapped to dedicated cable support systems or tray. Do not support armoured cabling from mechanical ducts, pipes or Equipment. Where possible, Teck cable runs will be consolidated into common routes. Teck cables will be supported such that connections to moving or vibrating Equipment does not transmit the vibration. Provide a label at each end of the Teck cable indicating circuit number colour coded by power system. Utilize aluminum watertight Teck connectors at all termination points.

7.7.10.2(5) Provide a dedicated neutral conductor for each branch circuit.

7.7.10.2(6) Conceal all wiring and wiring support systems from public view except where approved by the Authority.

7.7.10.2(7) Separate all wiring for systems of different voltages and from different sources and do not run in common Raceways. Maintain adequate shielding and separation between wiring for power and communication systems to prevent interference.

7.7.10.2(8) Do not install conduit or wiring in floor slabs, except where it is impossible to supply the device from a ceiling space (above or below) and specific approval has been granted by the Authority.

7.7.10.2(9) Route feeders to panelboards from the ceiling space above. Do not feed panelboards fed via the slab below, and do not ‘daisy-chain’ multiple panelboards.

7.7.10.2(10) Install wiring and conduit connections with sufficient flexibility of movement to minimize the noise and vibrations of electrical equipment/components (including transformers, luminaries, motors) to below an acceptable level as required in health care facilities. Design will comply with noise criteria identified in other sections.

7.7.10.2(11) Receptacles will be hospital-grade.

7.7.10.2(12) Colour code the power receptacles as follows:

7.7.10.2(12)(a) Conditional power – WHITE

7.7.10.2(12)(b) Vital and delayed vital power – RED

7.7.10.2(12)(c) UPS power – GREY

7.7.10.2(12)(d) SPD – BLUE

7.7.10.2(12)(e) Housekeeping – BLACK

7.7.10.2(13) Identify all power receptacles with the source panel ID and circuit number. Arrange colour of labelling of receptacles, safety

switches, panels, and other distribution equipment in accordance with Authority colour coding standards, as follows:

7.7.10.2(13)(a) Vital power - RED with WHITE text

7.7.10.2(13)(b) Delayed vital power - BLUE with WHITE text

7.7.10.2(13)(c) Conditional power - YELLOW with BLACK text

7.7.10.2(13)(d) UPS - GREY with BLACK text

7.7.10.2(14) Provide identification and warning signs of the electrical systems in accordance with Appendix 1V [Asset Management Requirements].

7.7.10.2(15) Utilize brushed stainless steel heavy-duty cover plates for receptacles and switches. Grouped receptacles and/or switches will have a single cover plate for the group.

7.7.10.2(16) Receptacles and cover plates will be suitable for the environment where they are located, including wet areas and outdoor areas.

7.7.10.2(17) Design each room such that receptacles are distributed throughout the room as required to support functionality and convenient use of equipment by users, in accordance with Good Industry Practice and as required by other provisions of the Agreement. Provide sufficient quantities of receptacles:

7.7.10.2(17)(a) To meet or exceed the requirements of these documents and CSA Z32; and

7.7.10.2(17)(b) To support all of the systems and equipment to be installed or used, including any additional power outlets required by other provisions of this Agreement; and as required by Good Industry Practice to provide convenience, flexibility of use and operational support.

7.7.10.2(18) Unless noted otherwise, allow a maximum connection of five (5) duplex receptacles per 20-A amp circuit.

7.7.10.2(19) Utilize CSA 5-20R 15/20-A T-slot receptacles with a 20 Amp breaker for all receptacle branch circuits, except where a special receptacle type or breaker size is required to suit the selected equipment.

7.7.10.2(20) Utilize temper resistant receptacles in waiting areas and any other room where children would be expected.

7.7.10.2(21) Receptacles for housekeeping will be spaced at a maximum of 15 metres apart staggered along alternate sides of each corridor and

spaces in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’. Provide dedicated conditional circuits for housekeeping receptacles, to a maximum of six (6) receptacles per circuit or as indicated in Appendix 1N [Electrical and Communication Matrix]. All parts of all spaces will have access to a housekeeping receptacle within 7.5 m without having to run an equipment cord through a doorway.

7.7.10.2(22) Where USB charging ports are specified, provide dual USB Type-C type female ports integrated into a single-gang duplex receptacle. Each USB port will be capable of simultaneous 100-W power output.

7.7.10.2(23) Provide multi-service fire rated floor boxes for equipment isolated from walls. Such devices will be required in areas including IPT Workroom and Rehabilitation Therapy rooms.

7.7.10.2(24) In Shared and Private Offices:

7.7.10.2(24)(a) Provide devices as per Appendix 1J [Equipment List IM/IT] located to provide flexibility of room layout.

7.7.10.2(25) In each Storage/Equipment/Holding room (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(25)(a) Provide conditional duplex receptacles for all Equipment that require charging.

7.7.10.2(25)(b) Provide one (1) conditional duplex receptacle per cart in Storage – Clean Supply – Phlebotomy Carts.

7.7.10.2(26) In each Alcove, excluding Nourishment Station Alcoves, (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(26)(a) Receptacle heights will be 1200mm above finished floor.

7.7.10.2(26)(b) Provide two (2) duplex receptacles, one fed from vital power and the other from conditional power.

7.7.10.2(26)(c) Provide a minimum of one (1) conditional duplex receptacle per cart that requires Equipment charging.

7.7.10.2(27) For each Imaging MRI and MRI Sim room:

7.7.10.2(27)(a) Ensure only non-ferrous components, fittings, fixtures and fasteners are used;

7.7.10.2(27)(b) Bond all sections of copper shielding to ground;

7.7.10.2(27)(c) Install EMI filters on all wiring entering the room; and

7.7.10.2(27)(d) Electrically interlock entry door with the MRI equipment.

7.7.10.2(28) In each Circulation and Public space (refer to room list in Appendix 1N [Electrical and Communication Matrix] 'Spaces without a Room Template'):

7.7.10.2(28)(a) Provide one (1) duplex on conditional in each vestibule, alternating stairwell landings, elevator lobbies, main entrance lobby;

7.7.10.2(28)(b) Provide one duplex receptacle on vital for each digital Wayfinding display, each kiosk;

7.7.10.2(28)(c) Provide 1 duplex receptacle on vital and 1 duplex receptacle on UPS for each meter of counter or desk in the Office – Security, Security Station, Information/Security Station. Also include 4 duplex receptacles for radio chargers in Office – Security and Security Station on UPS;

7.7.10.2(28)(d) Provide one (1) duplex receptacle on conditional with 3.0 USB charging per every four (4) seats in convenient wall locations in every waiting area; and

7.7.10.2(28)(e) Provide duplex receptacles for equipment chargers on Clinical UPS and conditional as needed in all Reception areas and Courier Reception & Packaging.

7.7.10.2(29) Provide convenience duplex receptacles at all Equipment charging locations above counters where noted in Appendix 1A [Clinical Specifications and Functional Space Requirements] and the following spaces, at minimum:

7.7.10.2(29)(a) Central and local storage rooms;

7.7.10.2(29)(b) Alcoves;

7.7.10.2(29)(c) Care Team Stations; and

7.7.10.2(29)(d) Medication rooms.

7.7.10.2(30) Provide at least one (1) vital duplex receptacle per Cardiac Diagnostic cart located in Alcove – Cardiac Diagnostics.

7.7.10.2(31) Provide adequate space, power, and outlet provisions within each department for the charging and storage of wireless devices as set out in Appendix 1H Attachment 1 [Equipment and Furniture] nor Appendix 1J [Equipment List IM/IT].

7.7.10.2(32) In Meeting/Conference Room (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(32)(a) Provide a minimum of one (1) conditional duplex receptacle per 2 m of usable wall space as described by CEC 26-724(c).

7.7.10.2(32)(b) At all locations with AV equipment, provide all duplex receptacles and circuit connections needed for AV equipment power, coordinated with the AV templates described in Section 7.8 Communications (Division 27).

7.7.10.2(32)(c) Provide power for all floor boxes in Multimedia Rooms as described in Section 7.8 Communications (Division 27).

7.7.10.2(32)(d) Refer to FHA IM/IT Standards for additional requirements.

7.7.10.2(33) In each Service Room (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(33)(a) Provide general-purpose duplex receptacles along the usable wall as described by CEC 26-724(c) at a maximum spacing of one (1) conditional duplex every 5 m and one (1) conditional duplex at each interior column. All rooms to have at least one (1) conditional duplex immediately adjacent to the room entry door.

7.7.10.2(34) In Morgue Viewing and ID rooms (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(34)(a) Provide duplex receptacles along the usable perimeter wall as described by CEC 26-724(c) at a maximum spacing of one (1) vital and one (1) conditional every 5 m.

7.7.10.2(35) In each On-Call, Resource Room and Lounge (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(35)(a) Provide a bedside conditional duplex receptacle.

7.7.10.2(35)(b) Provide general-purpose duplex receptacles along the usable perimeter wall as described by CEC 26-724(c) at a maximum spacing of one (1) conditional every 5 m with at least one (1) per room.

7.7.10.2(36) Provide one convenience duplex receptacle for every four (4) seats in wellness spaces, lounges and similar rooms. Provide two (2) USB charging ports for every two (2) convenience duplex receptacles.

7.7.10.2(37) In Logistical Support Area (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(37)(a) Provide general-purpose duplex receptacles along the usable perimeter wall as described by CEC 26-724(c) at a maximum spacing of one (1) conditional every 5 m.

7.7.10.2(37)(b) Provide receptacles on a dedicated circuit for all fixed Medical Device Reprocessing equipment and all equipment requiring special receptacles as set out in Appendix 1H [Equipment and Furniture].

7.7.10.2(37)(c) Install receptacles suspended from cable strain reliefs from modular ceiling plates above each workstation and Instrument Assembly area, located so that cables and cords do not impact circulation or span and drape between workstations. Refer to Sections 5.7.7.16 and 6.9.3.2(2)(d).

7.7.10.2(37)(d) Provide general purpose duplex receptacles above counters at 1-m spacing, connected to conditional power.

7.7.10.2(38) In External Ambulance Canopy/Vehicle Bay (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(38)(a) Provide (1) vital and one (1) conditional duplex receptacle.

7.7.10.2(39) In Cyclotron Vault (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(39)(a) Provide (1) duplex receptacle every 6 metres alternating between vital and conditional power.

7.7.10.2(40) In Medical Device Reprocessing (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(40)(a) Provide receptacles as required for Equipment noted in Appendix 1H [Equipment and Furniture]. Arrange equipment connections and receptacles in a manner that allows for future flexibility of the space.

7.7.10.2(40)(b) Provide (1) vital duplex receptacle hung from ceiling with cabtyre cable (SO cable) supported by strain relief above Instrument Assembly area as directed by the Authority.

7.7.10.2(41) In Communications Rooms:

7.7.10.2(41)(a) Provide general-purpose receptacles along the perimeter wall at a maximum spacing of one (1) vital or one (1) conditional (alternating sources) every 3 m and at each interior column in every communication room. All rooms to have one (1) vital and one (1) conditional receptacle immediately adjacent to the room entry door. In large rooms, receptacles will also be installed such that every part of each room can be reached from a 7.5-m extension cord. Each receptacle will be provided with a dedicated circuit;

7.7.10.2(41)(b) In TRs and the MER provide two CSA L21-30R 30A/208V twistlock receptacles above each rack with one connected to IM/IT UPS and the other to vital power; and

7.7.10.2(41)(c) In EF and AHER provide two CSA L21-30R 30A/208V twistlock receptacles above each Authority rack one connected to IM/IT UPS and the other to vital power and two CSA L21-30R 30A.208V twistlock receptacles above each telecommunications carriers equipment rack fed from vital power and IMI/IT UPS.

7.7.10.2(41)(d) Refer to Division 27 for circuit loading and demand requirements in communication rooms.

7.7.10.2(42) In the Energy Centre Control Room:

7.7.10.2(42)(a) Provide Clinical UPS receptacles for all permanently located Equipment.

7.7.10.2(42)(b) Provide one (1) USB charging port on UPS power at each workstation. Multiple USB ports may be installed in the same device only where located within 1-m cord length from the associated workstation.

7.7.10.2(42)(c) Provide general purpose receptacles above work counters spaced at 1 m on centre. 50% of these receptacles will be fed from UPS power and the remainder connected to conditional power, alternating between sources.

7.7.10.2(43) In each Kitchen & Nourishment Area (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(43)(a) Provide one (1) conditional duplex receptacle and one (1) vital duplex receptacle above counter.

7.7.10.2(43)(b) Provide receptacles on a dedicated circuit for all electrically connected Equipment such as microwaves, coffee makers, refrigerators, etc. as per Appendix 1H [Equipment and Furniture].

7.7.10.2(44) In each Food Services Area (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(44)(a) Provide one (1) duplex receptacle above kitchen counters at 2 meter spacing, connected to 50% vital and 50% conditional power.

7.7.10.2(44)(b) Provide one (1) general purpose duplex receptacle along the usable perimeter wall as described by CEC 26-724(c) at a maximum spacing of 5 meters. Connect to conditional power.

7.7.10.2(44)(c) Provide receptacles on a dedicated circuit for all electrically connected Equipment such as microwaves, coffee makers, refrigerators, stoves, etc. as per Appendix 1H [Equipment and Furniture].

7.7.10.2(45) Provide one (1) conditional duplex outlet for every five (5) bicycle parking stalls, distributed evenly throughout the bicycle parking areas, with a maximum of (2) two duplex outlets per circuit.

7.7.10.2(46) Provide one (1) conditional duplex outlet for every 700m^2 in the underground parking area. Locate receptacles within the 700m^2 to facilitate maintenance and cleaning activities at a minimum of 2m AFF.

7.7.10.2(47) Provide one duplex receptacle with GFCI protection and wet location cover on conditional power on every third lamp standard in at-grade parking areas.

7.7.10.2(48) In each FM Support Areas (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(48)(a) Provide general purpose duplex receptacles along the usable perimeter wall as described by CEC 26-724(c) at a maximum spacing of one (1) every 5 m. Connect to conditional power.

7.7.10.2(48)(b) Provide general purpose duplex receptacles above counters at 2-m spacing. 50% of these receptacles will be fed from vital power and the remainder connected to conditional power, alternating between sources.

7.7.10.2(48)(c) Provide 208V 3-phase 40Amp receptacle and 8 duplex receptacles on vital and conditional in the large Parts Storage workbenches and 8 duplex receptacles on vital and conditional in the smaller Parts Storage workbenches.

7.7.10.2(48)(d) Provide a minimum of one (1) CSA 6-50R type welding receptacle on each wall in each service room that houses boilers, chillers, or air handling units.

7.7.10.2(48)(e) Provide one (1) ceiling mounted retractable cord reel with a duplex receptacle every 0.8m or a quadplex receptacle every 1.5m for every workbench not located against a wall.

7.7.10.2(48)(f) Provide five (5) additional ceiling mounted retractable cord reel with duplex receptacle in the Main Workshop; coordinate locations within room with the Authority.

7.7.10.2(48)(g) Provide 208V 30A and 208V 40A receptacles in the Main Workshop, Carpentry Workshop and Metal/Welding/Plumbing Workshop.

7.7.10.2(48)(h) Refer to Section 7.7.11.1(6) for additional power requirements.

7.7.10.2(49) In Patient Washrooms, Public Washrooms and Staff Washroom/Lockers (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.10.2(49)(a) Patient room washrooms, one (1) duplex receptacle on conditional with GFCI protection at the sink above counter;

7.7.10.2(49)(b) Public washrooms, one (1) duplex housecleaning receptacle with GFCI protection on conditional at low level near entrance door;

7.7.10.2(49)(c) Staff washrooms and lockers, provide one (1) duplex conditional receptacle with GFCI protection for every two sinks above counter.

7.7.10.2(50) Provide receptacles with GFCI protection and wet location cover on conditional power at the following locations:

7.7.10.2(50)(a) minimum of one (1) duplex every 30 m along the exterior of the Facility;

7.7.10.2(50)(b) minimum of four (4) duplex receptacles at the Plaza; and

7.7.10.2(50)(c) minimum of four (4) along the Wellness Walkway.

7.7.10.2(51) For each RO or domestic water connection for the purposes of providing dialysis treatment or servicing of dialysis equipment, receptacle on a dedicated circuit will be provided adjacent to the water connection point.

7.7.10.2(52) Provide sufficient slack in the wiring systems at seismic and expansion joint locations.

7.7.11 Raceways

7.7.11.1 Basic Requirements

7.7.11.1(1) Provide Raceways for all wiring and cabling to support, protect and organize all wiring and cabling systems. Raceway systems will not be accessible to Patients.

7.7.11.1(2) Design Raceways to provide ease of access and install with capacity for expansion and change, consistent with the requirements of the equipment and systems that they serve. Raceways containing multiple homerun branch circuits will be sized to allow the wiring cross-sectional area to be increased by 50% in the future without exceeding CEC maximum fill requirements.

7.7.11.1(3) Install all Raceways in a neat and secure manner in such a way that they are protected from damage, are not in conflict with mechanical or architectural components and allow for future

changes and additions. Access to all boxes, outlets, and lay-in Raceways will be maintained throughout.

7.7.11.1(4) Design and install Raceways without sharp edges or tight bends so that cables will be pulled in or laid in and removed without damage to the cables.

7.7.11.1(5) Construct separate Raceways to isolate wiring of different systems and prevent magnetic interference between circuits.

7.7.11.1(6) Provide multi-channel aluminum or steel surface mounted wire way with relocatable duplex receptacles above work counters and around the entire room in the following locations:

7.7.11.1(6)(a) IM/IT work room (quadplex receptacles on vital and quadplex receptacles on conditional every one (1) meter) along Raceway;

7.7.11.1(6)(b) IM/IT Configuration Lab all walls provide quadplex receptacles on UPS and quadplex receptacles on conditional every one (1) meter along Raceway;

7.7.11.1(6)(c) Each workbench in Radiation Therapy Machine Shop (duplex receptacle on Vital every one (1) meter) along Raceway;

7.7.11.1(6)(d) Electronic Shop (duplex receptacle on vital and duplex receptacle on conditional every one (1) meter) entire room along Raceway;

7.7.11.1(6)(e) Electrical Workshop (quadplex receptacles on vital and quadplex receptacles on conditional every one (1) meter) along Raceway;

7.7.11.1(6)(f) Cyclotron Workshop (duplex receptacle on vital and duplex receptacle on conditional every one (1) meter) workbenches along Raceway;

7.7.11.1(6)(g) BioMed Receiving and Holding Area (duplex receptacle every one (1) meter) entire room along Raceway;

7.7.11.1(6)(h) Each workbench in Parts Storage room (duplex receptacle on vital and duplex receptacle on conditional every 600 mm) along Raceway; and

7.7.11.1(6)(i) Main Workshop (quadplex receptacles on vital and quadplex receptacles on conditional every one (1) meter) along Raceway.

7.7.11.1(7) Refer to Section 7.8 Communications for detailed requirements for Raceways for IM/IT systems.

7.7.11.2 Performance Criteria

7.7.11.2(1) Except as noted otherwise, install all wiring in EMT with steel couplings and connectors. Final connections less than 3 m in length to light fixtures may utilize armoured cable (Teck or AC90). Chiller branch circuit wiring and conditional wiring downstream of the HVATS within Back-of-House corridors may utilize Teck cable.

7.7.11.2(2) Mineral insulated conductors or other approved conductors tested to ULC-S139 requirements will be used for fire rated wiring, except for seismic isolation gap crossings, refer to Section 7.7.19 for seismic isolation gap crossing requirements. Straps and supports for mineral insulated and similar fire rated conductors will be as recommended by the manufacturer.

7.7.11.2(3) Provide all electrical duct banks with a minimum quantity of 50% of the total number of conduits reserved as spare. Size of the spare conduits to equal the largest filled conduit size. Locations where electrical services cross the seismic isolation gap will be provided with spare raceways matching the size and quantity of spares provided in the duct bank crossing the gap. This requirement does not apply to the CPPS duct bank. Refer to Appendix 1G for CPPS requirements.

7.7.11.2(4) All ducts will be tested by pulling a steel mandrel matching the duct size through the duct prior to installing any conductors. This testing will be witnessed and documented for inclusion in the maintenance manuals. Any duct found with obstructions, gaps or abrasive parts will be rectified to the satisfaction of the Authority.

7.7.11.2(5) Install all Raceways and cables in finished areas within finished walls or above finished ceilings.

7.7.11.2(6) Raceways and cables are to be surface mounted in unfinished mechanical and Electrical Rooms.

7.7.11.2(7) Do not encase EMT in concrete. Utilize rigid PVC conduit where conduit encased in concrete is necessary to achieve a concealed installation in finished spaces such as exposed concrete stairwells, underground parking, rehabilitation therapy, and Multimedia Room floor boxes. Such conduit runs will:

7.7.11.2(7)(a) Be as short as possible;

7.7.11.2(7)(b) Emerge from the concrete in the closest adjacent space above suspended ceilings;

7.7.11.2(7)(c) Be labelled with identifying tags on both ends;

7.7.11.2(7)(d) Have physical protection if emerging from concrete below 2 m AFF;

7.7.11.2(7)(e) Be reviewed by the Authority and achieve a concealed installation in finished spaces;

7.7.11.2(7)(f) Be clearly indicated on the Record Drawings whether embedded in the concrete structure or in trenches; and

7.7.11.2(7)(g) Must be grouped such that conduit and pipe run in close proximity to each other and are installed in straight lines parallel with the building grid lines.

7.7.11.2(8) Where conduits are installed in concrete the Design-Builder will take photographs of the conduit system before concealment and provide a 3D laser scan of the floor mapping of the conduit runs using clear points of reference prior to the concrete being poured. Import the data from this scan into the Revit model so the Authority can have an accurate as-built routing and location of conduits in the slab and associated documentation and images in the as-built documentation and BIM Model.

7.7.11.2(9) Minimum EMT conduit trade size is 21 mm, except that minimum EMT conduit size for IM/IT outlets will be as set out in Section 7.8 Communications (Division 27).

7.7.11.2(10) Use flexible conduit for all final connections to vibrating equipment, such as transformers and motors. Flexible PVC conduit (ENT) is not permitted in any locations. Flexible conduit sections will include a sufficient, but not excessive, amount of slack for movement in all directions such that they do not cause vibration or noise to extend into the structure. Provide minimum #12 AWG green bonding wire in each flexible conduit.

7.7.11.2(11) Minimum flexible conduit trade size is 21 mm and maximum length of any flexible conduit run is 1.5 m, except for conduits crossing through the seismic isolation gap. The length of conduit runs crossing the seismic isolation gap will be determined by the maximum movement of the seismic isolation gap such that the conductor will not be damaged.

7.7.11.2(12) Armoured cable (BX) may be used for final connections from concealed junction boxes to lighting fixtures on suspended ceilings in non-clinical areas. Armoured cable ISO-BX may be used for final connections from concealed junction boxes to lighting fixtures on suspended ceilings in clinical areas. The

maximum length of any armoured cable from the junction box to the lighting fixture is 3 m. Do not daisy chain lighting fixtures.

7.7.11.2(13) Use rigid PVC conduits for exposed sections subject to washdown and portions of wiring beyond the first exterior pull box.

7.7.11.2(14) Install individual bonding conductors in each Raceway.

7.7.11.2(15) Raceways will typically be concealed; however, surface Raceways may be installed where approved by the Authority. Typical areas with surface Raceways will include laboratory spaces, workbenches, Care Team Stations, and other areas where frequent changes in power and Telecommunication Outlets are likely.

7.7.11.2(16) Armoured cable (BX) may be used to connect modular pre-fabricated components of non-clinical electrical systems. Modular wiring will consist of pre-cut flexible wiring that will terminate at an easily located and accessible junction box above the ceiling. The junction box will be located in the same space within 3 m (horizontally) of the prefabricated unit. Excess lengths of armoured cable will be neatly coiled up in the ceiling space to accommodate future changes. All wiring installed in walls will be vertical from device to ceiling space.

7.7.11.2(17) All power outlet boxes will be a minimum 102 mm (4”) square welded steel type.

7.7.11.2(18) Bond and ground all conduits, cable trays, racks and other infrastructure as per CEC and as set out in Section 7.8.7 to the associated building ground.

7.7.11.2(19) Identify all conduits, Raceways, pull boxes, and junction boxes using painted colour bands in accordance with the Authority's colour coding standard. Provide all power and communication systems with unique colours in accordance with the colouring scheme. Major colour will be 100 mm wide and minor colour to be 50 mm wide. Identify Raceways with coloured bands (using either spray paint or coloured labels) at intervals of 6 m and at points where the Raceway enters a wall or floor (e.g. Raceway is identified on both sides of a penetration to facilitate tracing of Raceway). Colour-code all junction boxes using spray paint or labels on the cover. Neatly identify the relevant system and circuit ID using permanent marker pen. Identify parallel conduit runs at common locations. Identification in areas exposed to view will have neat writing and sharp-edged colour bands.

7.7.11.2(20) Install approved firestopping at electrical penetrations to maintain all fire separations as required by the BCBC and the AHJ. Provide all fire stop locations with manufactured identification labels intended for the purpose that indicate the specific fire stop system used.

7.7.11.2(21) Firestopping for cable trays and sleeves in communication and Electrical Rooms will be of the re-penetrable type that does not require re-sealing with puddy.

7.7.11.2(22) Provide expansion couplings and/or flexible conduits in the Raceway system at seismic and expansion joint locations and identify the locations on the Design and Construction Drawings, for review by the Authority and the seismic Structural Engineer-of-Record.

7.7.12 Grounding and Bonding

7.7.12.1 Basic Requirements

7.7.12.1(1) Provide grounding and bonding for all electrical and IM/IT Equipment and low voltage systems, for limiting potential differences, for maintaining power quality, for the safety of people, and for protection against damage to equipment or property from electrical faults. Install grounding and bonding as required by all applicable codes and Section 7.8.7.

7.7.12.1(2) Provide supplementary equipotential bonding per CSA Z32 in all Patient Care Areas in the Facility. Provide insulated bonding conductors with all feeders and branch circuits supplying security systems loads.

7.7.12.2 Performance Criteria

7.7.12.2(1) Utilize non-alloyed copper for all conductors and conducting components of electrical equipment that form part of the grounding and bonding systems, except for lugs rated for use with copper conductors and metallic equipment enclosures.

7.7.12.2(2) Provide a minimum #12 copper bonding conductor in every Raceway. Provide a #6 copper bonding conductor on each cable tray and ensure each section of the tray is securely bonded.

7.7.12.2(3) Bond all exposed conductive non-current-carrying components of equipment in Patient Care Areas to a room ground reference box using bonding conductors sized to meet CSA Z32 test requirements. Uniquely identify each bonding conductor at each end. Provide photo of each wall elevation in each room where CSA Z32 testing is required in CSA Z32 testing report.

7.7.12.2(4) Provide a ground bus in each Electrical and Communications Room connected to the main building ground electrode, of sufficient size to double the number of grounding and bonding conductors initially connected without adding additional busbars or multi-conductor lugs or drilling new holes. Ground buses and the grounding/bonding conductors interconnecting them will be sized and installed in accordance with CEC and ANSI/TIA-607-C requirements. TBB will be sized in accordance with PHSA standards. Ground buses and risers for Electrical Rooms and Communications Rooms will be completely independent and bonded together only at the main unit substation room ground buses.

7.7.12.2(5) Provide a lightning protection system for the Facility buildings to the requirements of CAN/CSA-B72.20. The lightning protection system to be designed by Professional Engineer registered in BC who regularly designs such systems. A lightning protection system will be installed for the Facility regardless of the calculated risk index.

7.7.12.2(6) Bond all electrical equipment located on the roof level, including antennas, satellite receivers, and luminaires, to the lightning protection system.

7.7.12.2(7) Where installed in conduit, lightning protection conductors will be installed in PVC conduit.

7.7.13 Lighting

7.7.13.1 Basic Requirements

7.7.13.1(1) Lighting systems will accommodate the needs of Staff, Patients, and visitors, and will support the visual tasks being performed and the desired appearance of the space. The lighting installed will support the activities described in Appendix 1A [Clinical Specifications and Functional Space Requirements] and the requirements of Appendix 1N [Electrical and Communications Matrix].

7.7.13.1(2) Provide complete lighting solutions that align with the requirements and recommendations of the BCBC, WorkSafe BC Regulation (General Conditions, Illumination, Section 4.64 – 4.69), ANSI/IES RP-29-20, IES Lighting Handbook (11th Edition), and CSA Z317.5-17. Where the recommendations vary among these standards, whichever illuminance levels are greatest and whichever requirements apply to LED lighting will govern unless otherwise reviewed with the Authority.

7.7.13.1(3) Lighting design in Communications Rooms and Multimedia Rooms to also comply with requirements in Section 7.8 Communications (Division 27).

7.7.13.1(4) Provide luminaires that are easily maintainable and accessible. Luminaires will be constructed such that LED strips and drivers are removable and replaceable without needing to replace the fixture itself wherever possible.

7.7.13.1(5) In Operating Rooms, Pharmacy, Sterile Preparation, MDR, areas of Component M. Functional Imaging as set out in Section 5.1.2.8(2) and Sterile Storage and Distribution areas, use luminaires with the ability to have drivers replaced without having to enter the room, adjacent restricted corridor or the sterile area, and without having to break the ceiling seam around the fixture. Remote drivers to be in secure, locked recessed cabinets that are accessible without disruption to the operations of the surrounding areas. Driver cabinets located in ceiling spaces and interstitial floors are not required to be locked and recessed. Driver cabinets are preferred to be located on the same floor as the fixtures and as close as possible in an accessible space.

7.7.13.1(6) In all other Patient Care Areas, utilize luminaires with the ability to have drivers and lamps / LED modules replaced from below without a need to break the ceiling seam around the fixture, or provide remote drivers on the wall in a secure, locked recessed cabinet. Drivers mounted on top of the luminaire may be used in non-Patient Care Areas where T-bar ceilings allow access to the drivers.

7.7.13.1(7) Provide luminaires that require minimal cleaning and permit practical and easy access and disassembly by authorized Staff. In locations where it is necessary to locate luminaires in locations not routinely accessible without fall restraint / staging (for example high Enclosed Atrium), utilize long-life LED (50,000 hours minimum) luminaires.

7.7.13.1(8) All luminaires will be free of light leaks. Luminaires in common Patient areas will be of form to provide a friendly, inviting, welcoming, non-institutional ambience feel.

7.7.13.1(9) Seal luminaires in negative pressure areas to block air transmission.

7.7.13.1(10) Provide appropriate luminaires to adhere to the Authority's infection control policies and procedures including minimizing accumulation of dust and debris. Locate luminaires such that they can be easily cleaned. In Patient areas, do not provide wall-mounted lighting that would create a dust shelf above.

7.7.13.1(11) All luminaries in Operating Rooms, Procedure Rooms, Trauma Room, and similar rooms will be NSF2 listed IP65 and ISO3 rated.

7.7.13.1(12) Provide non-electronic interfering MIL-STD 461F rated luminaires in MRI, CT Scanner, HDR Operating room, Treatment Bunkers, Orthovoltage room and similar appropriate rooms.

7.7.13.1(13) Selection and location of all luminaires will be closely coordinated with the IPVS to prevent “wash-out” of video surveillance video images and to ensure proper illumination levels are maintained to permit adequate video capture from the video surveillance system.

7.7.13.1(14) As architectural features, design lighting in Plazas, Wellness Walkways, lobbies, lounges, waiting areas, the Main Entrance Lobby and elevator lobbies with high quality products aesthetically pleasing to the public and Staff.

7.7.13.2 Performance Criteria

7.7.13.2(1) Specify luminaire construction based on the specific risks and needs of the space into which the luminaires are being installed.

7.7.13.2(1)(a) Luminaires in exterior walls, exit stairwells and underground parking areas will have tamperproof fasteners and minimum .187 gauge acrylic or .125 gauge polycarbonate lenses.

7.7.13.2(1)(b) Luminaires in stairwells will be mounted between 3.0 m - 4.0 m AFF at landings for ease of maintenance access. Alternate mounting locations will only be approved where necessary to achieve required illuminance levels.

7.7.13.2(2) Before finalizing lighting layouts and ordering luminaires, a sample of each luminaire type will be provided to the Authority for approval. Luminaires rejected by the Authority will be replaced with luminaires without the deficiencies noted by the Authority at no cost to the Authority.

7.7.13.2(3) Use LED lighting technology for all luminaires. Do not use incandescent, HID or fluorescent lighting unless noted otherwise in this Schedule or with approval by the Authority.

7.7.13.2(4) Utilize premium grade quality luminaires with emphasis on energy efficiency (69 lumens/watt minimum) and high colour fidelity. Where achieving the energy efficiency specified in this section is not feasible due to functional constraints imposed by the task being performed by the luminaire, the luminaire will be exempt

from the energy efficiency requirement. Examples of luminaires that are exempt from the energy efficiency requirement include medical procedure luminaires.

7.7.13.2(5) Luminaires and LED modules will have a colour temperature of 3500 K for general lighting and exam lighting unless noted otherwise for functions of certain areas. Exterior lighting will be 3000K in accordance with dark sky recommendations.

7.7.13.2(6) Master-slave wiring of multiple luminaires from a single driver or ballast is not permitted.

7.7.13.2(7) Rooms with only one (1) luminaire will have lighting circuited according to CSA Z317.2, CSA Z32, and code. Areas with more than one luminaire will have luminaires circuited from more than one power source, unless otherwise noted. Circuit the luminaires in all interior and exterior areas from vital, conditional, or clinical UPS as required, and in consultation with the Authority, so that if one power branch is not available, clinical operations can be maintained and emergency light levels are met. Provide clinical UPS powered luminaires in corridors at intersections and exit doorways as well as alternating stairwell landings, in addition to emergency lighting required by code and CSA Z32.

7.7.13.2(8) LED drivers and control modules to meet the following requirements:

- 7.7.13.2(8)(a) Operable from 50/60 Hz input source of 120 V through 277 V or 347 V through 480 V with sustained variations of ± 10% (voltage) with no damage;
- 7.7.13.2(8)(b) Input power factor greater than 0.90 from 20% to 100% rated load;
- 7.7.13.2(8)(c) Input current THD less than 20% from 20% to 100% rated load;
- 7.7.13.2(8)(d) Comply with NEMA 410 for inrush current limits;
- 7.7.13.2(8)(e) Output current regulated to ± 5 % across published load range;
- 7.7.13.2(8)(f) Output ripple current at maximum output:
  - 7.7.13.2.8.(f).1 less than 15 % measured peak-average/average;
  - 7.7.13.2.8.(f).2 less than 5 % low frequency content (< 120 Hz).

7.7.13.2(9) Integral means of limiting surges to the LED's, based on IEEE/ANSI C62.41.2 surge characteristics:

7.7.13.2(9)(a) for interior applications: common mode and differential mode surge protection of 2.5 kV (100 kHz, 30 Ohm ring wave);

7.7.13.2(9)(b) for exterior applications: common mode and differential mode surge protection of 3 kV (1.2/50 µs, 2 Ohm combination wave).

7.7.13.2(10) Able to tolerate sustained open circuit and short circuit output conditions without failure, without need for external fuses or trip devices, and with auto resetting.

7.7.13.2(11) Comply with IEEE 1789 recommended practices for minimizing flicker effects and ensure systems have no visible flicker when tested with a flicker wheel, including dimming systems across the full dimming range.

7.7.13.2(12) Minimum operating temperature:

7.7.13.2(12)(a) -20˚C (-4˚F) for interior applications;

7.7.13.2(12)(b) -40˚C (-40˚F) for exterior applications.

7.7.13.2(13) Metallic enclosure for optimal thermal performance.

7.7.13.2(14) Integral thermal foldback to reduce driver power in the event that case temperature exceeds rated maximum temperature.

7.7.13.2(15) Dimmable to 10% (1% where noted in Appendix 1N [Electrical and Communications Matrix], in Multimedia Rooms and PET uptake rooms) and compatible with the dimming system. This requirement does not apply to Back-of-House areas, corridors and rooms that do not have dimming requirements.

7.7.13.2(16) Class A sound rating.

7.7.13.2(17) For downlights: compact enclosure with integral studs allowing the driver to be mounted on the outside of the luminaire or on a junction box, without the need for an additional enclosure.

7.7.13.2(18) Integral colour-coded connectors.

7.7.13.2(19) Labelled compliant with the latest edition of the following standards:

7.7.13.2(19)(a) CSA-C22.2 No. 223, Power Supplies with Extra-low Voltage Class 2 Outputs,

7.7.13.2(19)(b) CSA C22.2 No 250-13, Light Emitting Diode (LED) Equipment for use in Lighting Applications.

7.7.13.2(20) Comply with applicable requirements of the FCC rules and regulations, Title 47 CFR part 15, for EMC and EF emissions of non-consumer equipment.

7.7.13.2(21) RoHS compliant.

7.7.13.2(22) LEDs will meet the following requirements:

7.7.13.2(22)(a) All luminaires to have correlated colour temperature tolerances within a 3-step MacAdam ellipse limit and to maintain a CRI of ≥ 80 throughout the full dimming range;

7.7.13.2(22)(b) In Patient Care Areas, provide luminaires with CRI ≥ 85 and R9 and R13 > 50;

7.7.13.2(22)(c) Where luminaires are used for Patient observation, examination (e.g. where examinations occur but separate articulating arm exam or surgical luminaires are not installed), or bloodwork, provide luminaires with R9 and R13 > 80;

7.7.13.2(22)(d) Comply with IESNA LM-79 testing procedures;

7.7.13.2(22)(e) Maximum temperature at the base of the “LED cap” mounted to the substrate to be controlled to ensure full LED life;

7.7.13.2(22)(f) Minimum lumen maintenance of L70 @ 50,000 hours. Comply with IESNA LM-80 and LM-21 testing procedures;

7.7.13.2(22)(g) LEDs of the same type to be from the same manufacturing batch and labelled with bin information sufficient to allow future colour matching of replacement luminaires; and

7.7.13.2(22)(h) Capable of continuous dimming, flicker and noise free, from 10%–100% of rated lumen output (1%-100% where required).

7.7.13.2(23) Provide self-testing standalone battery-operated emergency unit lighting with two LED heads in the security rooms, at the CACF, Energy Centre Control Room, Command Centre, generator enclosures, HV switchgear rooms, Operating Rooms, Trauma Room, Procedure/Treatment Rooms, and UPS rooms. This

lighting will operate for a minimum of 4 hours after input power loss. Provide minimum 10 lux throughout floor spaces.

7.7.13.2(24) Utilize low glare recessed luminaires, direct/indirect or architectural troffers, specifically designed to eliminate direct glare in treatment rooms, offices, reception areas, Care Team Stations and areas where computer terminals or similar screens are used.

7.7.13.2(25) Provide aesthetically pleasing specialty lighting for all Care Team Stations, lobbies, waiting areas, reception areas, kiosks, and other areas as noted on the Appendix 1N [Electrical and Communications Matrix]. Specialty lighting includes suspended fixtures above Millwork, LED cove lighting in bulkheads and architectural clouds and wall washing down lights for feature walls and similar locations.

7.7.13.2(26) Dynamic Skylight Luminaire Requirements

7.7.13.2(26)(a) Unless there is natural light in the Staff work spaces (excluding areas such as business work areas, washrooms, locker rooms, offices and meeting rooms) within the following spaces, provide dynamic skylight luminaires:

7.7.13.2.26.(a).1 Care Team Stations;
7.7.13.2.26.(a).2 C8 Staff Support Space;
7.7.13.2.26.(a).3 D7 Staff Support Space;
7.7.13.2.26.(a).4 E. Laboratory;
7.7.13.2.26.(a).5 J. Oncology Pharmacy;
7.7.13.2.26.(a).6 R. Pharmacy Services;
7.7.13.2.26.(a).7 S. Virtual Health;
7.7.13.2.26.(a).8 U. Administration;
7.7.13.2.26.(a).9 Y2 Medical Staff Facilities – CH; and
7.7.13.2.26.(a).10 Y4 Medical Staff Facilities – CC.

7.7.13.2(26)(b) For the areas listed above except Care Team Stations equal to or less than 18.5 NSM, provide a minimum of two (2) 610 mm x 610 mm (2'x2') dynamic skylight Luminaires for every 18.5 NSM (200 ft^2). For Care Team Stations equal to or less than 18.5 NSM, provide a minimum of two (2) 610 mm x 610 mm (2'x2') dynamic skylight luminaires. In all locations the dynamic skylight luminaires will be distributed within the overall lighting pattern of the space for maximum benefit of the occupant.

7.7.13.2(26)(c) Dynamic skylights to create the sensation of natural light and sunlit sky utilizing colour changing technology to simulate the natural dawn-to-dusk,

east-to-west arc of the sun. Program the skylight luminaires to mirror natural sun position from 9 am to 5 pm for every shift, then restart the program for the start of the next shift. Confirm times of shift start with the Authority.

7.7.13.2(27) Provide luminous backlit LED skylights or virtual backlit LED windows with static imagery tiles (i.e. blue sky, clouds, trees, and foliage, etc.) to provide a positive distraction for Patients which are sized to approximately 25% of the wall or ceiling space they occupy in the following areas:

7.7.13.2(27)(a) CT Scanner and CT Sim Rooms;

7.7.13.2(27)(b) MRI and MRI Sim Rooms;

7.7.13.2(27)(c) Orthovoltage Rooms;

7.7.13.2(27)(d) Radiation Therapy Treatment Bunkers;

7.7.13.2(27)(e) PET/CT, SPECT Scanner Rooms; and

7.7.13.2(27)(f) Reception areas, Patient Check-Ins, Waiting Areas as described in Appendix 1A [Clinical Specifications and Functional Space Requirements] which do not have an exterior window.

7.7.13.2(28) Utilize recessed batwing illumination pattern or indirect LED luminaries in offices, registration areas, Care Team Stations and other areas where computer workstations terminals and similar monitors or screens are present.

7.7.13.2(29) Where Patients are being transferred and/or lying on a stretcher or bed, provide batwing illumination pattern or indirect lighting with a UGR rating of 16 or lower (or equivalent) to limit glare to Patients. In waiting rooms, Staff work areas, meeting rooms and similar use spaces, provide lighting with a UGR of 19 or lower.

7.7.13.2(30) Provide under-cabinet task lights underneath all upper Millwork cabinets and as required by Appendix 1N [Electrical and Communications Matrix].

7.7.13.2(31) The Design-Builder will provide recessed wall washing down lights or surface mounted track lighting with heads for architectural feature walls such as where artwork is located or for donor recognition areas.

7.7.13.2(32) Position luminaires and PACS workstation displays to minimize glare on the displays. This includes positioning corridor luminaires out of a direct Line of Sight from displays with the

corridor doors open and positioning PACS displays so they are not directly opposite each other.

7.7.13.2(33) Design lighting in corridors to limit glare to Patients being transported on stretcher (e.g. direct slot lighting along the sides of corridor, wall washing, or indirect lighting).

7.7.13.2(34) Provide luminaires and controls functions appropriate to each room type as detailed in the room templates in Appendix 1N [Electrical and Communications Matrix]. For rooms without associated room templates, provide luminaires and controls in accordance with the general requirements of this schedule.

7.7.13.2(35) A 120V electrically connected LED "Laser In Use" sign will be located outside any room in which a laser is anticipated to be used, such as Operating rooms, Procedure Rooms or Trauma Room; refer to Appendix 1H [Equipment and Furniture] and Appendix 1N [Electrical and Communications Matrix]. The sign will be connected to an internally illuminated switch inside the room label "Laser". The switch will be interlocked with the laser equipment such that the equipment will not operate with the switch in the “off” position. The “Laser in Use” sign will be interlocked with the doors to the room and the laser will not function while the doors are open. Internal illumination of the switch will be on only when the “Laser in Use” sign is illuminated.

7.7.13.2(36) A 120V electrically connected LED "X-ray In Use" sign will be located outside any room in which fixed or mobile x-ray equipment is anticipated to be used; refer to Appendix 1H [Equipment and Furniture] and Appendix 1N [Electrical and Communication Matrix]. The sign will be connected to an internally illuminated switch inside the room label "X-ray". The switch will be interlocked with the x-ray equipment such that the equipment will not operate with the switch in the “off” position. The “X-Ray In Use” sign will be interlocked with the doors to the operating room and the X-Ray machine will not function while the doors are open. Internal illumination of the switch will be on only when the “X-ray in Use” sign is illuminated.

7.7.13.2(37) Provide an amber LED night light at 450 mm AFF along the walkway between the Patient bed and ensuite washroom to prevent tripping hazards in Inpatient Rooms. Night light to direct light to the floor and be located to not disturb Patient sleep. Provide switch at Patient bed head.

7.7.13.2(38) Provide an amber LED night light at 450 mm AFF within the ensuite washroom. Night light in ensuite does not need to be controlled by switch but will be controlled by photocell such that when lights are turned on in ensuite, the night light turns off.

7.7.13.2(39) Design lighting in technology meeting rooms and video conferencing facilities to maximize viewing of monitors and screens and provide suitable illumination of people being viewed (e.g. vertical illumination).

7.7.13.2(40) Provide specific dedicated lighting in rooms and areas intended for video conferencing to facilitate visual quality of video transmission in accordance with IESNA Design Guideline DG-17.

7.7.13.2(41) Provide lighting for specific functions with illumination levels as required by CSA Z317.5. Provide dedicated lighting designed for the types of functions conducted in rooms and areas where specialized analytical or diagnostic work is carried out. Provide lighting to illuminate room counter and work areas in exam rooms, medication rooms, offices, Care Team Stations, and all other space types. Provide specialized lighting for food preparation area counters.

7.7.13.2(42) On-Grade Parking and Underground Parking:

7.7.13.2(42)(a) Outdoor spaces will have luminaires to assure full cut-off photometric to prevent light leakage into the Facility while eliminating shadows. All outdoor parking spaces within the Project will be as per CSA 317.5-17 clause 5.12.4 Outdoor Parking Areas. Provide a minimum average illumination of 200 lux at generator enclosures, designated bulk oxygen site, loading docks, compactors and refuelling locations.

7.7.13.2(42)(b) Utilize Vandal Resistant and dark-sky compliant exterior luminaires. Comply with LEED requirements for light trespass and light pollution.

7.7.13.2(42)(c) Exterior lighting will be connected to vital and conditional power such that no area is dark with loss of one power source.

7.7.13.2(42)(d) Provide parking lot illuminance levels in accordance with the Canadian Parking Association CPA ACS Technical bulletin No. 8 Parking Lighting IESNA RP-20 Lighting for Parking Facilities and CSA Z317.5-17.

7.7.13.2(43) Plaza, Wellness Walkways and public entrances:

7.7.13.2(43)(a) All entrances will be lit above 100 lux and the Emergency department entry lit above 150 lux with uniformity ratio of 3:1, average to minimum. The Plaza and Wellness Walkway will be lit above 50

lux with uniformity ratio of 5:1, average to minimum. Public streets will be lit in compliance with City of Surrey requirements.

7.7.13.2(43)(b) Provide low-level lighting, bollards, wall-mounted and post-top lighting where needed to provide safe, well-lit walkways, parking areas and roads.

7.7.13.2(43)(c) Utilize Vandal Resistant and dark-sky compliant exterior luminaires. Comply with LEED requirements for light trespass and light pollution.

7.7.13.2(43)(d) Utilize high-abuse decorative fixtures for Patient accessible exterior roof areas. Select and locate fixtures to provide uniform illumination levels on all surface areas, avoiding shadows and light trespass into the building.

7.7.13.2(43)(e) Outdoor amenity areas will have illumination levels in accordance with IESNA recommendations, suitable for IPVS cameras and will minimize light spill into interior spaces.

7.7.13.2(43)(f) Provide architectural lighting to highlight artwork features and all outdoor spaces. Utilize architectural lighting to illuminate the Plaza including low-level bollards, wall-mounted fixtures.

7.7.13.2(44) Provide LED green pictogram exit and directional signs on vital power. Utilize edge-lit type exit signs in lobbies, waiting areas, public corridors and Multimedia Rooms. Provide exit signs as required by Code. Additional exit signs will be provided where required for Wayfinding to all exit doors and paths of egress from all internal corridors and corridor intersections. Provide direction to two paths of egress from corridors and intersections.

7.7.13.2(45) Design lighting in Multimedia Rooms to maximize viewing of monitors and screens and provide suitable vertical and horizontal illumination of people being viewed for video conferencing cameras. Refer to Section 7.8.15 and Appendix 1T [UBC FoM Design Guidelines and Functional Requirements] for additional requirements.

7.7.13.2(46) Provide built-in LED valance lighting as required for task-oriented and Staff areas such as: medication rooms, anterooms, nourishment areas, lounges, dictation, and Care Team Stations. All upper cabinets above a workstation, work surface, sink or countertop will be provided with valance lighting underneath.

7.7.13.2(47) Lighting in rooms or spaced containing PACS workstations will be dimmable to 1% locally and be positioned to minimize glare on the displays. Room and adjacent space lighting to be designed to avoid light spilling on PACS displays to provide clear PACS viewing. The following areas will have PACS workstations (fixed or mobile):

7.7.13.2(47)(a) Trauma Room C3.03;

7.7.13.2(47)(b) Care Team Stations C3.22, C4.18 and C5.02;

7.7.13.2(47)(c) Operating Rooms D2.05, D2.04 and D2.06;

7.7.13.2(47)(d) Procedure Rooms D3.02 and D3.03;

7.7.13.2(47)(e) Reading Rooms F2.15, F3.10, F3.11, F4.18, F5.15, F6.07 and M2.07;

7.7.13.2(47)(f) Office – Private M1.05 and M2.06; and

7.7.13.2(47)(g) B. Inpatient Unit and D6 Anesthetic Care Unit (ACU), mobile PACS workstations with exact locations to be determined in consultation with the Authority.

7.7.13.2(48) Front-of-House and Back-of-House Corridors

7.7.13.2(48)(a) In Front-of-House publicly accessible corridors, including corridors used for Patient transport, provide batwing illumination pattern or indirect recessed lighting and in Back-of-House corridors, excluding corridors used for Patient transport, not accessible by the public provide lensed recessed lighting.

7.7.13.2(48)(b) Provide daylight dimming sensors for all corridors, rooms and areas with exterior glazing. Provide dimming controls of corridors. Lighting in corridors will be reduced to 50% at each fixture during night time except where directed otherwise by the Authority.

7.7.13.2(48)(c) Corridor lighting will be 20% UPS power, 80% vital power. UPS powered luminaires will be located at corridor intersections and corners.

7.7.13.2(49) In each Storage/Equipment/Holding room (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(49)(a) Utilize direct recessed troffer luminaries to provide bright and even lighting levels in accordance with CSA 317.17.

7.7.13.2(49)(b) Lighting to be on vital and conditional power.

7.7.13.2(50) In each Logistical Support areas (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(50)(a) Utilize direct recessed troffer luminaries to provide bright and even lighting levels in accordance with CSA 317.17.

7.7.13.2(50)(b) Provide vapour tight fixtures where required.

7.7.13.2(50)(c) Lighting to be on vital and UPS power.

7.7.13.2(51) In each Alcove (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(51)(a) Utilize direct recessed downlight controlled with corridor lighting. Observation alcove lighting to be individually dimmed locally in the alcove.

7.7.13.2(51)(b) Lighting to be on vital power.

7.7.13.2(52) In each Kitchen & Nourishment area (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(52)(a) In Nourishment alcoves utilize hospital grade downlight luminaries to provide bright and even lighting levels in accordance with CSA 317.17.

7.7.13.2(52)(b) In the Food Services area provide direct recessed troffer luminaries to provide bright and even lighting levels in accordance with CSA 317.17. Luminaires to be rated and approved for use in food preparation areas.

7.7.13.2(52)(c) Provide under cabinet lighting under upper cabinets in all Kitchen and Nourishment areas.

7.7.13.2(52)(d) Lighting to be on vital and conditional power.

7.7.13.2(53) In each Meeting/Conference room (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(53)(a) Refer to FHA IM/IT lighting and control requirements.

7.7.13.2(53)(b) Lighting to be on vital and UPS power.

7.7.13.2(54) In External Ambulance Canopy Vehicle Bay (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(54)(a) Provide high bay LED luminaires rated IP 65 in the External Ambulance Canopy/Vehicle Bay.

7.7.13.2(54)(b) Provide recessed downlight luminaries in Ambulance Entry Vestibule.

7.7.13.2(54)(c) Lighting to be on vital and conditional.

7.7.13.2(55) In Service Rooms (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(55)(a) Provide surface mounted strip lighting complete with wire cage protection. Where Ceiling Height is more than 3 metres utilize low bay luminaires.

7.7.13.2(55)(b) Lighting levels to be 400 lux average or higher, avoid dark spots due to equipment in the room.

7.7.13.2(55)(c) Lighting to be on 50% vital and 50% UPS power.

7.7.13.2(56) In FM Support Areas (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(56)(a) Provide surface mounted strip lighting complete with wire cage protection. Where Ceiling Height is more than 3 metres utilize low bay luminaires with wire cage protection.

7.7.13.2(56)(b) Lighting levels to be 500 lux average or higher, avoid dark spots caused by shadows from workers at workstations and workbenches.

7.7.13.2(56)(c) Provide under counter lighting for all upper cabinets at workstations and workbenches.

7.7.13.2(56)(d) Lighting to be on 50% vital and 50% UPS power.

7.7.13.2(57) In Morgue Viewing and ID rooms (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(57)(a) Provide recessed indirect troffer lighting, dimmable.

7.7.13.2(57)(b) Lighting to be on vital and conditional power.

7.7.13.2(58) In On-Call, Resource rooms and Lounges (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(58)(a) Provide indirect recessed troffers in Quite rooms, on-call rooms. Provide dimming.

7.7.13.2(58)(b) Provide direct/indirect recessed troffers in Resource Centre – Patient/Family, Lounge – Family/Visitor, computer training room and Staff Lounges.

7.7.13.2(58)(c) Lighting to be on vital and conditional power.

7.7.13.2(59) In Circulation & Public Areas (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(59)(a) Provide recessed downlighting or recessed troffers in vestibules.

7.7.13.2(59)(b) Provide recessed troffers in Security Station, Security office and Information/Security Station.

7.7.13.2(59)(c) Provide indirect recessed troffers in waiting area.

7.7.13.2(59)(d) Provide architectural lighting such as pendants and indirect recessed troffers in reception areas and main entrance lobby. Lighting to be designed to not provide glare to Staff or public at reception desks.

7.7.13.2(59)(e) Lighting to be on vital and UPS power.

7.7.13.2(60) In Inpatient Washrooms, Public Washrooms and Staff Washrooms/Lockers (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(60)(a) Provide recessed downlighting and, above the sink, wall mounted vanity luminaries in washrooms. Provide downlighting in showers.

7.7.13.2(60)(b) In washrooms with showers luminaires will be IP 65 rated.

7.7.13.2(60)(c) In Staff Locker areas provide recessed direct troffers.

7.7.13.2(60)(d) Lighting to be on vital and UPS.

7.7.13.2(61) In the Cyclotron Vault (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(61)(a) Provide surface mounted LED or incandescent luminaires as per Cyclotron manufacturer recommendations. Ensure lighting is provided to eliminate dark spots due to equipment and vertical illumination on the equipment is included.

7.7.13.2(62) In Medical Device Reprocessing areas (refer to room list in Appendix 1N [Electrical and Communication Matrix] ‘Spaces without a Room Template’):

7.7.13.2(62)(a) Provide surface mounted LED luminaires. Ensure lighting is provided to eliminate dark spots due to equipment and vertical illumination on the equipment is considered.

7.7.13.2(62)(b) Luminaires to be IP 65 rated.

7.7.13.2(63) Provide wall mounted vanity lighting above each mirror in washrooms, change compartments, locker rooms, etc., located to minimize shadows on occupants facing the mirror.

7.7.13.2(64) Provide lighting to achieve the specified illuminance levels throughout when known large equipment exists or where partitions are closed, including toilet partitions, shower curtains, and change compartment partitions.

7.7.13.2(65) Install exam lights, providing minimum 750 lux lighting levels at the work surface, to meet the requirements of Appendix 1A [Clinical Specifications and Functional Space Requirements], including all Patient exam and treatment recovery.

7.7.13.2(66) Provide CDL luminaires utilizing general area lighting safe for occupants utilizing safe, visible white light in the 405nm wavelength range, with the required mode of operation in the following spaces:

7.7.13.2(66)(a) Single-mode operation:
- 7.7.13.2.66.(a).1 Public waiting areas;
- 7.7.13.2.66.(a).2 All Anterooms; and
- 7.7.13.2.66.(a).3 Sterile MDR area.

7.7.13.2(66)(b) Dual-mode operation:
- 7.7.13.2.66.(b).1 Patient Washrooms;
- 7.7.13.2.66.(b).2 Public Washrooms;
- 7.7.13.2.66.(b).3 Soiled Utility Rooms;
- 7.7.13.2.66.(b).4 Operating Room – Isolation;
- 7.7.13.2.66.(b).5 Operating Room;

7.7.13.2.66.(b).6 Operating Room – HDR;
7.7.13.2.66.(b).7 Procedure Room – Endoscopic; and
7.7.13.2.66.(b).8 Procedure Room – General.

7.7.13.2(67) The CDL luminaires will provide coverage for the entire space they are installed in.

7.7.13.2(68) The dual mode CDL luminaires will be able to switch between general lighting mode and disinfection mode via the use of manufacturer recommended controls when the room is vacant. The CDL luminaires will automatically return to general lighting mode upon room occupancy.

7.7.13.2(69) For each Imaging-MRI and MRI Sim room:

7.7.13.2(69)(a) Ensure only non-ferrous components, fittings, fixtures and fasteners are used;

7.7.13.2(69)(b) Install only DC-powered LED lighting fixtures suitable for use in an MRI room, controlled from the control room with remote drivers and a minimum of two DC dimming circuits;

7.7.13.2(69)(c) Provide flush ceiling-mounted vision panels complete with replaceable graphics, minimum 1.8 m by 2.4 m, located over the bed in front of the magnet. The Design-Builder to provide a set of custom graphics.

7.7.13.2(69)(d) Install EMI filters on all wiring entering the room; and

7.7.13.2(69)(e) Provide a custom LED warning sign at the entry to the MRI area, electrically interlocked with the MRI equipment. Wording to be as determined with the Authority.

7.7.13.2(70) Refer to Division 27 and FHA IM/IT Standards for communication room lighting requirements.

7.7.14 Lighting Control System

7.7.14.1 Basic Requirements

7.7.14.1(1) Provide a scalable, networked, and digital addressable lighting control system throughout the Facility for lighting control of all luminaires except where line voltage controls are permitted.

7.7.14.1(2) Lighting control system will provide flexibility to adjust lighting to suit functions and activities and permit simple, integrated control of lighting. Controls will be easily operated and located in each

area to suit the function of the space. Each room and area will have separate lighting control.

7.7.14.1(3) Lighting controls connections will be hard-wired, without exception. Lighting control system will be compatible with wireless control transmitters and wireless control devices to allow wireless control to be easily implemented in future renovation projects.

7.7.14.1(4) Luminaires for each space will be circuited from a single junction box per power branch and per control module. Locate the lighting power and control module junction boxes in the corridor ceiling space outside the entrance to the space, to minimize the disruption of future lighting renovations on adjacent spaces. Daisy-chaining circuits between rooms is not permitted.

7.7.14.1(5) Lighting controls will comprise a significant part of the energy management of the Facility reducing energy consumption as well as permitting simple and integrated control of lighting both locally and remotely;

7.7.14.1(6) Lighting controls are to meet or exceed ASHRAE 90.1-2019 requirements.

7.7.14.1(7) Utilize a combination of natural light, high-efficiency luminaires, dimming, occupancy sensing and daylight harvesting controls to maximize energy savings.

7.7.14.1(8) Provide daylight sensors and luminaires to maximize daylight use throughout the Facility. Install and design in accordance with manufacturers' recommendations. Optimize daylight sensor response and control operation during Commissioning.

7.7.14.1(9) Connect the lighting control system to the BMS for transfer of lighting sensor and energy use data and provide intuitive graphic interface software that can be used on BMS operator terminals to allow for Facility Management Staff to view luminaire on/off/dimming states and energy use, and override programmed settings, occupancy sensor, daylight sensor, or manual control setting.

7.7.14.1(10) Protect lighting controls from unauthorized operation when required to be located in areas accessible to the public.

7.7.14.1(11) In open areas, common areas, and Patient Care Areas, zone and subdivide lighting to permit energy management and appropriate control and variation of light levels.

7.7.14.1(12) Consult with the Authority when designing the lighting operation (controllability, zones, and timing) of the Facility.

7.7.14.1(13) Lighting control panels will be located in the FER or SER on the floor they serve.

7.7.14.2 Performance Criteria

7.7.14.2(1) Lighting control system:

7.7.14.2(1)(a) Will be Extra-low Voltage type;

7.7.14.2(1)(b) Will be networked and addressable, except the following spaces where standalone (non networked) controls are permitted:

7.7.14.2.1.(b).1 Storage rooms less than 20 NSM and used for equipment, FMO/IMIT, and housekeeping supplies only;

7.7.14.2.1.(b).2 Stairwells;

7.7.14.2.1.(b).3 Mechanical rooms, Communications Rooms and Electrical Rooms; and

7.7.14.2.1.(b).4 FMO and IM/IT workrooms and workshops.

7.7.14.2(1)(c) Will be networked to each lighting zone control device (e.g. zone controller, area controller, room controller, powerpack) and each input control device or each analog input control device via addressable module (e.g., switches, occupancy sensors, and daylight sensors);

7.7.14.2(1)(d) Will have each control bus serving not more than one (1) Component;

7.7.14.2(1)(e) Will have unique address for each control zone of luminaires and input control device;

7.7.14.2(1)(f) Will utilize 0-10V method for controls and dimming at each luminaire;

7.7.14.2(1)(g) Will not automatically control or override the lighting controls in the Patient Care Areas;

7.7.14.2(1)(h) Will have local on/off control and local dimming control of the lighting in each room, space, and lighting control zone, unless noted otherwise;

7.7.14.2(1)(i) Will resume the previous control settings for all zones after a power outage to the luminaires or controllers;

7.7.14.2(1)(j) Will initiate an ‘emergency mode’ that adjusts luminaires to full light output on failure of their associated controllers. Emergency mode will

activate upon an alarm signal from the fire alarm system, a forced access control point or activation of a panic device. Coordinate with the Authority.

7.7.14.2(1)(k) In critical spaces including Operating Rooms and Treatment/Procedure Rooms, provide a local or automatic override means to prevent over-illumination if a controller fails during a procedure;

7.7.14.2(1)(l) Will have a maximum on- or off-delay of 0.1 seconds for local control devices and 2 seconds for controls routed through remote network interfaces (e.g. via BMS workstations);

7.7.14.2(1)(m) Will allow daylight harvesting and time clock scheduling; and

7.7.14.2(1)(n) Will have a BACnet/IP interface with the BMS, load management, and IBMP systems for bi-directional communication and be able to:

7.7.14.2.1.(n).1 Provide lighting energy and demand reporting for each control zone; and

7.7.14.2.1.(n).2 Initiate ‘emergency mode’ that adjusts luminaires to full light output.

7.7.14.2(2) Ensure that the Facility, including buildings and On-Site lighted areas, will have a lighting control system divided into logical zones and be subdivided to permit energy management and allow Staff control of light levels for all interior and exterior lighting.

7.7.14.2(3) Reserve 20% of the continuous load capacity of each lighting power circuit and control circuit/bus spare for future lighting renovations.

7.7.14.2(4) Lighting systems will maximize the use of daylight and lighting control devices to maintain lighting levels and use the least amount of energy to provide the required illumination and will be in conformance with ASHRAE 90.1-2019 energy use requirements.

7.7.14.2(5) Provide and Commission all required communications infrastructure and gateways between the BMS, load management and IBMP systems and the networked lighting control panels.

7.7.14.2(6) Identify on/off/dimming status of lighting control zones on the IBMP operator screen.

7.7.14.2(7) Provide override at Care Team Stations for all associated lighting zones in corridors/alcoves, common spaces/rooms, and exterior

areas in the same department that have controls accessible by Patients.

7.7.14.2(8) Provide local controls for each Inpatient Unit at the associated Staff workstation and security control areas. The master controls will be divided into logical zones to allow Staff the flexibility to control lighting levels within the wing, including two illumination levels at outdoor spaces.

7.7.14.2(9) For Patient Care Areas not identified in Appendix 1N [Electrical and Communications Matrix], provide separate lighting control switches as follows:

7.7.14.2(9)(a) Room entry (for general area lighting and night light);

7.7.14.2(9)(b) Headwall Patient zone (for Patient reading light, night light, and general area lighting), located above the bed to allow Patient to access them;

7.7.14.2(9)(c) Headwall Provider zone (for exam lighting, bedside Staff light, and observation light);

7.7.14.2(9)(d) Visitor/family zone (for visitor/family zone lighting);

7.7.14.2(9)(e) Workstation (for workstation lighting); and

7.7.14.2(9)(f) In corridor adjacent to Patient room door (for observation light).

7.7.14.2(10) Utilize the lighting control system with time scheduled programming for corridor lighting levels. Light levels in corridors to maintain minimum 50 lux measured on the floors at all times, including scheduled night time reduced level. Provide local dimming control for corridors from Care Team Stations and Reception desks as applicable. Provide occupancy sensors in corridors.

7.7.14.2(11) All lighting in public and administration areas to be capable of being switched from a central location.

7.7.14.2(12) All rooms will have local switching, unless specified otherwise.

7.7.14.2(13) All Alcoves-Observation will have local switching and dimming control of the lighting within the alcove itself and the associated Patient rooms.

7.7.14.2(14) Except for exit signs, circuit breakers will not be used to switch lighting circuits.

7.7.14.2(15) Provide door switch lighting control for enclosed closet lighting.

7.7.14.2(16) Provide dual technology occupancy sensor lighting control for luminaires in open alcoves that are separate from the primary corridor lighting.

7.7.14.2(17) Provide dual technology occupancy sensors with two-pole outputs for full coverage of all interior spaces, to facilitate ongoing energy conservation measures by system operators and for potential security or Facility optimization applications. Occupancy information for all spaces is be provided to the BMS from the lighting control system either via BACnet or hardwired connections from the occupancy sensors.

7.7.14.2(18) Provide 10%–100% dimming range for all lighting, unless specified otherwise.

7.7.14.2(19) Provide 1 %–100% dimming range for spaces with diagnostic imaging equipment or related monitors and Multimedia Rooms.

7.7.14.2(20) Provide programmable scene lighting control in rooms requiring simple control of multiple functional lighting zones, including lecture theatres and conference/meeting rooms.

7.7.14.2(21) In waiting areas, reduce lighting levels by 50% within 20 minutes of all occupants leaving the space.

7.7.14.2(22) All interior open areas will be provided with independent switching controls with a minimum of one switch per 90 NSM.

7.7.14.2(23) Conference meeting rooms will have separately switched 1 %–100% dimmable low-level presentation lighting.

7.7.14.2(24) Luminaires in Patient Care Area will be controlled by push button type switches located within the Patient Care Area. Switches will be of a construction grade/duty type suitable for institutional use and meet infection control standards.

7.7.14.2(25) Provide 24-hr lighting within all stairwells and exit corridors without local switching. Luminaires will have automatic bi-level dimming with occupancy sensor control to maximize energy savings. In the event of sensor failure, lights will default to 100% on.

7.7.14.2(26) Refer to Appendix 1N [Electrical and Communications Matrix] for detailed room by room lighting control requirements.

7.7.14.2(27) All exterior luminaires will be switched from the Facility lighting control system via programmed astronomical time signals or photocell inputs to produce four (4) channels of control as follows:

7.7.14.2(27)(a) Channel 1 - Dusk to Dawn;

7.7.14.2(27)(b) Channel 2 - Dusk to Preset;

7.7.14.2(27)(c) Channel 3 - Preset to Preset; and

7.7.14.2(27)(d) Channel 4 - Preset to Dawn.

7.7.14.2(28) The exterior lighting system will be divided into logical zones. Include the following zones as the minimum:

7.7.14.2(28)(a) Private Roadways (per roadway);

7.7.14.2(28)(b) Surface Parking Areas (per parking area);

7.7.14.2(28)(c) Outdoor spaces Night Illumination and Enhanced Security Illumination (separate);

7.7.14.2(28)(d) Pathway/Walkway lighting;

7.7.14.2(28)(e) Facility entrances, including exterior stairs and ramps;

7.7.14.2(28)(f) Parkade lighting; and

7.7.14.2(28)(g) “ALL ON” single point control.

7.7.14.2(29) Lighting control will provide flexibility required to adjust lighting to minimal levels during predetermined nighttime hours to achieve energy savings while maintaining required uniformity to provide and support video surveillance system functionality.

7.7.14.2(30) Integrate controls in Multimedia Rooms, videoconference rooms and meeting rooms with equipment controls and control stations in the room to permit the room users to vary the lighting as required for different activities. Detailed requirements for lighting and controls in Multimedia Rooms are further described in Section 7.8 Communications (Division 27).

7.7.14.2(31) Provide manually operated lighting controls that can be completely cleaned and disinfected without requiring any disassembly, and which will not deteriorate or be otherwise adversely affected by frequent cleaning and disinfection.

7.7.14.2(32) Install specifically rated lighting controls for the application/condition in locations where they may be subjected to excessive moisture or to chemicals that might cause deterioration.

7.7.14.2(33) Provide control of parking garage lighting in accordance with ASHRAE 90.1-2019. Parking garage lighting control will meet the following requirements:

7.7.14.2(33)(a) Lighting output of each luminaire will be automatically reduced by a minimum of 30% when there is no activity detected within a lighting zone for 20 minutes. Lighting zones will be maximum 334 NSM. Provide occupancy sensors zoned such that lights are turned fully on ahead of traffic and people. Do not provide each fixture with individual occupancy sensor control. Lighting in parking garage will only be reduced at each fixture; do not shut lighting off;

7.7.14.2(33)(b) Lighting for covered vehicle entrances and exits with no parking will be separately controlled to automatically reduce the lighting output of each luminaire by at least 50% from sunset to sunrise;

7.7.14.2(33)(c) The power to each luminaire within 1.9 NSM of any perimeter wall structure that has a net opening-to-wall ratio of at least 40 % and no exterior obstructions within 1.9 NSM will be automatically reduced in response to daylight; and

7.7.14.2(33)(d) All parking garage lighting will return to full lighting level output upon activation of any panic alarm station within the parking garage, upon activation of second stage fire alarm or while a loss of power is experienced by one of the parking garage lighting power sources.

7.7.14.2(34) Provide scheduled shutoff for the outpatient areas. Provide adjustable programming, initially configured for one (1) hour before daily scheduled clinic opening and one (1) hour after clinic closing. Provide manual override control, limited to two (2) hours per activation during scheduled shut-off time. Lighting is not required to be on scheduled shutoff in spaces where Patient care is rendered or lighting in spaces where automatic shutoff would endanger the safety or security of the room or Facility occupants.

7.7.14.3 Training

7.7.14.3(1) Provide training for Facility Management Staff in accordance with the requirements of this Agreement Training will be provided On-Site and be video recorded for future self-paced training. Provide a minimum of two (2) training sessions, one week apart from each other, to ensure shift workers are able to attend one of the two sessions.

7.7.14.3(2) Train the Authority’s designated FMO Staff to enable them to perform the following:

7.7.14.3(2)(a) Day-to-day operators:

- 7.7.14.3.2.(a).1 Proficiently operate the system;
- 7.7.14.3.2.(a).2 Understand lighting control system architecture and configuration;
- 7.7.14.3.2.(a).3 Understand system components;
- 7.7.14.3.2.(a).4 Understand system operation;
- 7.7.14.3.2.(a).5 Program lighting control panels including schedules and presets;
- 7.7.14.3.2.(a).6 Log on and off the system;
- 7.7.14.3.2.(a).7 Adjust and change system defaults, time schedules, and holiday schedules;
- 7.7.14.3.2.(a).8 Recognize and troubleshoot malfunctions of the system;
- 7.7.14.3.2.(a).9 Understand system drawings and operating and maintenance manuals;
- 7.7.14.3.2.(a).10 Create, modify, and delete programming;
- 7.7.14.3.2.(a).11 Add panels when required;
- 7.7.14.3.2.(a).12 Install net-new equipment (e.g. addressable modules) onto the system, including configuring and Commissioning;
- 7.7.14.3.2.(a).13 Adjust lighting functionalities as per end-user requests; and
- 7.7.14.3.2.(a).14 Maintain, calibrate, and replace system components.

7.7.14.3(3) Provide a lighting control system expert who is factory trained and has experience using the system in acute health care environments. The expert will assist in Commissioning the lighting control system and provide training.

7.7.14.3(4) To ensure the Authority and Facility Management has a comprehensive understanding of the hardware and software, to ensure the ongoing operation and maintenance of the lighting control system.

7.7.15 Daylight Harvesting

7.7.15.1 Basic Requirements

7.7.15.1(1) Maximize the use of daylight to maintain lighting levels while reducing energy consumption with a combination of natural light, luminaires and controls. Provide daylight harvesting at all exterior windowed areas even if not required by ASHRAE 90.1-2019. Patient Rooms in Component B. Inpatient Unit as described in Appendix 1A [Clinical Specification and Function Space Requirements] are excluded from Daylight Harvesting requirements.

7.7.15.2 Performance Requirements

7.7.15.2(1) Provide local photocell sensors to optimize energy use and provide a stable illumination level utilizing natural and artificial light.

7.7.15.2(2) Provide continuous daylight harvesting controls utilizing dimmable light fixtures in spaces where natural light is entering the space directly from an exterior window.

7.7.15.2(3) Where daylighting control is installed in Patient accessible areas, provide for manual and time/mode controlled-switches disabling the daylighting control.

7.7.15.2(4) Where daylighting control is installed in corridors and other means of egress, the controls are to be configured such that luminaires revert to 100% output while a loss of power is experienced by one of the power sources serving these areas.

7.7.16 Occupancy Sensors

7.7.16.1 Basic Requirements

7.7.16.1(1) Use dual-technology (passive infrared and ultrasonic) occupancy sensors to automatically turn off lighting in areas that are unoccupied to reduce energy consumption. Vacancy sensor (manual-on/auto-off) functionality will be the preferred programming option for energy efficiency and will be used except where automatic on is specified for safety/convenience or required by code.

7.7.16.1(2) In spaces and rooms where occupancy sensor control is required without manual controls provide the occupancy sensor on the ceiling. Such areas include washrooms, soiled and clean storage etc.

7.7.16.1(3) Occupancy and vacancy sensors to be 2-pole to provide a dry contact output for future use.

7.7.16.2 Performance Requirements

7.7.16.2(1) Occupancy sensors will be capable of detecting presence anywhere in the floor area to be controlled. Additional occupancy sensors to be provided around corners and other blind spots within the area to be controlled.

7.7.16.2(2) Provide zoned occupancy sensors in Patient corridors and common spaces in all departments. The occupancy sensors will be enabled and disabled by switches located in the Care Team Station. The zoned occupancy sensors will switch on or brighten lights in the related zone when they are dimmed.

7.7.16.2(3) Provide occupancy sensors for full interior coverage of the Facility except where explicitly noted as not required.

7.7.16.2(4) In clean supply and Soiled Utility rooms, and similar spaces, provide occupancy (auto-on) functionality instead of vacancy (with manual on) functionality. Lighting required to be automatically on for Staff safety, e.g. awareness that a person is in the room.

7.7.16.2(5) In Mechanical, Communication and Electrical Rooms as well as work rooms and shops provide line voltage toggle switch in lieu of occupancy control. Occupancy sensors are still required in these spaces for interface with the BMS.

7.7.16.2(6) Luminaires with integral occupancy sensor will be permitted only in the stairwells.

7.7.17 Mechanical Equipment Connections

7.7.17.1 Basic Requirements

7.7.17.1(1) Provide electrical power, control, and monitoring connections to all mechanical equipment as required for proper operation, protection and maintenance of the equipment. Materials and installation methods will result in safe, reliable and serviceable mechanical equipment and systems.

7.7.17.2 Performance Criteria

7.7.17.2(1) Utilize institutional- or industrial-quality conductors, connectors, conduit systems, fittings and hardware for mechanical equipment connections, to provide for high levels of reliability, durability and ease of Equipment maintenance. Where electrical equipment is installed in sprinklered areas, utilize sprinkler proof connectors (NEMA 2) and methods; avoid installing feeders in top of equipment.

7.7.17.2(2) Design connections made to motors, motor driven equipment, and other vibrating equipment with sufficient flexibility to minimize vibration transmission to other building components.

7.7.17.2(3) Design connections to mechanical equipment to easily permit removal and replacement of the equipment.

7.7.17.2(4) Size MCCs and MCC feeders to accommodate the initial mechanical equipment load, with 33 % of the equipment capacity reserved as spare, as well as one (1) prepared space the size of a full-size NEMA 1 starter compartment per vertical MCC section.

7.7.17.2(5) Group motor starters into MCCs wherever three (3) or more 3-phase motors requiring starters are located within 30 m of each other, on the same power branch and the same storey.

7.7.17.2(6) Group VFDs and other starters that do not incorporate into MCCs, combine the VFDs together in an accessible location near the motors they control.

7.7.18 Seismic Requirements for Electrical Systems

7.7.18.1 Basic Requirements

7.7.18.1(1) Provide seismic restraint for all electrical equipment and components of electrical systems. Design the electrical systems and its associated equipment, restraints, and anchorage to comply with the BCBC for a post-disaster Facility and to meet the ground acceleration criteria and seismic importance factors for non-structural equipment restraints as identified for the geographical location of installation.

7.7.18.1(2) Provide seismic restraint systems and methods that facilitate ease of maintenance and ease of replacement and reconfiguration of electrical equipment and systems and other equipment and building components.

7.7.18.1(3) Provide seismic restraint systems and methods that coordinate with the Facility’s architecture and finishes. Wherever practicable, conceal components of seismic restraints from public view. Where concealment is not practicable, provide systems that complement the Facility’s architecture and finishes.

7.7.18.2 Performance Criteria

7.7.18.2(1) The following equipment will be designed, certified, and installed in accordance with the International Building Code (IBC) chapters 16 and 17, with special seismic certification obtained in accordance with the shake table testing standard ICC-ES AC-156:

7.7.18.2(1)(a) Generators, including ancillary systems such as battery chargers and fuel transfer controls;

7.7.18.2(1)(b) Synchronization switchgear and automatic transfer switches;

7.7.18.2(1)(c) UPS systems and related equipment;

7.7.18.2(1)(d) Switchgear;

7.7.18.2(1)(e) MDPs and CDPs;

7.7.18.2(1)(f) MCCs;

7.7.18.2(1)(g) Fire alarm control panels, annunciators, and CACF;

7.7.18.2(1)(h) Power transformers (12.47kV-600V or 25kV-12.47kV); and

7.7.18.2(1)(i) Distribution transformers.

7.7.18.2(2) Provide seismic restraint for all electrical equipment and components of electrical systems that have the potential to cause injury or damage during or following a seismic event.

7.7.18.2(3) Use seismic restraint systems that are designed by the Design-Builder's Structural Engineer-of-Record or a supporting Structural Engineer registered in British Columbia. If a supporting Structural Engineer is engaged, they are to supply model schedules to the Electrical Engineer-of-Record for electrical seismic installation. Where an identified pre-designed standard restraint device or system exists for a particular item, that equipment may be used provided that written confirmation of its acceptability for the installation is provided by a Professional Engineer registered in British Columbia who is a designated structural engineer having "Struct Eng" standing with EGBC. Provide signed and sealed drawings as well as typewritten field reports from the Design-Builder's Structural Engineer-of-Record or the supporting Structural Engineer for electrical seismic installation. Obtain certification of the electrical distribution equipment for seismic withstand capability and, to maintain the certification, anchor such equipment according to the manufacturer's instructions.

7.7.19 Structural Moat Wall Requirements

7.7.19.1 Basic Requirements

7.7.19.1(1) All cabling, raceways, and wiring transiting the seismic isolation gap (moat) between the structural moat wall and the underground parking exterior wall will be suitably supported meeting requirements of Section 7.7.11.

7.7.19.1(2) Flexible raceways crossing seismic isolation gaps for the Seismically Isolated Building Structure will be complete with dedicated bond conductor. The raceway or integral shield will not be relied upon for bonding purposes.

7.7.19.1(3) All cables will be independently supported using suitable, approved mechanisms that will not compromise the integrity of the cable over time, or with repeated movements.

7.7.19.1(4) Provide suitable lighting with manual switch and 120V, 20 amp GFCI maintenance receptacle within the seismic isolation gap.

7.7.19.1(5) Provide fire alarm pull station, smoke detector, and horn/strobe within the seismic isolation gap.

7.7.19.1(6) Provide “Danger: High Voltage Authorized Personnel Only” signage on the access door.

7.7.19.2 Performance Criteria

7.7.19.2(1) The seismic isolation gap for the Seismically Isolated Building Structure will be considered a damp or wet location.

7.7.19.2(2) Conductors required to be protected against fire exposure to provide continued operation in compliance with the BCBC & CSA C282 located within the seismic isolation gap will be suitably protected. This is to be achieved with a suitable raceway or by suitably protecting the entire space at the crossing.

7.7.19.2(3) All cabling, raceways, and wiring transiting the seismic isolation gap will be suitably supported meeting requirements of Section 7.7.11.

7.7.19.2(4) Raceways will be designed and installed to allow for the differential movement anticipated for the operational life of the Facility without damage to the cable, raceway, or interruption to the connected systems. Suitable slack will be provided such that cables or raceways are not at full extension during maximum movement.

7.7.19.2(5) Raceways will be installed such that water or moisture will not accumulate in enclosures.

7.8 Communications (Division 27)

7.8.1 Principles and Guidelines

7.8.1.1 Communications infrastructure, networks and systems identified in this section are key enablers for modern health care service delivery.

7.8.1.2 IM/IT will provide leadership and direction as it relates to the Design and Construction of the communications infrastructure, networks and systems in the Facility.

7.8.1.3 The responsibilities of the Authority and Design-Builder as it relates to communications infrastructure, networks and systems are summarized in Appendix 1W [Systems Responsibility Matrix].

7.8.2 Information Management Guidelines

7.8.2.1 The management of the Staff and Patients' information is the responsibility of the Authority.

7.8.2.2 The Authority will have two Clinical Information Systems operating in the Facility. The two systems are Meditech for Fraser Health and the other is Cerner for BC Cancer. The Design-Builder will integrate with either or both where required as per the Agreement.

7.8.2.3 IM/IT Equipment in the Facility will be provided by the Authority unless noted otherwise in this Agreement. Refer to Appendix 1J [Equipment List IM/IT] for further details.

7.8.2.4 The Facility will include adequate space, communications infrastructure, wall backing, cable management, power and TOs with sufficient Data Drops for all Equipment and networks specified in this Agreement.

7.8.2.5 The Design-Builder's proposed systems will be proven technologies designed for use in modern acute care hospital applications.

7.8.2.6 The Design-Builder's proposed systems will use the latest version of equipment and software at the time of procurement.

7.8.2.7 The Design-Builder will not, without the Authority's prior agreement, install or use any operating system, application or database software that resides on, accesses or otherwise interacts with the Authority's network(s).

7.8.2.8 For every system and application that will be connected to the Authority network, the Design-Builder will initiate the Solution Assessment Process (SAP) by submitting a completed Software Assessment Form (SAF) to the Authority no later than one year prior to Substantial Completion. The purpose of the SAP is to review and assess systems and applications being provided by the Design-Builder under this Agreement for privacy, cyber security and architecture risks while also initiating technical design and build activities. The list of systems and applications that will undergo a review through the SAP will be submitted by the Design-Builder along with vendor, product and version description at the completion of the Design Development process.

7.8.3 Information Technology Guidelines

7.8.3.1 The Design-Builder will consult and collaborate with the Authority regarding the Design and Construction of the communications infrastructure, networks and systems and meet all the policies, standards and requirements stated in the documents forming this Agreement.

7.8.3.2 The Design-Builder will ensure that the Facility's communications infrastructure, networks and systems are not encumbered with outmoded materials, equipment, systems and processes.

7.8.3.3 Unless noted otherwise or approved by the Authority, the Design and Construction of the communications infrastructure, networks and systems will

strictly comply to the requirements identified herein and to the standards and specifications detailed in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications].

7.8.3.4 Servers and computing hardware associated with systems, applications or databases supplied and installed by the Design-Builder will be physically located in the Facility's Main Equipment Room (MER) unless otherwise approved by the Authority.

7.8.3.5 The Design-Builder supplied hardware will comply with latest version of PHSA's Vendor Supplied Hardware Guidelines.

7.8.3.6 The hardware and software configuration of all servers provided by the Design-Builder will be reviewed and approved by the Authority through the SAP.

7.8.3.7 Where technically possible, the Design-Builder will offer the opportunity to virtualize any of the servers it is providing under this Agreement and, where approved by the Authority, cover all costs associated with implementation of such virtualization.

7.8.3.8 The Design-Builder will undertake the Design and Construction of separate physical networks and systems in accordance with equipment vendor specifications and where the Authority's requirements in this Agreement dictate.

7.8.3.9 IP addressing for any system or network provided by the Design-Builder will be done in consultation with the Authority. IP addresses that are already in use by the Authority will not be used by the Design-Builder.

7.8.3.10 All communications infrastructure, networks and systems supplied and installed by the Design-Builder will:

7.8.3.10(1) Have high availability and redundancy that meets or exceeds the industry standards for use in and support of acute care hospital applications;

7.8.3.10(2) Be easy to operate, maintain and scale;

7.8.3.10(3) Support advancement towards an integrated Facility that continuously contributes to operational efficiencies through standardization, provision of a consistent end-user experience, improved workflow and access to information;

7.8.3.10(4) Be compliant with the Authority's information and network security and privacy policies, standards, procedures and guidelines;

7.8.3.10(5) Function in a safe manner and will not unduly impact Patient care and the operation of the Facility; and

7.8.3.10(6) Be robust and resilient enabling the network to remain operational during and after disasters or in the event of a major

network event such as a Core Network Equipment failure or fibre cut.

7.8.4 Design and Construction

7.8.4.1 The Design-Builder will at a minimum provide all design documents and Submittals as prescribed in Section 2.5.9.

7.8.4.2 The Design-Builder will at a minimum ensure that the illustrative and written content of its design documents and Submittals meets the requirements in the Section 2.5.9.

7.8.4.3 The Design-Builder will provide a roadmap for the completion of the Design three (3) months prior to the 30% submission that identifies the progression for each element identified in Section 2.5.9 across each phase of Design development. This roadmap will be updated and included with each submission providing the Authority with specific instruction as to what aspects of the Design are ready for Authority review. The Authority will provide an example of a design roadmap as a basis for the Design-Builder to develop a plan for this Project.

7.8.4.4 The Design-Builder will employ at minimum of one (1) locally based RCDD with at least ten (10) years of Design and Construction experience actively working on projects of similar complexity on Staff for the duration of the Project. The RCDD certification will be required to be active during the Project and the Design-Builder will offer proof of RCDD by submitting a copy of each certification to the Authority.

7.8.4.5 The RCDD will be directly responsible for producing the drawings and specifications for Division 27, reviewing shop drawings and other Submittals and for assisting on related technical issues as required.

7.8.4.6 The Design-Builder will provide a locally based audio-visual professional(s) who has at least ten (10) years experience in the Design and Construction of audio/video and VC systems and Crestron programming. The audio-visual professional(s) will be a Certified Technology Specialist with a CTS-D level of certification.

7.8.4.7 The Design-Builder will provide a qualified quality assurance inspector to verify that the Construction of communications infrastructure, networks and systems is completed in accordance with this Agreement and the Reviewed Drawings and Specifications. The quality assurance inspector will have at least ten (10) years of construction experience specific to installing and Commissioning of communications infrastructure, networks and systems similar in complexity to those required on this Project. The Design-Builder will provide evidence of this experience at the Authority’s request.

7.8.4.8 Records of all inspections and any associated quality reports and or deficiency lists will be signed and dated by the quality assurance inspector and provided to the Authority for review. The Authority will be notified by the Design-Builder of any inspection(s) and the Authority may elect to participate in these inspection(s) in addition to those inspections of the Work it will carry out independently.

7.8.4.9 The Design-Builder will establish an IM/IT coordination committee with the Authority. The IM/IT coordination committee will meet regularly (minimum once per month) through the duration of the Project to deal with a wide range of topics and issues concerning the Design and Construction of the communications infrastructure, networks, and systems in the Facility;

7.8.4.9(1) The first meeting of the IM/IT coordination committee will occur within 30 days of the Effective Date;

7.8.4.9(2) The Design-Builder will appoint and make available to the Authority an IM/IT coordination lead to chair the IM/IT coordination committee. The appointment of the IM/IT coordination lead will occur prior to the first meeting of the IM/IT coordination committee;

7.8.4.9(3) The IM/IT coordination lead will coordinate meeting dates, establish agendas, record minutes and maintain an action register throughout all phases of the Project; and

7.8.4.9(4) The IM/IT coordination lead will have at least ten (10) years of experience being actively engaged in managing the Design and Construction of communications infrastructure, networks, and systems similar in complexity to those required on this Project.

7.8.4.10 The following IM/IT coordination committee meeting principles will be adhered to:

7.8.4.10(1) Agendas with clearly stated objectives will be issued by the Design-Builder no later than five (5) Business Days in advance of the meeting;

7.8.4.10(2) Time allotted to the meeting aligns with the agenda put forward; and

7.8.4.10(3) The Design-Builder will take “live minutes” so that all parties can agree on the content of the minutes during the meeting. The Design-Builder will circulate the minutes immediately after the meeting to all parties and within three (3) Business Days the Design-Builder will circulate formal minutes for review. If the Authority notifies the Design-Builder of any errors in the minutes, the Design-Builder will correct such errors within three (3) Business Days of the Authority’s notice and formally resubmit the minutes.

7.8.4.11 The Design-Builder will:

7.8.4.11(1) Provide all other necessary and qualified project management, technical expertise and labour required to complete the Design and Construction of the communications infrastructure, networks and systems defined in this Agreement;

7.8.4.11(2) Supply and install all materials, equipment, services, and other items required to complete the Design and Construction of the communications infrastructure, networks, and systems in accordance with the requirements in this Agreement; and

7.8.4.11(3) Ensure that every aspect of the Construction of the communications infrastructure, networks and systems identified in this Agreement (including those tasks performed by IM/IT directly or indirectly through its contractors and suppliers) are identified and factored into the Design and Construction Schedule in a logical, efficient, collaborative, and seamless manner. Refer to the Design-Build Agreement, Schedule 11 [Design and Construction Schedule] for further requirements.

7.8.4.11(3)(a) These tasks will be reflected in every version of the Design and Construction Schedule submitted to the Authority from the Effective Date and throughout the duration of the Project. Refer to the Design-Build Agreement, Schedule 11 [Design and Construction Schedule] for further requirements.

7.8.4.11(3)(b) In addition to the minimum tasks and milestones identified in the Design-Build Agreement, Schedule 11 [Design and Construction Schedule], IM/IT will direct the Design-Builder to add additional tasks and milestones to the Design and Construction Schedule for any work (regardless of who performs it) that it deems directly relevant to the completion of its work in the Facility or on the Site;

7.8.4.11(3)(c) The Design-Builder will:

7.8.4.11.3.(c).1 Include all the tasks noted in the Design-Build Agreement, Schedule 11 [Design and Construction Schedule] and other tasks identified by IM/IT (as noted above) on a two week lookahead schedule that provides a detailed day-to-day plan of upcoming work identified on the Design and Construction Schedule; and

7.8.4.11.3.(c).2 Provide a report with each two week lookahead schedule that identifies any risks or unresolved issues that threaten the Design and Construction Schedule.

7.8.5 Procurement Process

7.8.5.1 If a system procured by the Design-Builder for use in the Facility represents a net new addition to the overall Authority's systems inventory, the Design-Builder will ensure that any contract it enters into for that system includes provisions

permitting assignment of the contract to the Authority on favourable terms and conditions as included in the contract between the Design-Builder and the system vendor;

7.8.5.2 The Design-Builder will ensure that all of its contracts for supply and installation of systems and equipment have:

7.8.5.2(1) A defined service level commitment that supports the Authority service level expectations; and

7.8.5.2(2) A privacy and security schedule that aligns with the British Columbia Freedom of Information and Protection of Privacy Act / Personal Information Protection and Electronic Documents Act legislation as applicable.

7.8.5.3 Applications, software modules and any related software supplied, installed, operated, or used by the Design-Builder will not interfere with the operation or performance of, or reduce the security or privacy of, any Authority applications or equipment.

7.8.6 Telecommunications Services

7.8.6.1 The Authority will coordinate with telecommunications carriers to provide CATV, data, voice, and cellular services to the Facility.

7.8.6.2 If the Design-Builder requires telecommunications services over and above what is being provided by the Authority either in terms of additional circuits or capacity, different service offerings or alternate connections and/or demarcation points to support its own temporary works and/or the solutions it is providing in the Facility, then the Design-Builder will be responsible for all associated costs and coordination with the telecommunications carriers.

7.8.6.3 Telecommunications carriers will bring their cabling into the Facility through the CPPS. The CPPS is an underground network of structures consisting of ducts and manholes that runs around the perimeter of the Facility and ties into the Facility. The Design-Builder is to refer to Appendix 1G [Campus Perimeter Pathway System Technical Specifications] for further detail.

7.8.7 Telecommunications Grounding and Bonding Infrastructure

7.8.7.1 The Telecommunications grounding and bonding infrastructure contains grounding bus bars, grounding conductors, bonding conductors, and connecting devices, including pressure connectors, lugs, clamps, or exothermic welds. These components provide a low impedance path to ground for stray voltages or spurious signals present on Telecommunications media and equipment.

7.8.7.2 The Design-Builder will undertake the Design and Construction of a complete Telecommunication grounding and bonding infrastructure in the Facility that meets the requirements detailed in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications].

7.8.8 Communications Pathway System

7.8.8.1 General Requirements

7.8.8.1(1) The Design-Builder will undertake the Design and Construction of a Communications Pathway System in the Facility and on the Site that includes cable tray, conduits, underground ducts, sleeves, pull and junction boxes, underground pre-cast service vaults and boxes and all other miscellaneous accessories and products required for the routing, segregation, organization, support and protection of Structured Cabling and Extra-low Voltage communications systems wiring. This includes manufactured dropouts, cable spools and pre-manufactured bends.

7.8.8.1(2) The Communications Pathway System in the Facility and on Site will:

7.8.8.1(2)(a) Support all Structured Cabling for IM/IT Equipment and networks as well as Extra-low Voltage communications systems wiring for BMS, security systems, RTLS systems, digital Wayfinding signage systems, public address, clock systems, CATV, intercoms, nurse call, clinical equipment systems, multimedia systems and DAS; and

7.8.8.1(2)(b) Provide continuous support for all cabling required between the connection point for the emergency radio in the Meeting Room – EOC and the additional passive and active components of the system that will be situated in the AHER and on the roof of the Facility.

7.8.8.1(3) The Authority reserves the right to refuse the installation of any Extra-low Voltage wiring in the Communications Pathways System that falls outside of the systems listed above. In the event permission is not granted, the Design-Builder will supply and install a separate pathway system.

7.8.8.1(4) The Design-Builder will install all Structured Cabling and Extra-low Voltage communications systems wiring in conduit and cable tray even in fully accessible ceilings. Non-continuous support systems such as J-hooks are not permitted except for the following noted exception - patch cords and cables installed above accessible ceilings for the express purpose of connecting to access points, external antennas or other wireless equipment can be supported using non-continuous support systems to allow flexibility for positioning.

7.8.8.1(5) Where an access point is located in a different room or area than the TO it is designated to connect to and where the ceilings are consistently accessible along the entire route between the access point and the TO, the Design-Builder will supply and install sleeves and firestopping (regardless of the fire rating of the wall) in any full-height wall to enable patch cords to be installed.

7.8.8.1(6) Patch cords and cables installed in inaccessible or exposed ceilings for the express purpose of connecting to access points, external antennas or other wireless equipment will be installed in conduit unless otherwise approved by the Authority.

7.8.8.1(7) The Design-Builder will coordinate the Design and Construction of the Communications Pathway Systems detailed herein with:

7.8.8.1(7)(a) The Facility's architectural and structural elements as well as all other systems including mechanical, electrical, PTS, etc. such that capacity and access to Communications Pathway Systems are not compromised; and

7.8.8.1(7)(b) Site services and Utilities, landscaping, earthworks and all other exterior alterations and improvements including all components and requirements of the storm sewer system such as pipes, manholes, flow control manholes, oil-grit separators, and detention tanks as described in Section 4.15.6.

7.8.8.1(8) The Design-Builder will employ clash avoidance and detection processes, techniques, strategies and work practices throughout all Project phases to ensure other elements do not conflict with the Communications Pathway System and its associated clearances as set out in this Agreement.

7.8.8.1(9) The Design-Builder will meet the requirements stated herein and in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] when undertaking the Design and Construction of the Communications Pathway System.

7.8.8.1(10) The Design-Builder will undertake the Design and Construction of the Communications Pathway System to:

7.8.8.1(10)(a) Provide ease of access. All components of the Communications Pathway System will not be obstructed and be accessible by a maximum 2500 mm tall stepladder where the maximum safe reaching height will be considered to be no more than 3657 mm when standing no higher than 1823 mm off the ground;

7.8.8.1(10)(b) Minimize occupant disruption and not compromise the Facility's operation both clinically and in general when the Communications Pathway System is accessed. Communications cable tray and the backbone Communications Pathway System will not be routed through any of the Facility's rooms unless otherwise approved by the Authority; and

7.8.8.1(10)(c) Provide capacity for expansion and change.

7.8.8.1(11) The Design-Builder will ensure the Communications Pathway System is:

7.8.8.1(11)(a) Isolated from sources of EMI as well as high magnetic fields, radiation, and high temperatures;

7.8.8.1(11)(b) Installed at parallel or right angles to building lines in order to keep cable run length at an absolute minimum;

7.8.8.1(11)(c) Installed without burrs, sharp edges, or projections;

7.8.8.1(11)(d) Installed with sweeping bends in accordance with TIA standards;

7.8.8.1(11)(e) Inaccessible to Patients and the general public; and

7.8.8.1(11)(f) Not routed through Electrical or Mechanical Rooms except for the express purpose of servicing these rooms.

7.8.8.1(12) The Design-Builder will:

7.8.8.1(12)(a) Fire stop Communications Pathway System and cable penetrations of any kind resulting from the installation of Structured Cabling and Extra-low Voltage communications systems wiring using approved fire stop systems as listed under Appendix 1M [PHSA Communications Infrastructure Standards and Specifications]. This applies to all types of full-height walls for the purpose of either restoring the fire rating of the wall, infection control and or acoustic reasons;

7.8.8.1(12)(b) Bond and ground the Communications Pathway System and other infrastructure as set out in Section 7.8.8;

7.8.8.1(12)(c) Identify the Communications Pathway System as per the Authority's standard;

7.8.8.1(12)(d) For each pull box used for outside plant and intra-building backbone cables, provide and install a lamacoid label with a unique identifier to the exterior of the cover along with another lamacoid label applied to the inside of the cover identifying the origin and destination of each connecting conduit. Minimum size lettering is 25 mm in height;

7.8.8.1(12)(e) For each pull box used for outside plant and intra-building backbone cables, provide lockable hinged split covers; and

7.8.8.1(12)(f) Ensure that the Communications Pathways System is constructed to compensate for building movement when crossing expansion joints in the Facility.

7.8.8.2 Communications Cable Tray

7.8.8.2(1) The Design-Builder will undertake the Design and Construction of the communications cable trays and associated components in the Facility for Structured Cabling and Extra-low Voltage communications systems wiring.

7.8.8.2(2) The types of communications cable tray are as follows:

7.8.8.2(2)(a) Basket cable tray is to be supplied and installed:

7.8.8.2.2.(a).1 In all the Facility's hallways and corridors unless otherwise approved by the Authority;

7.8.8.2.2.(a).2 In the MER and TRs where it will be installed around the perimeter walls and extended over equipment racks and server cabinets; and

7.8.8.2.2.(a).3 For use as vertical risers to provide cable strain relief.

7.8.8.2(2)(b) Chatsworth ladder tray is to be supplied and installed in the EF Room and the AHER where it will be installed around the perimeter walls and extended over equipment racks; and

7.8.8.2(2)(c) Totally enclosed cable tray will be used on parking levels or other spaces exposed to the public. All enclosed cable tray will come with covers that do not exceed 1829 mm (six (6) feet) in length.

7.8.8.2(3) The size for all types of communications cable tray will be:

7.8.8.2(3)(a) Minimum depth will be 100 mm; and

7.8.8.2(3)(b) Minimum width will be 610 mm.

7.8.8.2(4) The fill ratio for communications cable tray of any size is to be a maximum of 50 percent of the total interior area (interior width x depth) at Substantial Completion of the Project. The remaining 50 percent of the cable tray's interior area is reserved for future growth capacity.

7.8.8.2(5) When a communications cable tray interfaces with a group of 103 mm sleeves or conduits, its width and or height will be adjusted above the minimum dimensions where necessary to encompass all sleeves and conduits in the group.

7.8.8.2(6) The Design-Builder will maintain the following clearances when designing and installing communications cable tray in the Facility:

7.8.8.2(6)(a) A minimum of 1220 mm from any motor;

7.8.8.2(6)(b) A minimum of 50 mm from light fixtures (150 mm if the lighting fixture is fluorescent);

7.8.8.2(6)(c) A minimum of 150 mm from any source of EMI;

7.8.8.2(6)(d) A minimum of 305 mm of continuous clearance on at least one side of a communications cable tray along its entire length wherever it is installed in the Facility to enable installation and maintenance of Structured Cabling and Extra-low Voltage communications systems wiring;

7.8.8.2(6)(e) Provide a minimum of 150 mm above, 150 mm in front, and 75 mm below of clearance from piping, conduits, ductwork, etc.;

7.8.8.2(6)(f) The bottom of the communications cable tray will be between 200 mm and 305 mm above an accessible finished ceiling; and

7.8.8.2(6)(g) Communications cable tray will be mounted at 2700 mm AFF in all Communications Rooms.

7.8.8.2(7) The Design-Builder will supply and install manufactured cable dropouts where cables exit and enter all horizontal communications cable trays in the Facility;

7.8.8.2(7)(a) Tray manufacturer's cable dropout fittings that clip over the side of the communications cable tray without the need to cut into the cable tray will be provided; and

7.8.8.2(7)(b) Design-Builder will:

7.8.8.2.7.(b).1 Undertake the Design and Construction of the communications cable tray in a manner that enables the cable dropouts be placed to empty cables directly and fully into vertical cable management channels, GigaBIX cable, management modules and other sections of communications cable tray; and

7.8.8.2.7.(b).2 Supply and install dropout fittings on the communications cable tray every 1200mm along all walls at a minimum and at the rear section of every vertical manager in each Communications Room. Additional dropout fittings will be added where necessary to support Structured Cabling and Extra-low Voltage wiring connecting to all equipment and panels mounted on the walls of Communications Rooms.

7.8.8.2(8) Where required by the Authority to segregate cables for different networks or systems, the Design-Builder will supply and install dividers inside the communications cable tray. Where dividers are used, fill calculations will apply to each divided section of the communications cable tray.

7.8.8.3 Communications Conduits and Sleeves

7.8.8.3(1) Sleeves:

7.8.8.3(1)(a) Where communications cable trays are required to pass through any full-height fire rated walls or floors, the Design-Builder will supply and install 103 mm Hilti speed sleeves in the Facility. Where communications cable trays are required to pass through any full-height non rated walls, the Design-Builder will supply and install 103 mm Hilti smoke and acoustic sealing sleeves.

7.8.8.3.1.(a).1 CP-653-103 mm Hilti firestop speed sleeves in fire rated walls and floors; and

7.8.8.3.1.(a).2 CS-SL SA 103 mm Hilti smoke and acoustic speed sleeve for all other non-fire rated penetrations.

7.8.8.3(1)(b) Where a standard-length Hilti speed sleeve will not work due to the thickness of a floor slab or wall, the Design-Builder will employ Hilti Extended Speed Sleeves. If the thickness of a floor slab or wall does not permit the use of Hilti Extended Speed Sleeves then the Design-Builder will consult with the

Authority to find an alternate and equivalent solution.

7.8.8.3(1)(c) Quantity of eight (8) 103 mm Hilti speed sleeves will be supplied and installed will accommodate the capacity of the 100 mm x 610 mm communications cable tray. If cable tray of greater capacity is required to meet cable fill and future growth requirements specified herein, the quantity of Hilti speed sleeves to be provided will be increased above the minimum of eight (8) to meet the capacity of the enlarged cable tray.

7.8.8.3(1)(d) The communications cable tray will end 600 mm from any group of horizontal 103 mm Hilti speed sleeves passing through a wall.

7.8.8.3(1)(e) Unobstructed clearance will be provided around a group of 103 mm Hilti speed sleeves passing through a wall for serviceability. This includes the provision of 450 mm of unobstructed clearance from the side of any group of 103 mm Hilti speed sleeves.

7.8.8.3(1)(f) The Design-Builder will use the Hilti ganging wall plate when installing two (2) or more Hilti speed sleeves.

7.8.8.3(1)(g) For backbone riser sleeves, the Design-Builder will use a combination of Hilti CP 680 cast-in-place fire stop devices c/w CP-653-103 mm firestop speed sleeves inserted into them. Refer to Section 7.8.8.4 for the quantity of Hilti speed sleeves to be supplied and installed in the Facility’s backbone risers.

7.8.8.3(2) Conduits

7.8.8.3(2)(a) The Design-Builder will undertake the Design and Construction of all conduits and associated components in the Facility for Structured Cabling and Extra-low Voltage communications systems wiring.

7.8.8.3(2)(b) Conduits will be EMT or rigid steel or PVC where permissible.

7.8.8.3(2)(c) Regardless of size, each conduit will have a pull string inserted and tied off at each end.

7.8.8.3(2)(d) The Design-Builder will not encase conduits that will be used for Structured Cabling or Extra-low Voltage wiring in concrete unless such installation is permitted by BC Building Code and approved by the Authority as being necessary to achieve a concealed installation. In each instance where the Authority has approved the encasement of conduit in concrete, the Design-Builder will:

7.8.8.3.2.(d).1 Use rigid PVC conduit;

7.8.8.3.2.(d).2 Install conduit is a consistent and uniform manner;

7.8.8.3.2.(d).3 Take photographs of the conduit system before concealment; and

7.8.8.3.2.(d).4 Provide a 3D laser scan of the floor mapping out the conduit runs using clear points of reference prior to the concrete being poured. Import the data from this scan into the Revit model so the Authority can have an accurate as-built routing and location of conduits in the slab and associated documentation and images as noted above are captured in the as-built documentation and BIM Model.

7.8.8.3(2)(e) The Design-Builder will individually connect each TO in the Facility to the nearest communications cable tray with a minimum 27 mm conduit:

7.8.8.3.2.(e).1 In the case of basket tray, conduits will terminate in a bonding type bushing.150 mm above the tray's sidewall;

7.8.8.3.2.(e).2 In the case of totally enclosed cable tray, conduits will be terminated in the tray's sidewall; and

7.8.8.3.2.(e).3 In the case of Chatsworth ladder tray, conduits will be attached to the edge of the tray with a bracket designed for this purpose.

7.8.8.3(2)(f) All conduit will be sized to not exceed a 28 percent fill ratio with no more than two 90º bends. There can be no more than two 90º bends between pull boxes.

7.8.8.3(2)(g) Sections between pull points will not exceed 30 m. In conduit runs that total more than 30 m, insert pull boxes so that no segment between pull points exceeds the 30m limit.

7.8.8.3(2)(h) Pull boxes will be placed in straight sections of conduit and will not be used in lieu of a bend.

7.8.8.3(2)(i) All conduits with an internal diameter of 50 mm or less will have sweeping bends with inside radius being no less than six (6) times the internal diameter of the conduit. For conduit 50 mm or larger, the bend radius will be no less than ten (10) times the internal conduit diameter. Fittings such as LB type joints are not acceptable.

7.8.8.3(3) Where conduits and sleeves stub through the floor of a Communications Room, the Design-Builder will include a minimum 150 mm high concrete curb or suitable alternative barrier to prevent flooding of the floor below.

7.8.8.3(3)(a) Provide a waterproof membrane within the area contained by the curb or suitable alternative barrier as specified in Section 09 67 70.

7.8.8.3(3)(b) The curb or other suitable alternative containment barrier will not infringe upon the one (1) metre working clearances specified in Sections 7.8.9.9.6.(d).4 and 7.8.9.10(2)(c).

7.8.8.3(3)(c) Fire stopping is not acceptable for a waterproof membrane.

7.8.8.4 Backbone Communications Pathway System

7.8.8.4(1) The Design-Builder will undertake the Design and Construction of a backbone Communications Pathway System in the Facility that provides two physically diverse routes between:

7.8.8.4(1)(a) The MER and each individual TR; and

7.8.8.4(1)(b) The MER and the EF Room.

7.8.8.4(2) The primary and diverse routes will be separated by a minimum of twenty (20) metres along the entire route between:

7.8.8.4(2)(a) The MER and each individual TR; and

7.8.8.4(2)(b) The MER and the EF Room.

7.8.8.4(3) The Design of the primary and diverse routes will:

7.8.8.4(3)(a) Ensure that a loss of single TR will not impact connections between the MER and any other TR in the Facility;

7.8.8.4(3)(b) Minimise the risk to service continuity to any Communications Rooms resulting from fire, flood,

adverse weather, seismic events, construction activities and vandalism;

7.8.8.4(3)(c) Be routed away from Patient rooms or other rooms or areas deemed by the Authority to be clinically sensitive;

7.8.8.4(3)(d) Not transit through or enter into the EF Room unless where noted in the Agreement; and

7.8.8.4(3)(e) Not transit through underground parking levels unless for the express purpose of serving TRs on the parking levels.

7.8.8.4(4) In the primary and diverse backbone risers connecting the MER to TRs on each floor, 103 mm Hilti CP-653 firestop speed sleeves will be the primary solution employed. The Design-Builder will supply and install a minimum of 4 x 103 mm Hilti CP-653 firestop speed sleeves in the risers adding one (1) additional 103 mm Hilti CP-653 firestop speed sleeve for every two additional TRs serviced from a MER. In this configuration, the quantity of sleeves provided will be at the maximum number entering the MER and will decrease in number to a minimum of four (4) at the last TR in the primary and diverse backbone riser. When Hilti CP-653 firestop speed sleeves cannot be employed, the Design-Builder will provide an alternative pathway and firestopping system that will provide an equivalent fill capacity to 103 mm Hilti CP-653 firestop speed sleeves such that the capacity of the riser system is not reduced at any point from the MER to the last TR.

7.8.8.4(5) To support the extension of outside plant cables between the EF Room and MER, the Design-Builder will also undertake the Design and Construction of four (4) 103 mm EMT conduits between these two rooms. Two (2) of these 103 EMT conduits will follow a diverse and separate path from the other two maintaining 20m of separation.

7.8.8.4(6) The Design-Builder will undertake the Design and Construction of two (2) 103 mm EMT conduits from the Entrance Facility Room to a TR that is connected to a diverse riser that services all floors of the Facility. These conduits will be designed to maintain a minimum of 20m separation from the MER and any primary backbone riser along the entire route between the Entrance Facility Room and the TR connected to the diverse riser.

7.8.8.4(7) Four (4) 103 mm EMT conduits will be supplied and installed by the Design-Builder to connect the Antenna Headend Equipment Room to the primary backbone communications riser system.

7.8.8.5 Rooftop Communications Pathway System

7.8.8.5(1) The Design-Builder will undertake the Design and Construction of a rooftop Communications Pathway System that will provide contiguous and continuous support of cabling installed from the AHER to antennas and wireless equipment placed on the roof of the Facility.

7.8.8.5(2) The composition of the rooftop Communications Pathway System in terms of routing, type and quantities of pathways to be supplied and installed by the Design-Builder will meet the Authority's and Telecommunications carriers' requirements for the various types of:

7.8.8.5(2)(a) Wireless systems planned for the roof of the Facility; and

7.8.8.5(2)(b) Fire ratings associated with the cables to be installed between the Antenna Headend Room and antennas and wireless equipment placed on the roof of the Facility.

7.8.8.5(3) The Design of the rooftop Communications Pathway System will be such that the pathways will be installed below the roof deck and rise up to the roof level through multiple roof penetration housings positioned in close proximity to where rooftop antennas and wireless equipment are to be located.

7.8.8.5(4) Rooftop penetration housings will:

7.8.8.5(4)(a) Accommodate the number of conduits and cables required at each location;

7.8.8.5(4)(b) Be lockable;

7.8.8.5(4)(c) Be installed with a curb;

7.8.8.5(4)(d) Meet all requirements for resistance to wind, water penetration and snow loads applicable to the local climatic conditions;

7.8.8.5(4)(e) Be made of suitable materials for an outside environment such as aluminum with a UV protected powder coated finish, stainless steel fasteners and gasketed lid;

7.8.8.5(4)(f) Meet building envelope and energy requirements stated in this Agreement;

7.8.8.5(4)(g) Be large enough to accommodate cable bend radiuses and provide the space and access for installation and maintenance of cables; and

7.8.8.5(4)(h) Come with watertight exit seals for conduits and cables and all other accessories required for a turnkey solution.

7.8.8.5(5) To meet the requirement to provide contiguous and continuous support of cabling, the Authority will permit the Design-Builder to extend the rooftop Communications Pathway System for short distances on the roof from penetration housings to antenna and wireless equipment locations;

7.8.8.5(5)(a) Wherever possible, these short extensions will be kept off the roof deck and attached to structures such as the parapet wall; and

7.8.8.5(5)(b) Where attachment to structure is not possible, these short extensions of the rooftop Communications Pathway System will be supported off the roof deck and elevated at a height determined in consultation with the Authority through the Review Procedure using a non-penetrative support system that is UV and wind resistant, rust proof and can support the snow load applicable to the local climatic conditions. Where this solution is employed, the Design-Builder will also be required to supply and install non-penetrative free-standing step over systems to ensure safe and free movement over the rooftop Communications Pathway System as determined in consultation with the Authority through the Review Procedure.

7.8.8.5(6) For all pathways that are exposed to the outside environment, the Design-Builder will use suitable materials such as aluminum or hot galvanized steel and include expansion joints at regular intervals to ensure the rooftop Communications Pathway System responds appropriately to the wide range of temperatures that exist on rooftops.

7.8.8.6 Surface Raceways, Furniture and Millwork

7.8.8.6(1) Communications Pathway Systems in the Facility will be concealed; however, surface Raceways may be installed in unique circumstances as approved by the Authority.

7.8.8.6(2) Finger duct or similar product mounted on the plywood walls of Communications Rooms to manage cable entering wall mount panels will be a minimum dimension of 105 mm deep x 159 mm wide. Maximum fill capacity of this surface Raceway will not exceed 40 percent.

7.8.8.6(3) All types of furniture, including systems furniture and Millwork supplied and installed by the Design-Builder will be equipped with:

7.8.8.6(3)(a) Wiring channels sized according to TIA standards with a maximum 40 percent fill ratio after all the cabling is installed;

7.8.8.6(3)(b) Metallic barriers to isolate electrical wiring from Structured Cabling or other types of Extra-low Voltage communications systems wiring where joint wiring channels are provided;

7.8.8.6(3)(c) TIA compliant furniture cut-outs;

7.8.8.6(3)(d) Manufactured vertical and horizontal wire management solutions to safely secure, manage and hide power and Structured Cabling including work area patch cords. The Design-Builder is to integrate manufactured (rather fabricated) cable management solutions into the Design and Construction of Millwork such as the Snaketray Cable Management system;

7.8.8.6(3)(e) A means to attach a cable lock or similar solution to secure equipment and devices where required by the Authority; and

7.8.8.6(3)(f) Grommets. Grommets will:

7.8.8.6.3.(f).1 Cover the interior of the core hole such that any porous material such as plywood inside the core hole is not exposed;

7.8.8.6.3.(f).2 Have rounded or smooth edges at both ends (work surface and underside of work surface) to protect cables from wearing on any sharp edges;

7.8.8.6.3.(f).3 Be sealed to the work surface such that liquids and fluids cannot leak between the grommet and the core hole cut for the grommet;

7.8.8.6.3.(f).4 Be completely sealed such that no liquids or fluids can leak between the parts that comprise the grommet assembly;

7.8.8.6.3.(f).5 Be comprised of metal; and

7.8.8.6.3.(f).6 Have a removable cap that covers the majority of the opening when not in use.

7.8.8.7 Campus Perimeter Pathway System

7.8.8.7(1) Refer to Appendix 1G [Campus Perimeter Pathway System Technical Specifications] for further details.

7.8.8.8 Underground Communications Pathway Systems

7.8.8.8(1) The Design-Builder will undertake the Design and Construction of a dedicated underground Communications Pathway System to connect the Facility to:

7.8.8.8(1)(a) The designated locations on the Site for the Mobile Medical Unit (MMU). A minimum of two (2) 50 mm communication ducts will be installed to each service pedestal. Provide additional ducts for power;

7.8.8.8(1)(b) All Wi-Fi access points, RTLS components, security devices and other equipment and devices requiring network connectivity on the Site; and

7.8.8.8(1)(c) Each new street light pole placed within the property boundary.

7.8.8.8(2) The underground Communications Pathway System will be designed to support the initial and anticipated Telecommunications needs. In determining the total number and size of ducts required, the Design-Builder will consider:

7.8.8.8(2)(a) Growth;

7.8.8.8(2)(b) Difficulty of adding pathways in the future; and

7.8.8.8(2)(c) Type and size of cable to be installed.

7.8.8.8(3) All underground ducts will be:

7.8.8.8(3)(a) PVC DB2, orange in colour;

7.8.8.8(3)(b) Connected to the nearest communications cable tray inside the Facility;

7.8.8.8(3)(c) All ducts will be sized to not exceed a 28 percent fill ratio with no more than two 90º bends. There can be no more than two 90º bends between service boxes;

7.8.8.8(3)(d) Properly drained in accordance with building and electrical codes;

7.8.8.8(3)(e) Checked by pulling a mandrel, sized for each duct from both directions to remove obstructions;

7.8.8.8(3)(f) Cleaned by passing a wire brush mandrel and/or rubber duct swab, or alternative as approved by the Authority, of appropriate size back and forth until all foreign materials and water are removed;

7.8.8.8(3)(g) Separated from electric power ducts by a minimum of 300 mm; and

7.8.8.8(3)(h) Installed with a minimum of one (1) metre of cover from the top of the duct bank to grade.

7.8.8.8(4) The Design-Builder will place a mule tape in all underground ducts. The mule tape will be Greenlee 4435 or alternative as approved by the Authority.

7.8.8.8(5) Supply and install a 152 mm wide warning marker tape in the trench on the centreline of each duct approximately 300 mm below final grade.

7.8.8.8(6) The Design-Builder will supply and install a precast service box when any section of duct has more than 180º of bends.

7.8.8.8(6)(a) Pre-cast service box will support a wheel loading of MS 200;

7.8.8.8(6)(b) Ducts will enter and exit service boxes in a straight-line method;

7.8.8.8(6)(c) Service box lid will have the word “Communications” in permanent raised or stamped letters; and

7.8.8.8(6)(d) Service box will be drained in accordance with the requirements stated in Appendix 1G [Campus Perimeter Pathway System Technical Specifications].

7.8.8.8(7) Underground ducts provided to the designated locations for the MMUs will be terminated in service pedestals that are supplied and installed by the Design-Builder. Each service pedestal will:

7.8.8.8(7)(a) Be co-located in the designated MMU parking areas and positioned to ensure the connections to the MMU trailers are kept as short as possible;

7.8.8.8(7)(b) Have a minimum NEMA rating of 4, and all aspects of its construction will be durable and resistant to corrosion and UV radiation as well as to vandalism and tampering;

7.8.8.8(7)(c) Equipped with an integral means for sealing and for using sealing fittings and connectors. This also applies to each internal compartment, pathway and cable entry point;

7.8.8.8(7)(d) Come with lockable, Tamper and Vandal Resistant access doors that are weatherproof and provide easy access to all communications and power connections;

7.8.8.8.7.(d).1 Access doors will be provided both for making connections as well as to install and maintain internal wiring, components and equipment; and

7.8.8.8.7.(d).2 Access doors will be shielded from direct exposure to rainwater.

7.8.8.8(7)(e) Be monitored by the Facility's security system using a camera or remote alarm;

7.8.8.8(7)(f) Be protected by bollards where there is a risk to damage from vehicles, and/or snow removal equipment; and

7.8.8.8(7)(g) Be equipped with sufficient internal pathways and compartments to segregate the different services being provided at each location;

7.8.8.8.7.(g).1 Compartments will be sized according to purpose. For communications, the compartments will need to come with internal wire management and be sized for the splicing, termination and connection of fiber and UTP cabling as well as for the installation of a TGB, media converters and surge protection devices;

7.8.8.8.7.(g).2 Compartments will come with a connection plate or divider that separates the connection point from the wiring and equipment in the back of the compartment. The connection plate will be removable and capable of supporting and stabilizing a variety of different industrial weatherproof fittings and connectors for communications and power; and

7.8.8.8.7.(g).3 The Design-Builder is to consult with the Authority and provide the fittings and connectors required for each service.

7.8.9 Communications Rooms

7.8.9.1 The types of Communications Rooms that will be required in the Facility include:

7.8.9.1(1) EF Room;

7.8.9.1(2) MER;

7.8.9.1(3) TR; and

7.8.9.1(4) AHER.

7.8.9.2 If a requirement in this Agreement uses the term “Communications Room” that requirement will apply to all the room types listed above.

7.8.9.3 Entrance Facility Room

7.8.9.3(1) The telecommunications carriers, e.g. Telephone Company, will demarcate and deliver their services in the EF Room.

7.8.9.3(2) The point of demarcation is analogous to a "border" between equipment and facilities owned by the telecommunications carriers and similar infrastructure which is owned by the Authority.

7.8.9.3(3) The Design-Builder will meet the requirements stated herein and in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] when undertaking the Design and Construction of the Entrance Facility Room.

7.8.9.3(4) The EF Room will house:

7.8.9.3(4)(a) Terminations of copper and optical fibre cables, coming from outside the building, owned by the telecommunications carriers; and

7.8.9.3(4)(b) Electronic equipment owned by the telecommunications carriers that is required to provide their services to the Facility.

7.8.9.3(5) The EF Room will be:

7.8.9.3(5)(a) Located at a minimum elevation of 6.0 m and not situated on any of the parking levels of the Facility;

7.8.9.3(5)(b) Separated from the MER by a minimum distance of 20 m, noting that the distance between the two

rooms cannot exceed 50 m without Authority approval;

7.8.9.3(5)(c) Located in a different architectural fire-compartment than the MER; and

7.8.9.3(5)(d) A minimum size of 4938 mm by 7932 mm capable of housing up to eleven (11) telecommunications carriers equipment racks (711 mm wide x 914 mm deep), a single equipment rack allocated to the Authority's equipment plus space for vertical cable managers between each equipment rack and at the end of the line-up.

7.8.9.3(6) The Design-Builder will connect the EF Room to the CPPS. Refer to Appendix 1G [Campus Perimeter Pathway System Technical Specifications] for further details.

7.8.9.3(7) The Design-Builder will connect the EF Room to the MER through the backbone Communications Pathway System. Refer to Section 7.8.8.4 for further details.

7.8.9.4 Main Equipment Room

7.8.9.4(1) The primary functions of the MER are to:

7.8.9.4(1)(a) House core Telecommunications equipment, connecting hardware, cables, pathways, splice closures, grounding and bonding facilities and appropriate protection apparatus;

7.8.9.4(1)(b) Function as a TR housing horizontal terminations for a portion of the Facility floorplate where it resides. Refer to Section 7.8.9.5 for the function and requirements associated with a TR;

7.8.9.4(1)(c) Contain the Main Cross-connect or Intermediate Cross-connects used in the backbone cabling hierarchy; and

7.8.9.4(1)(d) Provide for the routing of the equipment cabling, and or cords, from the Main cross-connect or Intermediate cross-connect to the Telecommunications equipment.

7.8.9.4(2) The Design-Builder will meet the requirements stated herein and in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] when undertaking the Design, Construction and fit out of the MER.

7.8.9.4(3) The MER will be:

7.8.9.4(3)(a) Located at a minimum elevation of 6.0 m and not situated on any of the parking levels of the Facility;

7.8.9.4(3)(b) A minimum size of 12250 mm wide x 8880 mm in length;

7.8.9.4(3)(c) Equipped with seven equipment racks and seven server cabinets; and

7.8.9.4(3)(d) Located adjacent to the corridors or hallways on at least two sides in order to facilitate a minimum of two separate and physically distant connections (by 103 mm Hilti speed sleeves) to the communications cable tray in accordance with the accessibility requirements of the Communications Pathway System.

7.8.9.4(4) When the Design-Builder sizes the MER, it must not only entail providing physical space for future installation of additional racks and server cabinets, the fully-sized room, must be fully fitted out with all necessary architectural, mechanical, electrical and communications infrastructure to support additional future communications equipment (i.e. racks, cable trays, plywood as an example) but excluding the power outlets required for the additional racks and cabinets in the space. The Design-Builder must also provide dampers that will be placed in the areas that are not currently populated with racks.

7.8.9.4(4)(a) The Design and Construction of the Centralized IM/IT UPS and vital distribution and mechanical systems servicing the MER will be sized for 14 racks and 14 server cabinets.

7.8.9.4(5) The Design-Builder will connect the MER to the CPPS. Refer to Appendix 1G [Campus Perimeter Pathway System Technical Specifications].

7.8.9.4(6) The Design-Builder will connect the MER to the EF Room, each TR and the AHER in the Facility through the backbone Communications Pathway System. Refer to Division 27, Section 7.8.8 for further details.

7.8.9.5 Telecommunications Rooms (TRs)

7.8.9.5(1) The TR is the critical point between the work area and the MER.

7.8.9.5(2) The TR’s connection to the work area is achieved through the horizontal pathways and cabling subsystem.

7.8.9.5(3) The functions of a TR are to:

7.8.9.5(3)(a) House the terminations of horizontal and backbone cables to connecting hardware; and

7.8.9.5(3)(b) Provide a controlled environment to house Telecommunications equipment, connecting hardware and splice closures.

7.8.9.5(4) The systems that are permissible by the Authority to be housed within a TR include IM/IT networks, security systems, RTLS based locating systems, public address, clock systems, CATV, intercoms, nurse call, clinical equipment systems, multimedia systems, and DAS. Any non-IM/IT system panels and equipment installed on walls or in equipment racks in a TR will be labelled to identify the system it belongs to.

7.8.9.5(5) The Authority reserves the right to refuse the installation of any equipment and its associated infrastructure in a Communications Room that falls outside of the systems listed above. In the event permission is not provided, the Design-Builder will be obligated to provide suitable alternative locations in the Facility to house equipment and its associated infrastructure for systems outside the defined list.

7.8.9.5(6) The Design-Builder will meet the requirements stated herein and in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] when undertaking the Design and Construction and fit out of the TRs.

7.8.9.5(6)(a) The minimum size of a TR is 4000 mm wide x 7700 mm in length and it will house four (4) Authority equipment racks. The minimum size of TRs located on the parking levels and Energy Centre of the Facility is 4000 mm wide x 4900 mm in length and will house two (2) Authority equipment racks;

7.8.9.5(6)(b) TRs will be located on the same floor as the work area they serve unless otherwise approved by the Authority. Where approval is provided, the Authority, acting reasonably, will stipulate the minimum requirements for Communications Pathway System required to support horizontal cabling to the additional floors being serviced by a TR;

7.8.9.5(6)(c) TRs will be located adjacent to the corridors or hallways on at least two sides in order to facilitate a

minimum of two separate and physically distant connections (by 103 mm Hilti speed sleeves) to the communications cable tray in accordance with the accessibility requirements of the Communications Pathway System. Where adjacency to corridors on at least two sides is not possible, the room depth will be extended to a 4050 mm and a minimum of two separate and physically distant (minimum 4500 mm) connections to the communications cable tray will be provided from a single corridor;

7.8.9.5(6)(d) The calculation of available spare capacity for growth will be based on an accurate depiction of the quantity and dimensions of all components identified in the layouts of each TR provided in the Design of the Facility. To validate dimensions, the Design-Builder will provide shop drawings of each component to be installed in a TR at the Authority's request;

7.8.9.5.6.(d).1 Useable wall mounting area does not include wall space above 2700 mm AFF or wall space that, if used, would compromise operational clearances; and

7.8.9.5.6.(d).2 Refer to Section 2.5.9.2.20.(c).5 for further detail concerning the definition and calculation of useable wall space.

7.8.9.5(7) The Design-Builder, where necessary, will enlarge the size of the TRs above the minimum dimension specified to provide additional equipment rack and wall space to meet the requirements of all systems housed within a given TR.

7.8.9.5(8) Unless otherwise approved by the Authority, the number of TRs required in the Facility is determined by:

7.8.9.5(8)(a) The 80 m (262') maximum Permanent Link length of cable required to reach the extremities of a building's interior space for designed and future TOs; and

7.8.9.5(8)(b) The density of Data Drops in specific work areas and spaces; and

7.8.9.5(9) The Design-Builder will connect each TR in the Facility to the MER. Refer to Division 27, Section 7.8.8 for further details.

7.8.9.5(10) The Design-Builder will ensure all horizontal and backbone communication cabling for a given floor or area terminates at a TR.

7.8.9.5(11) Subject to compliance with the maximum Permanent Link, the maximum quantity of Data Drops per TR is 1,440. If the number of Data Drops exceeds this quantity, the TR will need to be increased in size above the stated minimum dimensions to accommodate additional equipment racks.

7.8.9.6 Antenna Headend Equipment Room

7.8.9.6(1) The AHER will accommodate all radio frequency based (RF) special systems and headend equipment racks required for site wide wireless systems (such as clock GPS, Facilities and Security 2-way radio systems, SAT Com, ECOMM 911) intra-site wireless communications systems and Telecommunications carrier macro cellular antenna systems. Node B equipment required for the DAS will not be housed in this room. Refer to Section 7.8 Communications (Division 27) for further details relating to the DAS.

7.8.9.6(2) The Design-Builder will locate the AHER on the rooftop or penthouse of the Facility in close proximity to antenna locations.

7.8.9.6(2)(a) The minimum size of the AHER is 4500 mm wide x 8000 mm in length; and

7.8.9.6(2)(b) The AHER will be capable of housing nine telecommunications carriers' equipment racks (provided by others) and one (1) Authority equipment rack that will be allocated for site wide wireless systems. The layout and structural design of the room along with all the infrastructure to be provided in the AHER as per this Agreement (pathways, mechanical, electrical, etc.) will allow for the telecommunications carriers' equipment racks to be organized into three separate line-ups consisting of:

7.8.9.6.2.(b).1 One (1) 44 RU two post rack with a width of 679 mm;

7.8.9.6.2.(b).2 Two (2) 44RU two post racks with a width of 578 mm;

7.8.9.6.2.(b).3 Future space to accommodate one additional equipment rack with a width up to 679 mm; and

7.8.9.6.2.(b).4 127 mm gap between each equipment rack for vertical cable management.

7.8.9.6(3) The Design-Builder will connect the AHER to the backbone and rooftop Communications Pathway System as prescribed in Section 7.8.8.

7.8.9.7 Design Requirements

7.8.9.7(1) All requirements stated in this Section apply to all the types of Communications Rooms unless noted otherwise.

7.8.9.7(2) Architectural and Structural

7.8.9.7(2)(a) The Design-Builder will design Communications Rooms with expansion and maintenance as the foremost thought, taking into consideration building size, the variety of systems that operate within health care facilities, the floor area of the working space, the Permanent Link length of cables and Data Drop density.

7.8.9.7(2)(b) The Design-Builder will not place Communications Rooms adjacent to elevator shafts.

7.8.9.7(2)(c) The structural design of the Facility will not negatively impact the ability to comply with the Communications Room requirements stated in this Agreement. Particular emphasis needs to be placed on the positioning of conduits and or sleeves to ensure they enter the floors of Communications Rooms at a distance no greater than 25 mm from any perimeter wall.

7.8.9.7(2)(d) Triangle, L, curved or any other odd shaped rooms and spaces are not acceptable for use as a Communications Room.

7.8.9.7(2)(e) The Design-Builder will locate Communications Rooms:

7.8.9.7.2.(e).1 Away from all services and conditions that are visible or hidden within the fabric of the Facility that will endanger or adversely affect Telecommunications equipment and cabling;

7.8.9.7.2.(e).2 Away from where any service or displays involving water or other fluids are located in the Facility. Communications Rooms or adjoining walls will not contain any source of water/liquid such as drain pipes, sprinkler risers and plumbing pipes;

7.8.9.7.2.(e).3 To minimize the Permanent Link length for all cable runs;

7.8.9.7.2.(e).4 To provide easy access for equipment installation and replacement; and

7.8.9.7.2.(e).5 To prevent interference with architectural and structural elements as well as other systems

and services including mechanical, electrical, and PTS.

7.8.9.7(2)(f) The Design-Builder will vertically stack Communications Rooms on all floors throughout the Facility where possible in consultation with the Authority.

7.8.9.7(2)(g) The Design-Builder will not place Communications Rooms in any areas in the Facility that would be considered by the Authority to be a confined space of any kind or space with recognizable hazards requiring specific worker safety precautions and protocols.

7.8.9.7(2)(h) Communications Rooms will always be directly accessible from a common corridor or hallway that connects to an elevator where possible in consultation with the Authority. The access path which includes all entrances, corridors, doorways openings and elevators from Facility's Loading Dock to any Communications Room will be:

- 7.8.9.7.2.(h).1 Well lit;
- 7.8.9.7.2.(h).2 Unobstructed;
- 7.8.9.7.2.(h).3 Capable of supporting the smooth operation of mechanical handling aid such as a pallet jack, hand truck and cart;
- 7.8.9.7.2.(h).4 No lower than the height of the Communications Room door and one metre wide; and
- 7.8.9.7.2.(h).5 Capable of supporting a weight of 1361 kg (3000 lbs.).

7.8.9.7(2)(i) Communications Rooms require a minimum two-hour fire rating.

7.8.9.7(2)(j) Communications Rooms will not have exterior windows.

7.8.9.7(2)(k) Communications Rooms walls will be to underside of slab. All walls will be lined with rigidly installed 19 mm fire rated grade A G1S plywood painted with two coats of light-coloured paint applied to all sides. Sanding between coats is mandatory. The plywood panels will extend from the finished floor level or from the top of the cove base to a height of 3048 mm. Add an additional 1220 mm x 2440 mm sheet of plywood mounted horizontally above the cable

	tray for OSP cable storage in EF and MER. Expose certified stamped mark.
7.8.9.7(2)(l)	The minimum clear height in a Communications Room will be 2700 mm without obstructions. The height between the finished floor and the lowest point of the ceiling will be no less than 3048 mm to accommodate taller frames and overhead pathways and other infrastructure required to service the room.
7.8.9.7(2)(m)	There will be no suspended ceiling installed in a Communications Room.
7.8.9.7(2)(n)	The Design-Builder will ensure that all devices that need to be accessed for maintenance, inspection, replacement or other reasons in the ceilings of Communications Rooms are accessible by a maximum 2500 mm tall ladder in all instances. Where required to maintain this serviceability, TRs will be extended to 4050 mm deep The Design-Builder will demonstrate compliance with this requirement early in the design development process and will employ whatever means necessary to achieve the accessibility requirement such as increasing room dimensions to create sufficient access openings and employing alternate means of smoke detection such as VESDA or optical beam systems.
7.8.9.7(2)(o)	Static dissipative floor coverings in Communications Rooms will be linoleum composite sheeting (i.e. Marmoleum) and light in colour to enhance the brightness of the room. Vinyl flooring is not acceptable. The floor will be bonded to the Telecommunications grounding busbar in accordance with manufacturer’s instructions and the pathways used for bonding conductors routed between the floor and the Telecommunications grounding busbar will be fully concealed.
7.8.9.7(2)(p)	Floor loading, static and dynamic, capacity in the space will be sufficient to bear both the distributed and concentrated load of the installed equipment. A professional structural engineer, registered in British Columbia, will be consulted during the Design to specify the floor loading limit. The minimum floor load capacity will be 6.0 kPa (125 lbs/square foot) in all Communications Rooms.

7.8.9.7(2)(q) Seismic specifications for Telecommunications and IT infrastructure and related facilities will accommodate applicable seismic requirements in accordance with the AHJ.

7.8.9.7(2)(r) The door for the MER, EF Room and AHER will be a minimum size of 1066 mm wide and 2440 mm high and will swing 180º out to gain valuable floor and wall spaces inside the room for equipment and cable installs, and to provide working space for pulling entrance and riser cables.

7.8.9.7(2)(s) The door for a TR will be a minimum size of 1066 mm wide and 2133 mm high and will swing 180º out to gain valuable floor and wall spaces inside the room for equipment and cable installs, and to provide working space for pulling entrance and riser cables.

7.8.9.7(2)(t) If the door must swing into the Communications Room, the size of the room will be increased by the width of the door to compensate for lost space.

7.8.9.7(2)(u) All doors are to be equipped with door sweeps. Where a Communications Room is directly accessible from the Facility's exterior or from parkade levels, the door will be equipped with security hinges and a full-length astragal.

7.8.9.7(2)(v) Communications Room ID will be placed on the door frame using a lamacoid label. The Communications Room ID label will be placed on the opposite corner of the door frame from where the architectural room number label is located.

7.8.9.7(3) Mechanical

7.8.9.7(3)(a) Mechanical equipment, ducting, water/ sewer/ steam/ drain pipes, fuel lines, gas lines, medical gas lines, steam lines, sprinkler risers and radiant heating or any other mechanical component will not reside in or transit through Communications Rooms. This includes adjoining walls and the floor and ceiling slab.

7.8.9.7(3)(b) Mechanical equipment such as fan coils, VAV boxes, etc. that are required to cool and control the environment within Communications Rooms and provide positive air pressure will not be housed

within the Communications Rooms as this will inhibit the placement of overhead cable tray and lighting and constrain the optimal layout of the space. Mechanical supply and return air ductwork will be installed in the room in order to meet the requirements of Sections (d).7.1 and (d).7.2.

7.8.9.7(3)(c) Unless otherwise approved by the Authority, Raceways for thermostats, humidistats and all other mechanical components mounted to the walls of Communications Rooms will be concealed and not surface mounted to the plywood in order to conserve wall space.

7.8.9.7(3)(d) The Design-Builder will supply and install dedicated scalable, reliable and N+1 redundant cooling capacity in a consistent manner in all the Communications Rooms to permit all equipment racks to be fully populated.

7.8.9.7.3.(d).1 A minimum of 6000 BTUs of cooling capacity will be provided per equipment rack (including telecommunications carriers' equipment racks) and server cabinet in all Communications Rooms in the Facility. Stacked TRs will be served by a pair of redundant fan coils located on Level 5. Fan coils will be sized with 25% additional spare capacity. One pair of fan coils per stack of TRs. This includes:

(d).1.1 The provision of 6000 BTUs of cooling capacity for future equipment racks (including telecommunications carriers' equipment racks) and server cabinets that can be accommodated within the Communications Rooms; and

(d).1.2 The future growth of the MER as set out in Section 7.8.9.4.

7.8.9.7.3.(d).2 HVAC systems serving Communications Rooms will maintain a temperature between 18 and 24 degrees Celsius (DB temperature) with a relative humidity between 25 percent and 60 percent. Anything outside these ranges will generate an alarm that will be visible on the Facility's BMS;

7.8.9.7.3.(d).3 Design the HVAC system to maintain these requirements 24/7, 365 days a year;

7.8.9.7.3.(d).4 Supply and install separate, in room controls for the HVAC systems serving all Communications Rooms in order to enable the correct amount of cooling capacity and humidity control to be delivered to each Communications Room;

7.8.9.7.3.(d).5 Each TR will be provided with its own temperature sensor which is used to modulate the supply air volume by modulating the supply air motorized damper provided for each room. Supply and return air flow to the room will be provided with a motorized damper. On detection of smoke within the room the motorized damper in the room will close;

7.8.9.7.3.(d).6 Each stack of TRs will be provided with separate supply and return ducts that are sized with 25% spare capacity for future modifications. Fan coils and piping to the fan coils will also be sized with 25% spare capacity;

7.8.9.7.3.(d).7 Supply air and return air ducts will be laid out to support a cold and hot aisle configuration in accordance with Good Industry Practice and in coordination with overhead cable tray, lighting; sprinklers and other devices installed in the ceiling;

(d).7.1 Provide dedicated supply air ducting and air diffusers directly above the front of the racks and cabinets.

(d).7.2 Provide dedicated return air ducting and grills directly above the rear of the racks and cabinets.

7.8.9.7.3.(d).8 The air pressure inside a Communications Room will be positive to force the air out of the room to mitigate dust accumulation. Provide a minimum of 1 complete air change per hour; and

7.8.9.7.3.(d).9 Refer to Division 23, Section 7.5 Heating, Ventilating and Air Conditioning for further details.

7.8.9.7(3)(e) Communications Rooms will have proper sealing of doors or any other gaps to maintain positive air pressure in the interior of the room and to provide additional prevention against the ingress of dust and debris which may impact equipment performance and lifespan as well as result in cable

failures and degradation of service. The Design-Builder will supply and install filters (minimum acceptable rating MERV 8) on any mechanical system supplying air into Communications Rooms.

7.8.9.7(3)(f) The Design-Builder will supply and install heat and smoke detection and a stand-alone Vortex or clean agent system that will extinguish a fire while allowing equipment to remain operational in all Communications Rooms. Vortex or clean agent spray nozzles will not be placed above equipment racks and server cabinets in Communications Rooms.

7.8.9.7(3)(g) Where a Communications Room is located below grade, the Design-Builder will provide protection against the risk of flooding or ground water infiltration providing drainage and sump pumps, on delayed-vital power.

7.8.9.7(4) Electrical

7.8.9.7(4)(a) General Requirements

7.8.9.7.4.(a).1 Electrical feeders, branch circuits and equipment including transformers, non-IM/IT distribution panels, distribution centres and large motors that generate EMI will not be allowed to reside in or transit through Communications Rooms. This includes adjoining walls and floor and ceiling slabs. If Electrical Rooms are located adjacent to Communications Rooms, the Design-Builder will provide appropriate shielding measures on all adjoining or common walls shared by both rooms.

7.8.9.7.4.(a).2 All supporting electrical infrastructure in Communications Rooms will be routed following building lines and installed in a manner that preserves the greatest amount of uninterrupted space on the walls for the mounting of equipment.

7.8.9.7.4.(a).3 Unless otherwise approved by the Authority, Raceways for electrical outlets, light switches, grounding connections and all other electrical components mounted to the walls of Communications Rooms will be concealed and not surface mounted to the plywood in order to conserve wall space.

7.8.9.7.4.(a).4 All central IM/IT UPS distribution panels and or vital distribution panels located in Communications Rooms will be equipped with spare space and breakers in accordance with Section 7.7.2.18(7).

7.8.9.7.4.(a).5 The Design-Builder will supply and install convenience electrical outlets with 15/20A T-slot receptacles along the perimeter wall of all Communications Rooms at a maximum spacing of one outlet every 3 m. Connect 50 percent of the convenience outlets to vital power and the remainder to conditional power. Each receptacle to be on a dedicated circuit. All receptacles will be set flush-mounted and at a height determined by the Authority during the Review Procedure.

7.8.9.7.4.(a).6 Refer to Section 7.7 Electrical (Division 26) for further details.

7.8.9.7(4)(b) MER

7.8.9.7.4.(b).1 The Design-Builder will supply and install two (2) L21-30R twist lock receptacles per equipment rack and server cabinet. One receptacle will be connected to the central IM/IT UPS distribution panel in the room and other from the vital distribution panel in the room.

7.8.9.7.4.(b).2 In the event there is an outage on either the UPS or vital power supply receptacle, the Design and Construction of the electrical distribution to each equipment rack and server cabinet in the MER will automatically support 100 percent of the 8kW capacity on the remaining active receptacle.

7.8.9.7.4.(b).3 The Design and Construction of the electrical system (including IM/IT UPS frame sizing) servicing the MER needs to include the 100% growth factor as noted in Section 7.8.9.4.

7.8.9.7.4.(b).4 Equipment Racks

(b).4.1 The Design and Construction of all aspects of the electrical distribution (including IM/IT UPS frame sizing) to the equipment racks in the MER will accommodate 8kW per equipment rack.

(b).4.2 The kW load per equipment rack in the MER will have an average peak demand of 4kW per equipment rack,

but the Design-Builder will allow for 50 percent of the equipment racks to scale to 8kW of peak demand.

7.8.9.7.4.(b).5 Server Cabinets

(b).5.1 The Design and Construction of all aspects of the electrical distribution (including IM/IT UPS frame sizing) to the server cabinets in the MER will accommodate 10kW per server cabinet. Excluded from this requirement are the receptacles which can remain as L21-30R and the breakers in the MER IM/IT UPS distribution panel and vital distribution panel which can remain rated to support 8kW. Both components would be upgraded by the Authority in the future should the 10kW load be required.

(b).5.2 The kW load per server cabinet in the MER will have an average peak demand of 5kW per server cabinet, but the Design-Builder will allow for 50 percent of the server cabinets to scale to 10kW of peak demand.

7.8.9.7(4)(c) TRs

7.8.9.7.4.(c).1 The Design-Builder will supply and install two (2) L21-30R twist lock receptacles per equipment rack. One receptacle will be connected to the central IM/IT UPS distribution panel in the room and other from the vital distribution panel in the room.

7.8.9.7.4.(c).2 In the event there is an outage on either the UPS or vital power supply receptacle, the Design and Construction of the electrical distribution to each equipment rack within a TR will automatically support 100 percent of the 8kW capacity on the remaining active receptacle.

7.8.9.7.4.(c).3 The Design and Construction of all aspects of the electrical distribution (including IM/IT UPS frame sizing) to planned equipment racks in TRs will accommodate 8kW per equipment rack.

7.8.9.7.4.(c).4 Average Peak Demand Categories

(c).4.1 TRs that service areas such as the parking levels, MDR, Food Services,

Back-of-House and public spaces, Staff Facilities, Patient Portering, Energy Centre and dedicated mechanical and interstitial levels will be categorized as low demand. In these low demand TRs, the average peak demand will be 2.5kW per equipment rack.

(c).4.2 TRs that service program areas such as Administration, Interprofessional Team space, Ambulatory and Oncology Ambulatory Care and Inpatient Units will be categorized as medium demand. In these medium demand TRs, the average peak demand will be 4kW per equipment rack, but the Design-Builder will allow for 25 percent of the equipment racks to scale to 8kW of peak demand.

(c).4.3 TRs that service program areas such as the Emergency, Perioperative, Radiation Therapy spaces, Functional and Medical Imaging spaces, Laboratory Services, Biomedical Engineering, Pharmacy and Oncology Pharmacy, Clinical Trials, Virtual Health and conference and meeting spaces will be categorized as high demand. In these high demand TRs, the average peak demand will be 4kW per equipment rack, but the Design-Builder will allow for 50 percent of the equipment racks to scale to 8kW of peak demand.

(c).4.4 The decision as to whether a TR is categorized as low, medium or high demand resides with Authority and the decision will be based on the Design of the Facility and the placement of the program areas identified in Appendix 1A [Clinical Specifications and Functional Space Requirements].

7.8.9.7(4)(d) EF Room and AHER

7.8.9.7.4.(d).1 In the EF Room and AHER, the Design-Builder will allow for:

(d).1.1 The provision of two (2) L21-30R twist lock receptacles for an Authority

equipment rack where one receptacle is fed from the central IM/IT UPS distribution panel in the room and the other receptacle is fed from the vital distribution panel in the room. In the event there is an outage on either the UPS or vital power supply receptacle, the Design and Construction of the electrical distribution to each Authority equipment rack will automatically support 100 percent of the 8kW capacity on the remaining active receptacle.

(d).1.2 The provision of two (2) L21-30R twist lock receptacles per telecommunications carriers equipment rack fed from a vital distribution panel in the room. Exact receptacle configuration will be confirmed by the Authority in consultation with the carriers during Design.

7.8.9.7.4.(d).2 The EF Room and AHER will be considered as low demand as it relates to the Authority equipment racks in these two rooms. The average peak demand will be 2.5kW per Authority equipment rack.

7.8.9.7.4.(d).3 For each of the planned and future telecommunication's carrier racks which are only fed from the vital panel in the room, the Design-Builder will allow 8kW demand load.

7.8.9.7.4.(d).4 The Design and Construction of all aspects of the electrical distribution (including IM/IT UPS frame sizing) to the Authority and telecommunications carriers equipment racks in the EF Room and AHER will accommodate 8kW per equipment rack.

7.8.9.7(4)(e) Lighting

7.8.9.7.4.(e).1 The lighting in Communications Rooms will be coordinated with other design elements in the room to ensure the light emanating from the lighting fixtures is not obstructed.

7.8.9.7.4.(e).2 The lighting supplied and installed by the Design-Builder in each Communications Room will meet the following requirements.

(e).2.1 Lighting fixtures will be mounted to Unistrut used to support the cable tray;

(e).2.2 Lighting fixtures and associated power cables will have a minimum separation of 50 mm from communications cabling;

(e).2.3 The lenses of the lighting fixtures will be removable by a release button or similar mechanism to prevent lenses from routinely falling out as is common when fixtures with simpler mechanisms are installed;

(e).2.4 The minimum light levels will be 500 lux in the horizontal plane and 200 lux in the vertical plane @ 1 m AFF. The Design-Builder will demonstrate that its lighting calculations account for light loss due to a full cable tray;

(e).2.5 Interior room lighting will be supplied from both the vital and conditional power branches with a minimum of 50 percent of the lights supplied from the vital branch;

(e).2.6 Lighting will not be powered from the distribution panel in the Communications Room; and

(e).2.7 Supply and install a single local light switch to control all lighting fixtures and an occupancy sensor(s) to control the lights. Vacancy sensors are not to be installed in Communications Rooms as the lights must always turn on upon entry.

7.8.9.7(5) Security

7.8.9.7(5)(a) The Design-Builder will supply and install a card access system for all Communications Rooms doors. Only the main entry door will be equipped with a network access control card reader. Supplementary doors will be for exit only. Manual punch code locks are not permitted.

7.8.9.7(5)(b) The Design-Builder will supply and install IPVS camera(s) inside all Communications Rooms. IPVS cameras will be used to:

7.8.9.7.5.(b).1 Identify people at the points of entry and egress into the room such that the person’s face is clearly visible in the camera’s field of view;

7.8.9.7.5.(b).2 Track activity within the room. The quantity of cameras will be sufficient to ensure that the interior of the room is completely within the field of view of the IPVS system such that there are no blind spots including in front and behind equipment racks and server cabinets.

7.8.9.7(5)(c) IPVS camera footage to be recorded on the Facility's security system and stored for a minimum of thirty (30) days.

7.8.9.7(5)(d) The Design-Builder will supply and install an intrusion alarm when the Communications Room is directly accessible from the building's exterior, underground parking or public areas inside the Facility. Alarm will consist of door contacts on all doors, dual tech motion detectors and keypad. Control panel will be located in a secure space. Intrusion system will not be integrated with access control to arm or disarm the alarm.

7.8.9.7(5)(e) Unless otherwise approved by the Authority, Raceways for security devices mounted to the walls of Communications Rooms will be concealed and not surface mounted to the plywood in order to conserve wall space.

7.8.9.8 Communications Rooms – Cleaning

7.8.9.8(1) Prior to installing any active equipment and components in a Communications Room, the Design-Builder will:

7.8.9.8(1)(a) Complete a cleaning of the Communications Room at the sub-micron level that meets or exceeds the Federal Standard 209E, Class 100,000 (same as ISO 14644-1 Class 8 standard) or better, removing all dust and debris from all surfaces including floors, walls, ceilings, electrical and mechanical equipment, cables trays and equipment racks and all components installed within them.

7.8.9.8.1.(a).1 Once active equipment and components are installed in a Communications Room, the Design-Builder will repeat the cleaning process and associated air quality testing as many times as necessary to maintain a clean environment until Substantial Completion of the Facility is achieved; and

7.8.9.8.1.(a).2 The cleaning will be done professionally by a company that is specialized in cleaning critical

environments. The Design-Builder will use the Authority's vendor to clean the Communications Rooms in the Facility and conduct the air quality testing and reporting.

7.8.9.8(1)(b) Conduct air quality testing and provide the Authority with a report and analysis of particle counts before and after the cleaning of a Communications Room. If the quantity of particles of 0.5 and 0.3 microns per square foot exceeds acceptable levels as permissible by the Fed. Standard Class 100,000 (same as: ISO 14644-1 class 8) guidelines, then the Design-Builder will re-clean the room and take whatever other measures that are necessary to achieve the required air quality in the Communications Room; and.

7.8.9.8(1)(c) The Design-Builder will supply and install clean room sticky mats, booties, curtains and plastic strip doors and air scrubbers as long as required to maintain the required air quality and keep the Communications Rooms clean until Substantial Completion of the Facility is achieved.

7.8.9.9 Equipment Racks

7.8.9.9(1) The Design-Builder will supply and install equipment racks required in all the Facility's Communications Rooms. Equipment racks will:

7.8.9.9(1)(a) Be freestanding four (4) post equipment rack, black in colour and gang-able with the following dimensions: 610 mm wide by 914 mm deep by 2134 mm high;

7.8.9.9(1)(b) Come with RU markings (RU1 at top & RU44 at bottom) that are stamped or silk screened onto the front and rear vertical mounting rails or posts (labels will not be acceptable);

7.8.9.9(1)(c) Be independently tested and certified to meet or exceed established Seismic Zone 4 NEBS Telcordia GR-63-CORE standards and specifications;

7.8.9.9(1)(d) Provide 483 mm (19") rack mount capability for rack mountable components; and

7.8.9.9(1)(e) Provide 1956 mm of vertical mounting space. (44 rack units).

7.8.9.9(2) Refer to Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] for product details, approved manufacturers and model numbers that will be used on this Project.

7.8.9.9(3) The minimum number of equipment racks to be supplied and installed by the Design-Builder will be:

7.8.9.9(3)(a) EF Room – One (1) equipment rack;

7.8.9.9(3)(b) MER – Seven (7) equipment racks;

7.8.9.9(3)(c) TR – Four (4) equipment racks per room (three of which will be at a minimum dedicated for IM/IT data, Wi-Fi and voice network equipment cabling and will not house equipment and cabling or wiring from any other Extra-low Voltage communications systems); and

7.8.9.9(3)(d) Antenna HE Room – One (1) equipment rack.

7.8.9.9(4) Additional equipment racks (including vertical and horizontal cable management and ePDUs) over and above the minimum quantities noted above will be supplied and installed by the Design-Builder to:

7.8.9.9(4)(a) Provide more space to accommodate all the rack mountable equipment associated with any network or system required in the Facility that is permitted to be located in a Communications Room; and/or

7.8.9.9(4)(b) Achieve the growth factor in a TR.

7.8.9.9(5) When additional equipment racks are required over and above the minimum quantities noted above, the Design-Builder will:

7.8.9.9(5)(a) Enlarge the Communications Room to accommodate all the additional equipment racks (including vertical cable management) and meet all required clearances;

7.8.9.9(5)(b) Supply and install additional power and cooling capacity for each additional equipment rack in accordance with the requirements in this Agreement; and

7.8.9.9(5)(c) Adjust any other related infrastructure required to accommodate additional equipment racks and or an enlarged Communications Room.

7.8.9.9(6) The Design-Builder will ensure:

7.8.9.9(6)(a) The maximum number of Data Drops per equipment rack will be 480 at the time when the Facility becomes operational unless otherwise approved by the Authority;

7.8.9.9(6)(b) The location of the equipment racks will provide physical and environmental protection for IM/IT network and Extra-low Voltage communications systems equipment. This protection addresses threats including temperature, humidity, vibration, exposure to ultraviolet radiation, ingress of dust, fluids or other Contaminants, physical damage (accidental or malicious), security, EMI and the presence of other hazards and impediments;

7.8.9.9(6)(c) The location of the equipment racks will allow for adequate access to safely allow repair, expansion, installation and maintenance of the Structured Cabling infrastructure, Extra-low Voltage communications system wiring and IM/IT network and Extra-low Voltage communications systems equipment;

7.8.9.9(6)(d) The following access clearances are provided:

- 7.8.9.9.6.(d).1 One (1) metre in the front, side and behind the rear of the equipment racks;
- 7.8.9.9.6.(d).2 One (1) metre between rows where several rows of equipment racks are located side by side;
- 7.8.9.9.6.(d).3 A minimum of one (1) metre clearance along the entire length of the egress route from the farthest corners of the Communications Room to its doorway in order to ensure no area within the interior of the room is considered to be either a confined space, a restricted space, or both;
- 7.8.9.9.6.(d).4 A minimum clearance of 50 mm will be maintained between one side of an equipment rack’s vertical manager and the wall; and
- 7.8.9.9.6.(d).5 All of the stated clearances above are to be measured from the face of any equipment mounted to the wall (as opposed to the wall itself) and from the front or side of the vertical cable managers.

7.8.9.9(6)(e) All installations of equipment racks will be reviewed by a Professional Engineer registered in British Columbia for certification as being seismically

restrained in accordance with the requirements for a post-disaster building; and

7.8.9.9(6)(f) Equipment racks will be grounded in accordance with Section 7.8.7.

7.8.9.9(7) The Design-Builder will supply and install vertical and horizontal cable management. Vertical and horizontal cable management requirements are as follows:

7.8.9.9(7)(a) All vertical cable managers will be 2134 mm in height;

7.8.9.9(7)(b) Where two or more equipment racks are mounted side by side, the equipment racks will have a double sided 254 mm wide by 559 mm deep to 305 mm wide by 478 mm deep vertical cable managers installed in between them and ganged with metal bolts and washers. This size of vertical cable manager will also be installed where one of the adjacent equipment racks is designated as future or planned and is not physically being installed under the scope of this Project;

7.8.9.9(7)(c) Supply and install double sided 152 mm wide vertical cable managers at either end of the line-up;

7.8.9.9(7)(d) All vertical cable managers are to be equipped with three (3) slack management spool kits; and

7.8.9.9(7)(e) Supply and install two (2) rack mounted horizontal wire managers for the top and bottom of each equipment rack. Each horizontal wire manager will be two (2) rack units in height and will come with fingers, rear access and cover plate.

7.8.9.9(8) For each equipment rack, the Design-Builder will supply and install two (2) redundant ePDUs connected to L21-30R circuits, one fed from the centralized IM/IT UPS power and one from the vital power. The ePDU specified for the Communications Rooms is an Eaton EMI331-10 (Part Name EMI3PD15JFJ78A1). The requirements for each ePDU is as follows:

7.8.9.9(8)(a) Input: NEMA L21-30P, three (3) metre cord (w/molded male cord ends);

7.8.9.9(8)(b) Output: (24) C13, (3) C19 and (6) NEMA 5-20R;

7.8.9.9(8)(c) LCD metered with Ethernet Connection and Environmental Probe; and

7.8.9.9(8)(d) Supply and install all required mounting hardware necessary to attach each ePDU to the vertical post of an equipment rack.

7.8.9.10 Server Cabinets

7.8.9.10(1) The Design-Builder will supply and install seven (7) server cabinets in the MER. The requirements for this server cabinet are as follows:

7.8.9.10(1)(a) Server cabinets will be 610 mm wide x 1220 mm deep with integrated vertical wire managers (100 mm wide) on each side of the rear of the cabinet;

7.8.9.10(1)(b) Steel construction painted black medium texture;

7.8.9.10(1)(c) Perforated (79% open area) front and rear door. Each door will be prepped with compatible cut out to accommodate an Assa Abloy KS200 integrated server cabinet lock;

7.8.9.10(1)(d) Side panels will be removable, lockable and equipped with knockouts (50mm wide by 1828 mm height) at rear aligned with the vertical cable managers inside the server cabinet;

7.8.9.10(1)(e) Bottom panel solid;

7.8.9.10(1)(f) Top panel with four (4) 150 mm x 100 mm cable entry knockouts complete with two brushes per server cabinet;

7.8.9.10(1)(g) Three (3) pairs of adjustable 11 GA EIA (48U) rails with square 10-32 clips nuts, hundred (100) 10-32 mounting hardware;

7.8.9.10(1)(h) Server cabinets come with silk screened RU markings (RU1 at top & RU44 at bottom) on front and rear posts and rails;

7.8.9.10(1)(i) The server cabinet will be independently tested and certified to meet or exceed established Seismic Zone 4 NEBS Telcordia GR-63-CORE standards and specifications; and

7.8.9.10(1)(j) Provide sufficient number of blanking plates to blank 95% plates of the total U space for all server cabinets.

7.8.9.10.1.(j).1 Use a combination of 10U, 6U, 4U, 3U, 2U and 1U blanking plates. The exact breakdown

will be determined by the Authority during shop drawing approval; and

7.8.9.10.1.(j).2 Blanking plates will be made of matte black powder coated aluminum.

7.8.9.10(2) The Design-Builder will ensure:

7.8.9.10(2)(a) The location of the server cabinet will provide physical and environmental protection for IM/IT network and Extra-low Voltage communications systems equipment. This protection address threats including temperature, humidity, vibration, exposure to ultraviolet radiation, ingress of dust, fluids or other Contaminants, physical damage (accidental or malicious), security, EMI and the presence of other hazards and impediments;

7.8.9.10(2)(b) The location of the server cabinet will allow for adequate access to safely allow repair, expansion, installation and maintenance of the Structured Cabling infrastructure, Extra-low Voltage communications system wiring and IM/IT network and Extra-low Voltage communications systems equipment;

7.8.9.10(2)(c) The following access clearances are provided:

7.8.9.10.2.(c).1 One (1) metre in the front, side and behind the rear of the server cabinet;

7.8.9.10.2.(c).2 One (1) metre between rows where several rows of server cabinets are located side by side;

7.8.9.10.2.(c).3 A minimum of one (1) metre clearance along the entire length of the egress route from the farthest corners of the Communications Room to its doorway in order to ensure no area within the interior of the room is considered to be either a confined space, a restricted space, or both;

7.8.9.10.2.(c).4 A minimum clearance of 50 mm will be maintained between one side of the server cabinet and the wall; and

7.8.9.10.2.(c).5 All clearances are to be measured from the face of any equipment mounted to the wall (as opposed to the wall itself) to the server cabinet.

7.8.9.10(2)(d) The installation of the server cabinet will be reviewed by a structural Professional Engineer registered in British Columbia for certification as

being seismically restrained in accordance with the requirements for a post-disaster building; and

7.8.9.10(2)(e) The server cabinet will be grounded in accordance with 7.8.7.

7.8.9.10(3) For the server cabinet, the Design-Builder will supply and install two (2) redundant ePDUs connected to L21-30R circuits, one fed from the centralized IM/IT UPS power and one from the vital power. The ePDU specified for the Communications Rooms is an Eaton EMI331-10 (Part Name EMI3PD15JFJ78A1). The requirements for each ePDU is as follows:

7.8.9.10(3)(a) Input: NEMA L21-30P, three (3) metre cord (w/molded male cord ends);

7.8.9.10(3)(b) Output: (24) C13, (3) C19 and (6) NEMA 5-20R;

7.8.9.10(3)(c) LCD metered with Ethernet Connection and Environmental Probe; and

7.8.9.10(3)(d) Supply and install all required mounting hardware necessary to attach each ePDU inside the server cabinet.

7.8.10 Structured Cabling

7.8.10.1 General Requirements

7.8.10.1(1) Structured Cabling is defined as building or campus Telecommunications cabling infrastructure that consists of a number of standardized smaller elements (hence structured) called subsystems.

7.8.10.1(2) The importance of the Structured Cabling is similar to that of other critical building infrastructure in a hospital where interruptions to service can have a serious impact. Because of this, and the additional fact that the Design Life of a Structured Cabling infrastructure will last several decades, it is essential that the Design and Construction of the Structured Cabling system in the Facility is done with due care and attention ensuring capacity when and where required as well as protection against obsolescence and physical risks.

7.8.10.1(3) The Design-Builder will meet local building codes, applicable rules and regulations of the AHJ, industry standards and best practices, codes and methods and Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] when undertaking the Design and Construction of the Structured Cabling infrastructure in the Facility.

7.8.10.1(4) The Design and Construction of the Structured Cabling infrastructure in the Facility will deliver predictable performance, support the connectivity of the networks, systems and equipment as well as have the flexibility to accommodate moves, adds and changes, support a wide variety of applications, provide redundancy and diversity to critical networks and systems and meet future technology demands.

7.8.10.1(5) To meet ever-changing IT demands, standardizing on a product set that is recognized in the industry for its high degree of reliability, quality and performance is vital. Refer to Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] for further details on the manufacturers and products approved for use on this Project.

7.8.10.1(6) The installation of the Structured Cabling infrastructure in the Facility will be performed by one of the Authority's prequalified cable contractors.

7.8.10.1(7) All components of the Structured Cabling infrastructure installed on the interior and exterior of the Facility and on the Site in general will be protected from water, moisture, ultra violet exposure, dust, corrosive agents and all other hazards that could impact the operation, performance, connectivity and or life span Structured Cabling infrastructure.

7.8.10.1(8) Structured Cabling will be installed in the Facility’s Communications Pathway System. Refer to Section 7.8.8 for further requirements.

7.8.10.1(9) A minimum slack allowance of 300 mm will be supplied and installed by the Design-Builder for all Structured Cabling crossing an expansion joint location in the Facility.

7.8.10.1(10) All manufacturer's warranties as it relates to the Structured Cabling infrastructure will be transferable to the Authority at the completion of the project. Refer to Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] for warranty requirements.

7.8.10.2 Horizontal Cabling Subsystem

7.8.10.2(1) The Design-Builder will undertake the Design and Construction of a complete horizontal Category 6A subsystem for the Facility. This includes the supply, installation, termination, testing and labelling of all components of the subsystem.

7.8.10.2(2) The horizontal cabling subsystem extends from the work area’s TOs to a designated TR or MER.

7.8.10.2(3) The configuration of the horizontal cabling subsystem will be a star structure with separate dedicated Category 6A Data Drops run in a continuous fashion with no splices from the TR or MER to the work area TOs on the same floor.

7.8.10.2(4) The horizontal cabling subsystem supplied and installed by the Design-Builder will include horizontal Category 6A cables, TOs, jacks, mechanical terminations, patch panels and patch cords.

7.8.10.2(5) The maximum Permanent Link length of any Category 6A Data Drop in the horizontal cabling subsystem will not exceed 80m (262') within the entire physical work area (hereupon identified as serving zone) served by TR or MER. If the Permanent Link length of 80m is exceeded within the interior of the Facility, The Design-Builder will need to undertake the Design and Construction of additional TRs unless otherwise approved by the Authority.

7.8.10.2(6) The Design-Builder will supply and install surge protectors in Communications Rooms for each horizontal Category 6A Data Drop entering the Facility from the exterior. Refer to Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] for further details.

7.8.10.2(7) If the Permanent Link length of 80m is exceeded to any TO located on the exterior of the Facility or within the boundary of the Site, the Design-Builder will supply and install a powered fibre system equivalent to CommScope's Powered Fibre Cable System or GatorLink by Fiber Connections Inc., as approved by the Authority. The system will include all the necessary components required for a complete system, such as:

7.8.10.2(7)(a) Hybrid fibre / copper cable (either single mode or multimode will be used depending on the distance between the TO and the TR or MER);

7.8.10.2(7)(b) PoE extender;

7.8.10.2(7)(c) Media converters;

7.8.10.2(7)(d) Safety & overload protection;

7.8.10.2(7)(e) Power supply;

7.8.10.2(7)(f) Power transmission management; and

7.8.10.2(7)(g) Cable/fibre management.

7.8.10.2(8) In applications where the horizontal cable is installed in tight spaces and is subjected to repetitive rotations and or motion-

intensive applications such as inside booms, the Category 6A Data Drops supplied and installed will be of small overall diameter and specifically engineered and tested to withstand millions of flex cycles and torsion ratings.

7.8.10.2(9) Serving zones will be established for the MER and each TR in the Facility and identified on all floor plans. Horizontal Category 6A Data Drops will not cross the serving zone boundary lines to be terminated in another TR.

7.8.10.2(10) The ANSI/TIA-1179-A Health Care Facility Telecommunications Cabling Standard will be used as a guide to help determine the rough number of data drops required in rooms or spaces identified in the standard. The total number of category 6A Authority Data Drops installed that will be used as the basis for a data drop agreement in the Facility by the Design-Builder will be 19,500 (not including any spares and data drops required for FF&E). In the event that more than 19,500 drops are required, unit pricing will apply to any data drop in excess of 19,500. In the event that less than 19,500 drops are required, delete units prices will apply to any data drops less than 19,500. Add unit prices that are applicable prior to IFC and post-boarding will, in any given area, be used based on the appropriate add/delete prices. Refer to Schedule 10 Appendix 1 [Data Drop – Definitions and Unit Pricing] of the Agreement.

7.8.10.2(11) The Design-Builder will, as directed by the Authority acting reasonably, assign each room, area and space in the Facility a work area density ("High", "Medium" or "Low") in accordance with the ANSI/TIA-1179-A Health Care Facility Telecommunications Cabling Standard Table 1:

7.8.10.2(11)(a) Low Density Work Area - 2 to 6 Data Drops in each area;

7.8.10.2(11)(b) Medium Density Work Area - 7 to 14 Data Drops in each area; and

7.8.10.2(11)(c) High Density Work Area - > 14 Data Drops in each area.

7.8.10.2(12) If the ANSI/TIA-1179-A Health Care Facility Telecommunications Cabling Standard does not clearly identify a work area density for a specific type of room or area in the Facility, then the Design-Builder will, as directed by the Authority acting reasonably, assign a work area density to that specific room or area. The total number of category 6A Authority Data Drops that will be installed in the Facility by the Design-Builder will not exceed 19,500 (not including any spares and data drops required for FF&E). In the

event that more or less than 19,500 drops are required, unit pricing will apply. In the event that less than 19,500 drops are required, delete unit prices will apply to data drops less than 19,500. Add unit prices will apply for additional drops prior to IFC and for additional drops prior to boarding in any given area. The unit pricing will be apply based on the appropriate add/delete prices. Refer to Schedule 10 Appendix 1 [Data Drop – Definitions and Unit Pricing] of the Agreement.

7.8.10.2(13) The Design-Builder will, as directed by the Authority acting reasonably, determine the specific number of Data Drops to be supplied and installed in each room or area of the Facility. This determination will fall within the range of the work area density assigned for a given room and or area in the Facility. The total number of category 6A Authority Data Drops that will be installed in the Facility by the Design-Builder will not exceed 19,500 (not including any spares and data drops required for FF&E). In the event that more than 19,500 drops are required, unit pricing will apply to any data drop in excess of 19,500. In the event that less than 19,500 drops are required, delete unit prices will apply to data drops less than 19,500. Add unit prices will apply for additional drops prior to IFC and for additional drops prior to boarding in any given area. The unit pricing will be apply based on the appropriate add/delete prices. Refer to Schedule 10 Appendix 1 [Data Drop – Definitions and Unit Pricing] of the Agreement.

7.8.10.2(14) The Design-Builder will supply and install additional Data Drops in excess of the minimum quantity to:

7.8.10.2(14)(a) Support all of the networks, systems and equipment to be installed or used in the Facility;

7.8.10.2(14)(b) Comply with any other provisions of this Agreement that require Data Drops; and

7.8.10.2(14)(c) Ensure there is one unused Data Drop for each TO installed in the Facility with the exception of those TOs associated with wall mounted telephones, intercom door stations, Multimedia Room control panels, IPVS cameras and access points.

7.8.10.3 Backbone Cabling Subsystem

7.8.10.3(1) Copper Backbone

7.8.10.3(1)(a) The Design-Builder will undertake the Design and Construction of a complete multi-conductor twisted pair Category 3 copper backbone in the Facility.

This includes the supply, installation, termination, testing and labelling of all components.

7.8.10.3(1)(b) The multi-conductor twisted pair Category 3 copper backbone supplied and installed by the Design-Builder will include such components as unshielded twisted pair cables (including tie cables), Gigabix termination equipment, cross-connect wire, patch panels and patch cords.

7.8.10.3(1)(c) This multi-conductor twisted pair Category 3 copper backbone will connect the MER to each TR in the Facility:

7.8.10.3.1.(c).1 The configuration of the copper backbone will be a hierarchical star topology where separate dedicated multi-conductor twisted pair Category 3 cables will be installed from the MER to each TR; and

7.8.10.3.1.(c).2 The pair count of each multi-conductor twisted pair Category 3 riser cable installed between the MER and each TR will be a minimum of twenty-five (25) pairs.

7.8.10.3(1)(d) This multi-conductor twisted pair Category 3 copper backbone will also include:

7.8.10.3.1.(d).1 The supply and installation of a 100 pair cable installed between the MER and the EF Room in the Facility; and

7.8.10.3.1.(d).2 The supply and installation of a 25 pair cable between the MER and each of the service pedestals allocated for the MMU.

7.8.10.3(2) Intra-Building Fibre Backbone

7.8.10.3(2)(a) The Design-Builder will undertake the Design and Construction of an intra-building fibre backbone in the Facility. This includes the supply, installation, termination, testing and labelling of all components.

7.8.10.3(2)(b) The intra-building fibre backbone supplied and installed by the Design-Builder will include such components as single mode and multimode fibre optic cables, high density patch panels, cassettes, connectors, patch cords and fibre management components.

7.8.10.3(2)(c) The type of fibre to be supplied and installed in the Facility is:

7.8.10.3.2.(c).1 Single mode – OS2 distribution fibre, tight buffer, all dielectric; and

7.8.10.3.2.(c).2 Multimode – OM5 distribution fibre, tight buffer, all dielectric.

7.8.10.3(2)(d) The configuration of the intra-building fibre backbone will be a hierarchical star topology where separate dedicated primary and secondary multimode and single mode fibre optic cables will be installed between the MER and each TR.

7.8.10.3.2.(d).1 Primary and secondary multimode and single mode fibre optic cables will be installed utilizing the physically route diverse backbone Communications Pathway System between the MER and each TR. Do not route primary and secondary fiber backbone cabling servicing a TR along the same floor level cable tray system;

7.8.10.3.2.(d).2 Minimum strand count for each primary and secondary multimode and single mode fibre optic backbone cabling subsystem running between the MER and each TR will be forty-eight (48) and will consist of multiple twenty-four (24) strand cables; and

7.8.10.3.2.(d).3 Refer to Section 7.8.22 for additional requirements for the DAS system.

7.8.10.3(2)(e) As part of the intra-building fibre backbone, the Design-Builder will also supply and install:

7.8.10.3.2.(e).1 A minimum of forty-eight (48) strands consisting of multiple twenty-four (24) strand cables of single mode and multimode fibre between the MER and the AHER;

7.8.10.3.2.(e).2 A minimum of twelve (12) strands of single mode fiber optic cable between the MER and each of the service pedestals allocated for the MMU; and

7.8.10.3.2.(e).3 A minimum of ninety-six (96) strands of single mode fibre comprised of twenty-four (24) strand fibre cables between the MER and the EF Room where 50 percent of the cables are placed in a physically diverse route with 20 m separation from the primary route used for the remaining cables.

7.8.10.3(2)(f) All fiber optic cable will be protected along its entire length either by employing interlocking armoured cable or inner duct.

7.8.10.3.2.(f).1 All fibre optic cable jackets including inner and outer jackets as well as inner duct are to be colour coded so the type of fibre can easily be identified. The accepted colour code standards are yellow for single mode and lime green for OM5 multimode; and

7.8.10.3.2.(f).2 Armoured fibre optic cable will be grounded in accordance with Section 7.8.7.

7.8.10.3(2)(g) All connectors, boots, cassettes, patch cords and cable assemblies employed are to be colour coded so the type of fibre can easily be identified. The accepted colour code standards are blue (connectors) and yellow (for cable) for single mode and lime green for OM5 multimode.

7.8.10.3(2)(h) The Design-Builder will supply and install:

7.8.10.3.2.(h).1 Eight (8) metres of slack on both ends of each fibre optic cable installed;

7.8.10.3.2.(h).2 Wire management in each Communications Room to manage fibre optic cable slack; and

7.8.10.3.2.(h).3 Angle bracket or cantruss structure to support the wire management rings in each Communications Room.

7.8.10.3(2)(i) All intra-building backbone fibre optic cables will be terminated using LC connectors unless noted otherwise.

7.8.10.4 MER Cabling

7.8.10.4(1) The Authority requires each server cabinet in the MER to be connected by primary and secondary copper and fiber tie cables in a route diverse manner to the line-up of equipment racks in the MER.

7.8.10.4(2) During the Design, the Authority will designate specific bays in the equipment rack line-up that will be the terminus for primary and secondary copper and fiber tie cables to each of the server cabinets in the MER.

7.8.10.4(3) The Design-Builder will provide each server cabinet with primary tie cables consisting of:

7.8.10.4(3)(a) Six (6) Category 6A cables; and

7.8.10.4(3)(b) A twelve (12) strand OM5 or Singlemode pre-term MPO trunk cable.

7.8.10.4(4) The Design-Builder will also provide each server cabinet with secondary tie cable consisting of:

7.8.10.4(4)(a) Six (6) Category 6A cables; and

7.8.10.4(4)(b) A twelve (12) strand OM5 or Singlemode pre-term MPO trunk cable.

7.8.10.4(5) The outer jackets of the fiber tie pre-term trunk cables will be colour coded in accordance with the standard set forth in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] and are not required to be armoured.

7.8.10.4(6) Terminate the server cabinet end of the fiber pre-term trunk cable into a 1U high density fiber patch panel using a twenty-four (2) port MPO to LC cassette.

7.8.10.4(7) Terminate the equipment rack end of the fiber pre-term trunk cable into a 4U high density fiber patch panel using a twenty-four (2) port MPO to LC cassette.

7.8.10.4(8) Provide sufficient slack and slack management to enable the fiber pre-term trunk ties cables to be re-located to any server cabinet by the Authority in the future.

7.8.10.4(9) The Design-Builder will test all pre-terminated product in accordance with Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] in addition to providing all cabling manufacturer’s factory test results.

7.8.10.5 Telecommunications Outlets

7.8.10.5(1) In this Agreement, the terms "telecom outlet”, “Telecommunications Outlet”, “workstation outlet”, “data outlet”, “Voice-Data Outlet”, “wireless outlet”, "wireless communication outlet" and "communications outlet" are used interchangeably.

7.8.10.5(2) Regardless of their name, all such outlets will be considered Telecommunications Outlets (TOs).

7.8.10.5(3) All TOs in the Facility will:

7.8.10.5(3)(a) Include a minimum of two Data Drops;

7.8.10.5(3)(b) Be accessible. TOs will not be obstructed and will be reachable using a maximum 2500 mm tall ladder unless otherwise approved by the Authority;

7.8.10.5(3)(c) Be located consistently in rooms that are exactly the same in terms of size and layout of all furniture,

Millwork and equipment unless specifically stated otherwise by the Authority;

7.8.10.5(3)(d) Be connected to the nearest cable tray or Communications Room (MER or TR) with conduit in accordance with Section 7.8.8. In the event the TO is located within a box of any kind (enclosure, backbox, junction box, pull box, etc.), it is the box that will be connected to the nearest cable tray or Communications Room (MER or TR) with conduit in accordance with Section 7.8.8;

7.8.10.5(3)(e) Maintain the proper bend radius of cable media installed; and

7.8.10.5(3)(f) Include a 4-port single gang cover plate with RJ45 jacks as required to terminate the supplied cabling, plus blank filler plates on unused ports unless otherwise specified by the Authority.

7.8.10.5(4) The Design-Builder will:

7.8.10.5(4)(a) Design each room and area in the Facility such that TOs are distributed throughout the room as required to support clinical and operational functionality and convenient use of equipment;

7.8.10.5(4)(b) Co-locate, at each TO location, an electrical outlet(s) with an appropriate quantity and type of receptacles for planned equipment such that external power bars are not required to augment the number of receptacles provided at the electrical outlet and or to provide surge protection;

7.8.10.5(4)(c) Protect TOs and associated cables, jacks, faceplates and labels from water, detergents, extreme temperature conditions, moisture, ultra violet exposure, dust, corrosive agents and all other hazards that could impact the operation, performance, connectivity and or lifespan of the TO and its component parts including the Category 6A cabling. The Design-Builder will achieve this protection through:

7.8.10.5.4.(c).1 Using materials that are suitable for the environment where the TO resides; and

7.8.10.5.4.(c).2 By supplying and installing NEMA enclosures that are appropriately rated to protect the TO.

7.8.10.5(4)(d) Supply and install Telecommunication Outlets in the ceilings of the Facility for all equipment including access points, antennas, beacons, transmitters, receivers, AV and multimedia equipment and all types of cameras. Specific installation method of the TOs located in the ceilings of the Facility will vary depending on the type of ceiling and location.

7.8.10.5.4.(d).1 Inaccessible ceilings - The TO box will be:

(d).1.1 Mounted above the finished ceiling for the termination of the Category 6A Data Drops;

(d).1.2 A minimum size of 100 mm x 100 mm x 54 mm with a 100 mm x 100 mm shoe box steel cover for a decora strap;

(d).1.3 Fastened directly to the ceiling's structural support member with a caddy clip and or screws no more than 305 mm above the access hatch opening;

(d).1.4 Accessible through the provision of an access panel with a minimum dimension of 305 mm x 305 mm. Access panels will be of high abuse security grade, Ligature Resistant, Tamper Resistant, and Vandal Resistant where required by the Authority; and

(d).1.5 Labelled in accordance with requirements in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications]. This includes the access panel.

7.8.10.5.4.(d).2 Accessible ceilings - The TO box will be:

(d).2.1 Mounted above the finished ceiling for the termination of the Category 6A Data Drops;

(d).2.2 A minimum size of 100 mm x 100 mm x 54 mm with a 100 mm x 100 mm shoe box steel cover for a decora strap;

(d).2.3 Fastened by the Design-Builder directly to the ceiling's structural support member with a caddy clip and or screws no more than 305 mm above the finished ceiling; and

(d).2.4 Labelled in accordance with requirements in the PHSA

Communications Infrastructure Standards and Specifications. This includes the ceiling grid or panel.

7.8.10.5.4.(d).3 Exposed or unfinished ceilings – Junction boxes will be:

(d).3.1 Mounted to the ceiling;

(d).3.2 A minimum size of 150 mm x 150 mm x 100 mm with a solid cover plate;

(d).3.3 Contain a Telecommunication Outlet that will consist of a two (2) port surface jack assembly located; and

(d).3.4 Labelled in accordance with requirements in Appendix 1M [PHSA Communications Infrastructure Standards and Specifications.

7.8.10.5(4)(e) In rooms and areas identified in Appendix 1N [Electrical and Communications Matrix] that have inaccessible ceilings, provide:

7.8.10.5.4.(e).1 A minimum 152 mm x 152 mm x 76 mm junction / pull box above the ceiling in a consistent location in each room / area connected to the cable tray by a 35 mm conduit; and

7.8.10.5.4.(e).2 An access panel directly below the junction / pull box that meets the requirements as set out in Section (d).1.4.

7.8.10.5(4)(f) Supply and install TOs in the ceiling plates of the Packaging and Assembly Area in the MDR;

7.8.10.5(4)(g) Supply and install TOs in the Emergency Generator Building Enclosure; and

7.8.10.5(4)(h) Supply and install floor boxes with TOs and power to meet all requirements specified in this Agreement including kiosks and Digital Wayfinding and Signage, AV and multimedia systems.

7.8.10.6 Patch Cords and Cross Connect Wire

7.8.10.6(1) The Design-Builder will supply and, where noted, install Category 6A multimode and single mode fibre patch cords as well as any copper cross connect wire jumpers of the correct length for all equipment in sufficient quantity to make each device, network and system in the Facility fully operational.

7.8.10.6(2) The Design-Builder will supply additional spare Category 6A patch cords in excess of the quantity required above. The formula

used to determine the quantity will be 2 x (10% x the total number of switch ports in the Facility at Substantial Completion). The variety of lengths of the spare patch cords will be provided to the Design-Builder by the Authority.

7.8.10.6(3) All Category 6A patch cords used in Communications Rooms will be 28 AWG stranded with an outer diameter less than or equal to 4.72 mm.

7.8.10.6(4) Design-Builder will supply four Category 6A patch cords for each TO associated with the Category 6A cabling grid (two for the access point and two for connection to the switch in the MER or TR).

7.8.10.6(5) The Design-Builder will supply additional spare multimode and single mode patch cords in excess of the quantity required above. The amount will be equal to twelve spare multimode and twelve spare single mode patch cords for each fibre patch panel installed in the Facility. The variety of lengths of the spare patch cords will be provided to the Design-Builder by the Authority.

7.8.10.6(6) In addition to the patch cords required for IM/IT networks, the Design-Builder will supply and install any additional patch cords necessary to support all of the other networks and systems to be installed or used in the Facility as required in this Agreement.

7.8.10.6(7) Meet all other stated requirements in the Appendix 1M [PHSA Communications Infrastructure Standards and Specifications].

7.8.11 IM/IT Data Network

7.8.11.1 The Authority will:

7.8.11.1(1) Design the IM/IT data network;

7.8.11.1(2) Provide, configure, activate and test the network equipment, required to provide direct connections between systems and equipment in the Facility and the IM/IT data network (this does not include network equipment required for independent systems with separate physical networks that are provided by the Design-Builder under this Agreement); and

7.8.11.1(3) Coordinate with Telecommunications carriers to deliver the services necessary for the IM/IT data network to function in the Facility.

7.8.11.2 The Design-Builder will:

7.8.11.2(1) Undertake the Design and Construction of all other communications infrastructure in the Facility required to support

the implementation of the Authority's IM/IT data network in accordance with the requirements stated in this Agreement;

7.8.11.2(2) Mount all Authority supplied network equipment in Communications Rooms in the Facility in accordance with instructions and documentation provided by the Authority. This includes the provision and installation of all mounting hardware as well as the connection of network equipment to the ePDUs installed in equipment racks and server cabinets;

7.8.11.2(3) Supply and install the materials and labour to physically connect all Authority supplied network equipment to the Facility's intra-building fibre backbone infrastructure in accordance with instructions and documentation provided by the Authority; and

7.8.11.2(4) Supply and install all patch cords required to connect Authority supplied network equipment to all systems and equipment requiring connectivity to the Facility's IM/IT data network in accordance with instructions and documentation provided by the Authority.

7.8.11.3 Network equipment and any other form of active component that is part of the permanent installation regardless of who is providing it will only be installed in the Facility's Communications Rooms when the room is considered Equipment ready by the Authority. A Communications Room will be considered Equipment ready by the Authority once the following conditions are met:

7.8.11.3(1) The Facility is enclosed and weather tight and its internal temperature and humidity conditions are approximately the same as final conditions expected;

7.8.11.3(2) The Communications Room construction and finishes are complete and the room is cleaned in accordance with Section 7.8.9.8;

7.8.11.3(3) The Category 6A horizontal cabling subsystem associated with the serving zone of a MER or a TR is tested in accordance with Appendix 1M [PHSA Communications Infrastructure Standards and Specifications]. All test results will be accepted by the Authority before a Communications Room is considered equipment ready;

7.8.11.3(4) The intra-building copper and fibre backbone cabling subsystem between the MER and a Communications Room is tested in accordance with Appendix 1M [PHSA Communications Infrastructure Standards and Specifications]. All test results will be accepted by the Authority before a Communications Room is considered equipment ready;

7.8.11.3(5) The cabling information for the horizontal cabling subsystem associated with the Communications Room is provided in the format prescribed by the Authority (know as the “TR spreadsheet”). The information in the “TR spreadsheet” will be used to map the relationship between an end use device or system that requires network connectivity and a network switch port and it is used as the means through which to configure network switches and to complete the patching in the Communications Room. This information is to be considered separate and distinct from the as-built documentation prescribed in Section 2.5.9.5(6) and it is to be provided fifteen (15) business days in advance of the Equipment ready date identified in the Design and Construction Schedule;

7.8.11.3(6) Telecommunications grounding and bonding infrastructure is completely installed and tested; and

7.8.11.3(7) All other electrical, mechanical and security infrastructure and systems associated with Communications Rooms are fully constructed and Commissioned as required in this Agreement. If necessary, the Design-Builder has the option to present temporary measures to the Authority that, if approved by the Authority, can exist for an interim period until the electrical, mechanical and security systems associated with the Communications Rooms are fully Commissioned.

7.8.11.4 Upon receipt of network equipment, the Design-Builder will be financially responsible for any damage or disappearance of Authority provided equipment due to improper handling and storage, negligence, fire, theft and environmental conditions until Substantial Completion is achieved. This includes any financial costs associated with impacts to the Design and Construction Schedule or to the Authority’s deployment schedule resulting from the loss of network equipment.

7.8.11.5 Completion of any outstanding work including the resolution of deficiencies that needs to occur in a Communications Room after network equipment has been installed will require the Design-Builder to submit a Work Plan.

7.8.12 IM/IT Wi-Fi Network

7.8.12.1 General Requirements

7.8.12.1(1) The IM/IT Wi-Fi network is a mission critical infrastructure and as such will be designed and installed to:

7.8.12.1(1)(a) Provide superior coverage, capacity and reliability, with a cabling infrastructure capable of supporting wireless services;

7.8.12.1(1)(b) Blend aesthetically with the environment while not impacting wireless performance;

7.8.12.1(1)(c) Protect wireless access points and external antennas from theft, vandalism, tampering, accidental damage and unauthorized moves and disconnects;

7.8.12.1(1)(d) Protect access points from adverse environmental conditions; and

7.8.12.1(1)(e) Permit convenient and authorized access to access points and cabling to simplify moves, adds and changes brought about by technological advancements, new wireless applications, alterations in the physical environment, and increased utilization over time.

7.8.12.1(2) In a wireless environment, network reliability is a function both of the level of user congestion (traffic loads) and service availability (interferences and coverage). In an effort to provide wireless reliability and performance to its end users, the Authority will not permit other wireless networks to operate in the Facility that cause interference and disruption to its IM/IT Wi-Fi network. If the Design-Builder installs a wireless system that interferes with the IM/IT Wi-Fi network in the Facility, the Design-Builder will have to turn it off and completely remove the interfering system and associated infrastructure that it installed and replace it with an alternative solution at any point up until the end of the Warranty period.

7.8.12.1(3) The Authority will:

7.8.12.1(3)(a) Design IM/IT Wi-Fi network. The Design of the IM/IT Wi-Fi network is largely dependent on the Design of the Facility. As such, the Design of the IM/IT Wi-Fi network will be iterative and commence once the Design-Builder can confirm that the shell and core of Facility is largely finalized. The final iteration of the Design of the IM/IT Wi-Fi network will be complete after the IFC submission is issued by the Design-Builder;

7.8.12.1(3)(b) Procure, configure and Commission all wireless network equipment required to make the IM/IT Wi-Fi network fully operational including access points, external antennas, controllers and other appliances;

7.8.12.1(3)(c) Provide centralized authentication and security appliances or latest equivalent to support the wireless network within the Facility;

7.8.12.1(3)(d) Procure and supply all standard vendor mounting brackets, lightning arrestors and accessories required to install wireless hardware;

7.8.12.1(3)(e) Conduct all predictive, active and passive wireless RF surveys necessary to determine access point placement and to validate and calibrate the wireless network to ensure all required technical parameters (coverage, SNR, etc.) are met; and

7.8.12.1(3)(f) Label and supply the Design-Builder with wireless access points, antennas, mounting brackets, lightning arrestors and other standardized hardware in accordance with the Design and Construction Schedule.

7.8.12.1(4) The Design-Builder will:

7.8.12.1(4)(a) Furnish the Authority with all Design documentation in the format requested by the Authority to complete a software based predictive Design of the IM/IT Wi-Fi network. This includes floor plans, reflected ceiling plans, elevation and section drawings, furniture and equipment layouts and information on building materials and finishes;

7.8.12.1(4)(b) Meet all requirements stated in Section 2.5.9 as it relates to:

7.8.12.1.4.(b).1 Identifying specific elements of the Wi-Fi Design on the construction drawings;

7.8.12.1.4.(b).2 Coordinating specific elements of the Wi-Fi Design on the construction drawings; and

7.8.12.1.4.(b).3 Updating the construction drawings to reflect changes to the Wi-Fi Design throughout the duration of the Project.

7.8.12.1(4)(c) Obtain, if required, a BC Building Code variance from the AHJ to ensure access points can be placed in stairwells to provide Wi-Fi coverage to the stairwell. Coverage in stairwells is essential for critical communications in the Facility and it is standard practice for the Authority to place access points in stairwell landings in all of its buildings.

7.8.12.1(4)(d) Minimize the risk of interference and ensure the proper operation of the Wi-Fi system by:

7.8.12.1.4.(d).1 Keeping all metal 1200 mm away from access points and placing no metal underneath access points. This includes pipes and

ducting (insulated or otherwise) and EMT conduits of all sizes. If this requirement is not achieved during Construction, the Design-Builder will be responsible to re-locate the metal infrastructure at no cost to the Authority; and

7.8.12.1.4.(d).2 Adequately spacing all RF emitting devices and antennas provided by the Design-Builder 1200 mm from access points to ensure sufficient isolation. If this requirement is not achieved during Construction, the Design-Builder will be responsible to re-locate its RF emitting device and antennas at no cost to the Authority.

7.8.12.1(4)(e) Undertake the Design and Construction of a Category 6A cabling grid for the IM/IT Wi-Fi network as per Section 7.8.12.2;

7.8.12.1(4)(f) Install Authority provided access points, external antennas and associated accessories and hardware as required by Section 7.8.12.3;

7.8.12.1(4)(g) Supply and install enclosures and other components as noted in Section 7.8.12.3;

7.8.12.1(4)(h) Provide adequate space and power outlets for wireless device charging stations inside each functional area of the Facility, taking in to account that charging stations with multiple devices may cause signal concentrations that impact wireless performance and capacity. Sufficient spread of charging stations will be maintained for both charging and storage areas so as not to impact operational performance of the Wi-Fi network. Refer to Section 7.7 Electrical (Division 26) for additional requirements.

7.8.12.1(4)(i) Provide the Authority and its representatives with all access to the Site as required to complete the Design and Construction of the IM/IT Wi-Fi network.

7.8.12.2 Category 6A Cabling Grid

7.8.12.2(1) Design-Builder will undertake the Design and Construction of cabling grid consisting of Category 6A Data Drops terminated in TOs throughout the Facility's ceiling spaces to connect Wi-Fi access points.

7.8.12.2(2) This Category 6A cabling grid will be considered as part of the horizontal cabling subsystem and, as such, its Design and Construction will conform to all requirements stated in Section 7.8.10 Structured Cabling.

7.8.12.2(3) The Category 6A cabling grid is defined as a collection of uniform cells where each cell is a square.

7.8.12.2(3)(a) The size of each square is 10 m x 10 m. The Authority permits Design-Builder to adjust the size of grid squares to 15 m x 15 m on the parking levels of the Facility only;

7.8.12.2(3)(b) TOs with two Category 6A Data Drops are to be supplied and installed by the Design-Builder in the ceiling spaces of the Facility at the centre of each square cell;

7.8.12.2(3)(c) Where only a portion of a square cell resides within the interior of the Facility (such as at the Facility's perimeter), a TO with two Category 6A Data Drops will still be supplied and installed by the Design-Builder in the interior of the Facility for that partial cell; and

7.8.12.2(3)(d) Refer to Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] for further design guidance on how to correctly layout a Category 6A cabling grid.

7.8.12.2(4) To ensure ubiquitous seamless Wi-Fi coverage for both the 2.4 GHz and 5.0 GHz frequency ranges, the Category 6A cabling grid supplied and installed by the Design-Builder will cover all rooms, areas and spaces within the Facility. This includes Utility rooms, (mechanical, electrical, elevator machine, Communications Rooms), interstitial floors, stairwells, parking levels, service links, bridges and tunnels.

7.8.12.2(5) At the Communications Room (MER or TR), the Category 6A Data Drops which comprise the cabling grid in a given serving zone will be terminated evenly across all patch panels to enable patching to different network switches.

7.8.12.2(6) Additional TOs over and above what is provided by the Category 6A cabling grid will be supplied and installed by the Design-Builder in:

7.8.12.2(6)(a) Large Multimedia Rooms in accordance with ANSI/TIA-4966 - Telecommunications Infrastructure Standard for Educational Facilities.

7.8.12.2.6.(a).1 Design-Builder is to install one additional TO equipped with two Category 6A Data Drops for every twenty-five (25) seats in a Multimedia Room; and

7.8.12.2.6.(a).2 The location of these additional TOs in Multimedia Rooms will be determined in consultation with the Authority through the Review Procedure.

7.8.12.2(6)(b) All elevator landings, (lobbies), and if permissible by code, in elevator shafts and cabs.

7.8.12.2(6)(c) All stairwell landings.

7.8.12.2(6)(d) On the exterior of the Facility and within the boundary of the Site to provide exterior Wi-Fi coverage to the property line.

7.8.12.2.6.(d).1 Exterior Wi-Fi coverage areas include patios, courtyards, roofs, pedestrian pathways, surface parking lots, MMU parking area, Loading Dock, Emergency Generator Building Enclosure and External Ambulance Canopy/Vehicle Bay;

7.8.12.2.6.(d).2 The location and quantity of TOs to be placed the exterior of the Facility and on the Site will be determined through the Authority's Design of the IM/IT Wi-Fi network; and

7.8.12.2.6.(d).3 The location and quantity of TOs to be placed on the street light poles of the site will be determined through the Authority's Design of the IM/IT Wi-Fi network. The Design-Builder will allow for 50 percent of the street light poles to be cabled with the composite powered fiber system.

7.8.12.2(7) To enable Wi-Fi access points and other network connected devices (such as IPVS camera) to be installed on streetlight poles the Design-Builder will ensure a minimum of 50 percent of the new street light poles installed on the Site are serviced with the composite fiber system as well as:

7.8.12.2(7)(a) Connected to the nearest communications cable tray in the Facility through a dedicated underground Communications Pathway System. Refer to Section 7.8.8 for requirements; and

7.8.12.2(7)(b) Provided with:

7.8.12.2.7.(b).1 Separate composite fiber cabling and power necessary for media converters, for each of

the exterior Wi-Fi access point and IPVS cameras;

7.8.12.2.7.(b).2 Weatherproof grommets inserted into the pole as required for cabling to the exterior Wi-Fi access point and IPVS camera;

7.8.12.2.7.(b).3 A means inside the length of the pole to isolate street light conductors from cabling to the exterior Wi-Fi access point and IPVS camera;

7.8.12.2.7.(b).4 Handholds with a removable raintight cover with theft-proof bolt;

7.8.12.2.7.(b).5 Ground bolt and bond accessible from a handhole; and

7.8.12.2.7.(b).6 A lockable 200 mm x 400 mm x 200 mm box for communications equipment made of a suitable material to install into the base of the pole. This box is to be connected to the underground Communications Pathway System and to the electrical box co-located in the base of the pole.

7.8.12.3 Wi-Fi Network Equipment, Components and Enclosures

7.8.12.3(1) Design-Builder will install all wireless network equipment (access points, external antennas and associated accessories and hardware) as prescribed in the Authority's Design of the IM/IT Wi-Fi Network.

7.8.12.3(2) Wireless network equipment provided to Design-Builder for the interior of the Facility will not be installed until:

7.8.12.3(2)(a) The Facility is enclosed, weather tight, temperature and humidity conditions are approximately the same as final conditions expected; and

7.8.12.3(2)(b) Category 6A cabling grid is installed and tested.

7.8.12.3(3) The Design-Builder will not be permitted to install wireless network equipment until the Authority has inspected the interior conditions of the Facility and provided written approval to proceed with the installation.

7.8.12.3(4) Prior to receipt of wireless network equipment for installation, the Design-Builder will provide the Authority with as-built documentation of the Category 6A cabling grid identifying the cable IDs associated with each TO.

7.8.12.3(5) Upon receipt of wireless network equipment, the Design-Builder will be financially responsible for any damage or disappearance

of Authority provided equipment and associated materials due to improper handling and storage, negligence, fire, theft and environmental conditions until Substantial Completion. This includes any financial costs associated with impacts to the Design and Construction Schedule or to the Authority's deployment schedule resulting from the loss of wireless network equipment.

7.8.12.3(6) The Design-Builder will:

7.8.12.3(6)(a) Seismically restrain all access points and wireless components;

7.8.12.3(6)(b) Install and label two patch cords between each access point and it's designated TO as specified in the Authority's Design of the IM/IT Wi-Fi network;

7.8.12.3(6)(c) Supply and install lightning arrestors and associated grounding on all outdoor access points;

7.8.12.3(6)(d) Supply, install and label an indoor/outdoor NEMA rated access point enclosures to protect wireless network equipment from the environment, theft or vandalism in the parking levels and other areas inside and outside the Facility and on the Site as specified by the Authority.

7.8.12.3.6.(d).1 Enclosures will be UV stabilized for exposure to directly sunlight, virtually transparent to wireless signals and work with all variations of Authority provided wireless network equipment;

7.8.12.3.6.(d).2 Enclosures provided will come with locking hardware; and

7.8.12.3.6.(d).3 The Design-Builder, if requested, will provide samples of the enclosure to Authority for RF testing purposes and to check for interoperability with wireless network wireless network equipment.

7.8.12.3(6)(e) Supply, install and label ceiling (hard cap and tile) enclosures to house wireless network equipment in areas of the Facility where the Authority identifies a high risk to Patient and Staff safety. These enclosures will hide wireless equipment from view and prevent unauthorized access to the access point and the connecting cabling.

7.8.12.3.6.(e).1 Enclosures will be high abuse security grade, Ligature Resistant, Tamper Resistant, and Vandal Resistant;

7.8.12.3.6.(e).2 Enclosures provided will come with locking hardware;

7.8.12.3.6.(e).3 Enclosures will work with all variations of Authority provided wireless network equipment, allow RF transmissions to penetrate with little or no attenuation and match the surrounding ceiling colour; and

7.8.12.3.6.(e).4 The Design-Builder, if requested, will provide samples of the enclosure to Authority for RF testing purposes and to check for interoperability with wireless network equipment.

7.8.12.3(6)(f) Supply, install and label electrical boxes of suitable dimensions that are approved by the Authority for mounting wireless network equipment in areas inside the Facility that have exposed ceilings (where an enclosure is not required by the Authority);

7.8.12.3(6)(g) Supply and install in all inaccessible and exposed ceilings, the conduits necessary to connect:

7.8.12.3.6.(g).1 Enclosures and electrical boxes either supporting or containing wireless network equipment to access hatches or boxes containing a TO (designated by the Authority to be used to connect wireless equipment); and

7.8.12.3.6.(g).2 Enclosures and boxes either supporting or containing wireless network equipment to enclosures and boxes containing or supporting external antennas.

7.8.12.3(6)(h) Supply and install coloured vanity skins or covers for wireless network equipment where required by the Authority for aesthetic reasons;

7.8.12.3(6)(i) Supply and install specialized or customized mounts and brackets to install and or suspend wireless network equipment;

7.8.12.3(6)(j) Take full responsibility (including cost) for all alterations in the Design and Construction of the Facility required to install any aspect of the wireless infrastructure;

7.8.12.3(6)(k) Move and or install new wireless network equipment as prescribed by the Authority after

completion of pre and post occupancy wireless surveys. This includes:

7.8.12.3.6.(k).1 Supply and installation of all patch cords;

7.8.12.3.6.(k).2 Supply and installation of all conduits, sleeves, firestopping, boxes and enclosures; and

7.8.12.3.6.(k).3 In the event of a move, replacement of ceiling tiles and repair of walls and ceilings where necessary.

7.8.13 IM/IT Voice Network

7.8.13.1 The voice network and infrastructure in the Facility will be equipped to provide VoIP, analog, fax and public access services through the Authority's own PBX.

7.8.13.2 The Authority will:

7.8.13.2(1) Coordinate with Telecommunications carriers to deliver the services and capacity required to connect the Facility to the PSTN directly through the Authority's PBX; and

7.8.13.2(2) Provide dial tone, voice mail and related features to systems and equipment in the Facility.

7.8.13.3 The Design-Builder will:

7.8.13.3(1) Undertake the Design and Construction of all other communications infrastructure in the Facility required to support the implementation of the Authority's IM/IT voice network in accordance with the requirements stated in this Agreement; and

7.8.13.3(2) Provide the materials and labour required to cross-connect and patch all VoIP, analog, fax and public access lines in the Facility in accordance with instructions and documentation provided by the Authority.

7.8.14 IM/IT Equipment

7.8.14.1 The requirements and responsibilities relating to IM/IT Equipment are as described in Appendix 1J [Equipment List IM/IT].

7.8.15 Multimedia Infrastructure and Systems

7.8.15.1 Multimedia Rooms

7.8.15.1(1) Multimedia AV systems and equipment will be located in Multimedia Rooms throughout the Facility. The more stringent acoustic and finishes requirements for Multimedia Room Design and Construction described herein are necessary in order to enable accurate capture and playback of audio and video signals

free from distortion, while preventing acoustic or visual interference in and from adjacent rooms or spaces.

7.8.15.1(2) Types of Multimedia Rooms. In general, there are six (6) types of Multimedia Rooms used for multimedia capture and playback in the Facility:

7.8.15.1(2)(a) Type 1 - Video Conference / Virtual Enabled Rooms: Used for video conferencing utilizing a Hard and Soft Codec (to support both PHSA and FHA video conferencing standards) and presenting material from a laptop or other portable device onto Ultra HD digital display monitors for collaborative meetings and presentations. Participants will be able to easily connect and display audio and video content from a laptop, mobile device, or in-room PC on to a permanently installed AV system.

7.8.15.1(2)(b) Type 2 – Meeting Room – EOC: A 20 seat flexible meeting room with the capabilities of a Type 1 Room plus additional technologies that enables the room to function, in the event of an emergency, as an EOC where furniture and equipment layouts will change to accommodate emergency response situations.

7.8.15.1(2)(c) Type 3 – Command Centre: Will enable the Authority to view multiple Clinical Information Systems, Building, Communications and Security systems as well as video and computer graphic dashboards on a DVLED video display wall. The video display wall will accept multiple soft capture and baseband inputs and allow users to switch video and graphics layouts on the fly using a touch panel. Desktops will have a dedicated console for changing layouts as well.

7.8.15.1(2)(d) Type 4A –Virtual Health: Rooms where clinical Staff will engage in Virtual Health discussions with Patients and or other health care practitioners using the phone or video calls.

7.8.15.1(2)(e) Type 4B – Virtual Health Mobile Solution: Rooms where Virtual Health mobile devices will be employed to facilitate point to point video conferences from the Facility to a remote Patient and or other health care practitioners.

7.8.15.1(2)(f) Type 5A – Clinical Education Viewing: There are multiple clinical education viewing rooms where Source Camera live streams are viewed. These rooms will use decoding hardware to decode and display the encoded live stream from any Type 5B - Source Camera used.

7.8.15.1(2)(g) Type 5B – Clinical Education Source Camera: There are multiple clinical rooms equipped with PTZ cameras and microphones that are used by the Authority as a source room for internally televising procedures for the purposes of training and education via a clinical education camera system.

7.8.15.1(2)(h) Type 6 – UBC FoM - Videoconference/Seminar Room: The Design and Construction of this room will adhere to the Appendix 1T Part A [UBC FoM Design Guidelines and Functional Requirements for Learning Spaces: Small Seminar Rooms].

7.8.15.1(2)(i) The Multimedia Rooms quantities and locations are identified in Appendix 1K [Multimedia Room Matrix].

7.8.15.2 Multimedia Scope

7.8.15.2(1) The Authority is responsible for:

7.8.15.2(1)(a) Identifying the typical number of seats and table layouts required for Multimedia Rooms and Spaces. This will determine sightlines to Ultra HD digital display monitors and/or cameras, monitor sizes, and connectivity requirements to electrical and data connections in floor boxes. The number of seats in Multimedia Rooms only refers to that number of seats required for typical use as a Multimedia Room, not the maximum occupancy of the space. In cases where a Multimedia Room is used for non-multimedia purposes such as when tables are removed, and additional chairs are brought in the actual occupancy figures and heat loads will be greater;

7.8.15.2(1)(b) Describing mounting requirements and other functional and aesthetic considerations for installing Ultra HD digital display monitors, cameras, microphones, speakers, amplifiers, control devices and other related multimedia equipment;

7.8.15.2(1)(c) Providing tables and seating for all Multimedia Rooms as described in Appendix 1H [Equipment and Furniture];

7.8.15.2(1)(d) Providing and installing desk phones, wall phones, speaker phones, or conference phones deployed in Multimedia Rooms as listed in Appendix 1J [Equipment List IM/IT];

7.8.15.2(1)(e) Providing and installing a in-room computer, keyboard and mouse in those Multimedia Rooms that require such a computer as listed in Appendix 1J [Equipment List IM/IT];

7.8.15.2(1)(f) Providing and installing Virtual Health equipment in Type 4 Rooms;

7.8.15.2(1)(g) Providing digital signage display screens, brackets and PCs/digital signage player other than for Digital Wayfinding to the Design-Builder for subsequent installation and inter-connection in those rooms or spaces where digital signage is to be functional at Substantial Completion; and

7.8.15.2(1)(h) The Authority will observe the Design-Builders testing and Cx and integration of the multimedia systems to verify compliance, and to then participate further with performance verifications including testing connections with other external VC facilities and endpoints.

7.8.15.2(2) The Design-Builder is responsible for:

7.8.15.2(2)(a) The Design and Construction of the Multimedia Rooms incorporating the requirements, dimensions, layouts, materials and finishes that the Authority has described herein;

7.8.15.2(2)(b) The supply and installation of a videoconference leader's desk in the Meeting Room - EOC and all Multimedia Rooms that are 30 NSM or larger and or have a seat count of thirty (30) or greater;

7.8.15.2(2)(c) Providing all multimedia equipment required to provide a complete solution including display monitors, AV network elements (switches, routers, etc.), speakers, microphones, signal amplification and digital signal processing equipment, systems computers, controls, software licensing and license keys and related cabinets or racks and the wiring

and hardware components necessary in order to provide complete AV and VC systems for Type 1, 2, 3, 5A and 5B Multimedia Rooms, and the installation, integration, configuration and testing of that equipment;

7.8.15.2(2)(d) The installation and inter connection of digital signage components including display screens, brackets and PCs/digital signage players that are procured by the Authority and supplied to Design-Builder for installation;

7.8.15.2(2)(e) Ensuring that the equipment provided and installed matches, meets or exceeds the Authority's latest types and standards for multimedia equipment at the time of procurement;

7.8.15.2(2)(f) Providing clinical UPS power to:

- 7.8.15.2.2.(f).1 The complete DVLED video wall solution in the Type 3 Command Centre with the exception of any active components that are installed within Communications Rooms (which will be connected to the IM/IT UPS);
- 7.8.15.2.2.(f).2 All active AV components supporting the Multimedia systems in the Type 2 Meeting Room – EOC and in Multimedia Rooms 30 NSM or larger; and
- 7.8.15.2.2.(f).3 AV network switches, control processors, Codecs and DSPs situated inside other types of Multimedia Rooms.

7.8.15.2(2)(g) The supply and installation of all wiring, connection cables, patch cables, multi-cable extension snakes, connectors, terminals, mounting brackets, fasteners, labels, hardware and accessories required for installing, interconnecting and operating the AV equipment in Multimedia Rooms;

7.8.15.2(2)(h) Providing adequate space and TOs and power outlets for all multimedia components such that external power bars are not required to augment the number of receptacles provided at the electrical outlet and or to provide surge protection;

7.8.15.2(2)(i) Providing floor boxes in Multimedia Rooms

- 7.8.15.2.2.(i).1 Minimum acceptable standard is the Legrand Wiremold Evolution Series;
- 7.8.15.2.2.(i).2 Provide six (6), eight (8) or ten (10) gangs to meet the requirements of the Design and to

accommodate future growth and technology change;

7.8.15.2.2.(i).3 The top of the floor box including the hinged cover will be flush with the finished floor and be capable of being removed without damaging the flooring in the room; and

7.8.15.2.2.(i).4 Covers will have:

(i).4.1 A durable finish that is scratch resistant and suitable for high traffic areas such as travel pathways or under moveable furniture;

(i).4.2 Flooring inserts which match the adjacent floor finish in the room; and

(i).4.3 Cable exit shutters that open horizontally so that they do not protrude above the floor and present a tripping hazard when in use.

7.8.15.2(2)(j) Providing AV wall boxes of a type acceptable to the Authority in all Multimedia Rooms;

7.8.15.2(2)(k) The complete installation, interconnection, testing and Cx by qualified AV contractors of all hardware, components and materials and controls that form the multimedia systems. This will include proper adjustment and calibration of audio levels and signal processing settings and other adjustments necessary to optimize the intelligibility of audio capture and playback and optimize the quality of video capture and display;

7.8.15.2(2)(l) Configuring VC hardware in Type 1, 2, 3, 5A and 5B Multimedia Rooms in consultation with the Authority;

7.8.15.2(2)(m) Providing the Authority and its representatives with access to the Multimedia Rooms so that they may conduct inspections during construction, observe the Commissioning, and to ultimately participate in the verifications of multimedia equipment and systems;

7.8.15.2(2)(n) Provide service training to the Authority’s technical Staff including wiring routes and interconnections, means of access to junction boxes, mounts and related multimedia infrastructure and the removal and replacement procedures for all components;

7.8.15.2(2)(o) Delivering a working uncompiled copy of the code changes related to customized GUI template programming for the Crestron control panels; and

7.8.15.2(2)(p) Providing any and all codes, passwords, module passwords and configuration settings for equipment that the Design-Builder installs.

7.8.15.3 Design Guidelines for Multimedia Rooms

7.8.15.3(1) The Design-Builder will coordinate with the Authority to ensure Multimedia Rooms are designed to support the technology, performance and services required.

7.8.15.3(2) Multimedia Rooms will not be situated in areas in the Facility at risk from plumbing or drainage failures or adjacent to sources of high humidity. Water supply lines, waste, hydronic, drain lines and any other form of fluid system piping are not to traverse Multimedia Room ceilings with the exception of sprinkler lines specifically necessary to provide protection within the room.

7.8.15.3(3) No aspect of the PTS (stations, diverter units, tubes, etc.) will reside in (including the walls) or transit through the ceilings of Multimedia Rooms.

7.8.15.3(4) The Design of Multimedia Rooms will facilitate operational flexibility through the provision of appropriately located connection boxes in floors, walls and ceilings that distribute data, audio, video, controls and communications signals, and electrical power throughout the room.

7.8.15.3(5) Shafts will not be placed inside Multimedia Rooms nor will shafts be permitted to be accessed from Multimedia Rooms. If a shaft is placed adjacent to a Multimedia Room then it must be separated by a rated acoustic wall that complies fully with Section 7.8.15.3(14)(a).

7.8.15.3(6) The Design of Multimedia Rooms including the quantity and location of floor boxes will allow furniture to be relocated to facilitate various operational configurations.

7.8.15.3(7) Walls will be suitably reinforced in locations where Ultra HD digital display monitors, cameras, microphones, amplifiers and speakers will be mounted, and ceilings will be suitably reinforced in those locations from which such items will be hung or suspended.

7.8.15.3(8) Any Multimedia Room that contains an operable partition will be equipped with automatic partition sensor approved by the Authority that will trigger the Crestron system to automatically

present the user with a different GUI to control the room when combined or divided. When the rooms are combined the BMS and multimedia controls will automatically operate both rooms as one, with the larger room's Crestron controller acting as master for both rooms.

7.8.15.3(9) Adjoining rooms will be carefully analysed to detect and then prevent the causes and or mitigate any effects of structural-borne vibration. Ultra HD cameras have a low tolerance for vibration, and the problem is compounded when using zoom lenses. Camera mount locations that have a detectable vibration will use additional physical isolation measures and damping materials to stabilize the image. Cameras cannot be mounted on walls adjacent to elevator shafts to reduce vibration;

7.8.15.3(10) Standalone in-room controls for Building Systems and AV systems will not be deployed Multimedia Rooms. Refer to Section 7.8.15.3(21) for additional requirements.

7.8.15.3(11) In addition to the clock display on Crestron panels, all Type 1, 2, 3, 5A and 6 Multimedia Rooms require a wall mounted clock that will not have reflective properties detrimental to the camera glare from lighting, poor readability) nor LED elements that cause video banding issues or flicker in the video stream.

7.8.15.3(12) Whiteboards with glossy finishes are not to be used in any Multimedia Room.

7.8.15.3(13) Non-reflective whiteboards in Type 1, 2, 3, 5A and 6 Multimedia Rooms will be located in a position that can be seen by the videoconference camera.

7.8.15.3(14) Acoustics and Noise Abatement Requirements – Type 1, 2 ,3, 5A and 6 Multimedia Rooms

7.8.15.3(14)(a) Rated acoustic walls will be constructed to minimize unwanted acoustic transfer. Walls will be composed of double steel stud rows containing mineral fibre acoustic batt insulation with double sheeted gypsum board on each side of the double stud rows and a 25mm air gap.

7.8.15.3(14)(b) Refer to Appendix 1D [Acoustic, Vibration, and Noise Control Measures] for further requirements.

7.8.15.3(14)(c) Reverberation time is not to exceed 0.5 seconds in the mid and high frequencies. The Design-Builder will provide a report demonstrating that this requirement is met when the room is unoccupied.

7.8.15.3(14)(d)	Partition walls and ceiling will provide the same degree of sound control through each component of the assembly. When a partition is used for sound isolation extend the sound control construction from slab to slab.
7.8.15.3(14)(e)	Direct contact between the wall lining board and floor finish will be prevented, to reduce vibration transfer. Wall plasterboard will be stopped 5 mm above the floor and the resulting gap filled with acoustic sealant.
7.8.15.3(14)(f)	Air paths through walls are not permitted. Vents and grilles will not be installed in rated acoustic walls and device boxes are not to be installed "back-to-back" but will be separated by at least one stud space.
7.8.15.3(14)(g)	Joints in successive layers of drywall will be staggered. Any gaps will be sealed with acoustic sealant.
7.8.15.3(14)(h)	Rubber floors are required for reasons of infection control and to reduce impact noise within the space (footsteps, chair scraping, etc.). Ceiling and wall acoustic treatment will be increased to maintain the 0.5 second reverberation time in Multimedia Rooms, compensate for the reflective floor finish and to maintain the maximum allowable 0.5 second reverberation time.
7.8.15.3(14)(i)	Ceilings will not be constructed of hard, acoustically reflective material. Acoustic ceiling tiles with a minimum NRC of 0.95 are required.
7.8.15.3(14)(j)	Acoustic wall panels will be installed on at least two adjacent walls in Type 1, 2, 3, 5A and 6 Multimedia Rooms having eight (8) or more seats to eliminate echo, reverberation and flutter. Install washable acoustic wall panels that meet the Authority’s infection control requirement. Acoustic panels will be mounted starting 1m AFF and continue to ceiling.
7.8.15.3(14)(k)	Noise control measures will be undertaken to minimise ingress of noise from outside. The noise floor for Type 1, 2 ,3, 5A and 6 Multimedia Rooms is NC-25 with an acceptable maximum of NC-30.

7.8.15.3(14)(l) The interior noise levels of Type 1, 2, 3, 5A and 6 Multimedia Rooms (LA90 15 minute) due to exterior sources will not exceed noise levels of NC 25-30, dBA 30-35.

7.8.15.3(14)(m) Utilize methods such as physical separations, insulated cavities, and other suitable noise and vibration mitigation measures in floors and ceilings to ensure noise and vibration associated with mechanical, electrical and other equipment does not negatively impact Type 1, 2, 3, 5A and 6 Multimedia Rooms.

7.8.15.3(14)(n) Utilize vibration isolation methods and flexible, non-rigid, connectors on all mechanical, electrical and other equipment adjacent to Type 1, 2, 3, 5A and 6 Multimedia Rooms to control airborne and structure borne noise and vibration.

7.8.15.3(14)(o) Any Type 1, 2, 3, 5A and 6 Multimedia Rooms that contain operable partitions will meet the specific acoustic requirements for each room when the partition is closed. When the rooms are combined the more stringent requirement (if they are different) applies to the entire room.

7.8.15.3(14)(p) The operable partition wall will have a rating of STC 55 or higher.

7.8.15.3(14)(q) Sounding masking will not be employed as an alternative to meeting the acoustic requirements or performance levels identified in this Agreement.

7.8.15.3(14)(r) Post-construction acoustic performance verification tests will be performed as detailed in Section 5.6.22.

7.8.15.3(15) Multimedia Room Finishes

7.8.15.3(15)(a) Acceptable wall colours for Multimedia Rooms are pale gray or blue with an eggshell finish or acceptable alternative colours suitable for use in video production as approved by the Authority. Semi-gloss finishes are permitted on door and window frames only.

7.8.15.3(15)(b) Acceptable finish colours for the tops of desks, tables, Millwork and other work surfaces provided by the Design-Builder in rooms with cameras are to be white, off white, or pale gray to allow light to

bounce off the surface and reflect upward. This helps to illuminate the faces of the presenters, eliminate dark shadows under the chin/nose, and maintain contrast ratios when white paper is moved. Wood surfaces will be light maple or alternative as approved by the Authority but will not have a gloss finish.

7.8.15.3(15)(c) Solid colours will be used, not stripes or patterns, to prevent adding unnecessary bandwidth to video capturing and transmission.

7.8.15.3(16) Multimedia Room Doors

7.8.15.3(16)(a) All Multimedia Rooms will utilize a card access system via a swipe or proximity card system that is capable of providing an audit trail of activities.

7.8.15.3(16)(b) Door secure status will be monitored with door position switches connected to the Facility's security system.

7.8.15.3(16)(c) Any glazing on Multimedia Room doors will be minimal in size and requires blackout integral blinds.

7.8.15.3(16)(d) Type 1, 2, 3, 5A and 6 Multimedia Room doors will have a STC rating of STC45 or better when tested as a complete unit (door slab, glass, perimeter seals, and frame).

7.8.15.3(16)(e) Type 1, 2, 3, 5A and 6 Multimedia Room doors will be fitted with effective acoustic seals on top and sides, and door bottom sweeps or drop seals.

7.8.15.3(17) Multimedia Room Window Treatments

7.8.15.3(17)(a) All exterior windows in Multimedia Rooms require that 90% or better blackout shades are non-reflective acoustically and visually.

7.8.15.3(17)(b) Blackout shades will utilize side rails/tracks to ensure no light leakage between panels.

7.8.15.3(17)(c) Blackout shades on exterior windows in Multimedia Rooms with twelve (12) or more seats will be electrically deployed shades.

7.8.15.3(17)(d) Controls for will be electrically deployed shades in Multimedia Rooms will be via the Crestron control panel.

7.8.15.3(17)(e) Electrically deployed shades will employ an ultra quiet reliable long life brushless motor equivalent to Crestron's Digital Quiet Motor Technology for nearly imperceptible operation to control the movement of the shade, keep track of the shade's position, and adjust the shade to the user's desired pre-set positions.

7.8.15.3(17)(f) The electrically deployed shade motor will be connected to a control processor or control module inside the room utilizing Cresnet or equivalent wired communications. Use of wireless communications for electrically deployed shade control is not acceptable.

7.8.15.3(17)(g) Interior window glazing in the walls of Multimedia Rooms will not be permitted. This includes sidelights adjacent to doors.

7.8.15.3(18) Electrical and Communications Requirements

7.8.15.3(18)(a) Lighting Requirements

7.8.15.3.18.(a).1 Lighting will provide an evenly lit space with minimal glare and shadowing. LED lamp technology will be used to reduce maintenance and energy costs.

7.8.15.3.18.(a).2 Colour temperature in Multimedia Rooms will be 3500K suitable for video production.

7.8.15.3.18.(a).3 Achievable light levels in Multimedia Rooms will be 80-foot candles measured 1 metre above the floor with a minimum of 50-foot candles of horizontal illuminance and 30-foot candles of vertical illuminance.

7.8.15.3.18.(a).4 Dimming controls will be provided for each Multimedia Room. All lighting circuits, fixtures and luminaires will be dimmable. Dimming will be lineal and smooth, not stepped, from 100 percent down to 1 percent.

7.8.15.3.18.(a).5 Lighting controls in all Type 1, 2, 3, 5A and 6 Multimedia Rooms will be via a Crestron panel, programmed with multiple lighting scenes, and connected to an occupancy sensor.

7.8.15.3.18.(a).6 Lighting fixtures closest to Ultra HD digital display monitors in Multimedia Rooms will be

on a separate control so that they can operate independently of other lighting circuits in the room. All lighting fixtures will be located so as to provide even coverage to desktop and faces while eliminating light spill washout on Ultra HD digital display monitors and camera lens glare.

7.8.15.3.18.(a).7 Minimum of three (3) lighting zones will be provided:

(a).7.1 Display device lighting within one (1) meter of the display devices;

(a).7.2 Wall wash lighting; and

(a).7.3 Participant and ceiling lighting.

7.8.15.3.18.(a).8 Multimedia Rooms with eight (8) or more seats require dimmable wall washers.

7.8.15.3.18.(a).9 A separate key light will be provided for a prime presenter location in Multimedia Rooms with twelve (12) or more seats.

7.8.15.3.18.(a).10 Lighting in Type 1, 2, 3, 5A and 6 Multimedia Rooms will have multiple pre-set scenes that provide varied lighting conditions that support meetings, televised interviews, AV presentations, video conferencing and non-AV related activities. Pre-sets will include:

(a).10.1 All on;

(a).10.2 All off;

(a).10.3 Receiving; and

(a).10.4 Presenting.

7.8.15.3.18.(a).11 Lighting controls will be integrated with the equipment controls and Crestron control panels in the rooms so that the lighting can vary to suit different activities.

7.8.15.3.18.(a).12 Lighting controls in Multimedia Rooms will be interfaced to the BMS to enable monitoring and overrides necessitated by fire alarms or forced evacuations.

7.8.15.3.18.(a).13 Design-Builder will submit a photometric map for each individual Multimedia Room during each Design stage.

7.8.15.3.18.(a).14 Lighting design in Multimedia Rooms will also comply with requirements in Division 26.

7.8.15.3(18)(b) Floor Box power and data. Floor boxes will be proportionally spaced for ease of access beneath the meeting room tables in Type 1, 2, 3 and 5A rooms. Each floor box to contain 2 x 120v duplex receptacles, 2 powered USB charging outlets and a Telecommunication Outlet. Provide one (1) such

floor box for every four (4) end-user seats except for the Type 2 Meeting Room – EOC, Type 3 Command Centre which will have one such floor box for every end-user seat.

7.8.15.3(18)(c) Four (4) duplex outlets per wall (16 total) will be required in each Multimedia Room.

7.8.15.3(19) Mechanical Requirements

7.8.15.3(19)(a) Room specific temperature zoning will be provided for each of the Type 1, 2, 3, 5 and 6 rooms and for both sections of a room of a room equipped a moveable partition. HVAC control for Multimedia Rooms with Crestron panels will be by the in-room Crestron panel.

7.8.15.3(19)(b) Long-term ambient room temperature target for these VC rooms to operate in is 21 degrees Celsius with a relative humidity level of 30-50%.

7.8.15.3(19)(c) Maximum short-term (1 hour) sustainable ambient temperature for these rooms is 24 degrees Celsius with a relative humidity level of 30-50%.

7.8.15.3(19)(d) The Design and Construction of the Facility will be such that noise from the mechanical systems does not exceed the levels of NC 25-30, dBA 30-35, within Multimedia Rooms.

7.8.15.3(19)(e) HVAC diffusers will be selected for low noise properties and will not vibrate or rattle. Dampers will not be placed within 3 metres of diffusers. Ducts in Multimedia Rooms will be lined with duct liner.

7.8.15.3(19)(f) Mechanical, electrical and other equipment that makes or emits noise will not be installed in Multimedia Room ceilings.

7.8.15.3(20) Security Requirements

7.8.15.3(20)(a) The Design-Builder will supply and install a card access system on Multimedia Room doors.

7.8.15.3(20)(b) The display mounts require a padlock secured via a 4-digit combination lock.

7.8.15.3(20)(c) The camera, VC hardware and touch panel require a 4-digit combination T-Lock style laptop cable lock.

7.8.15.3(21) Automation Requirements

7.8.15.3(21)(a) The Design-Builder is responsible for:

7.8.15.3.21.(a).1 Providing in-room Crestron touch screen control panels and associated controllers and interface units for:

(a).1.1 BMS, Lighting Control, Blind Control and AV control in all Type 1, 2, 3 and 5A Multimedia Rooms and the integration of the Crestron panels with other systems and devices as described herein;

(a).1.2 BMS, Lighting Control, and Blind Control Type 6 Multimedia Rooms and the integration of the Crestron panels with other systems and devices as described herein; and

(a).1.3 AV Control Type 5B Multimedia Rooms and the integration of the Crestron panels with other systems and devices as described herein.

7.8.15.3.21.(a).2 Designing the Crestron graphics and programming the Crestron control panels and ensuring their customized display graphics match the Authority's standards and meet the operational requirements for such controls;

7.8.15.3.21.(a).3 Providing remote interface controls software (such as Xpanel, HTML5 or equivalent) and the associated programming and integration of this networked software with:

(a).3.1 BMS for HVAC;

(a).3.2 Lighting Control;

(a).3.3 Clock system;

(a).3.4 Fire Alarm system; and

(a).3.5 Electrically deployed shades.

7.8.15.3(21)(b) In the event of an emergency situation or Fire Alarm condition, all lighting will function at full brightness (full on), electrically deployed shades will fully open, all audio will mute and all video will be turned off in all Multimedia Rooms and rooms with supplementary sound systems;

7.8.15.3(21)(c) When the rooms are combined the BMS and multimedia controls will automatically operate both rooms as one, with the larger room's Crestron controller acting as master for both rooms;

7.8.15.3(21)(d) Controls for hardware in Multimedia Rooms will not be infrared based where hardwired or control-over-

IP options are available. A hardwired feedback loop system that provides device status to the control panel, such as RS-232, Ethernet/LAN or similar will be used if available;

7.8.15.3(21)(e) For the Type 6 Multimedia Room, one touch panel will be used and programming of room control buttons will be in conjunction with UBC FoM standards;

7.8.15.3(21)(f) Room temperature controls are to be limited to a change of 3 degrees Celsius above to 3 degrees Celsius below the normal set point for the room;

7.8.15.3(21)(g) The Design-Builder will select a Crestron Masters level programmer that is independent from any trade partner to design the Crestron control screen graphics (user interface) and perform all Crestron programming. The independent Crestron Masters level programmer selected by the Design-Builder will be submitted to the Authority for final approval;

7.8.15.3(21)(h) When programming the control panels the Design-Builder will ensure that its customized display graphics are intuitive for the user, and match the Authority's standards and templates for such controls as deployed elsewhere;

7.8.15.3(21)(i) Use of default, built-in or vendor supplied graphics (such as an ellipse button or in-room control icon) to direct users to additional functionality is not permitted unless otherwise approved by the Authority;

7.8.15.3(21)(j) The maintenance page for each Crestron panel is to be password protected; and

7.8.15.3(21)(k) Produce colour copies of the Crestron control screen graphics that include details for each screen page, illustrating the proposed graphic layout for the Authority's approval prior to commencing Creston programming;

7.8.15.3.21.(k).1 Screen page graphics are to illustrate links between top level pages and their subsequent or subordinate pages;

7.8.15.3.21.(k).2 Graphics and symbols are to be intuitive so that a first-time user can easily navigate through the menu layers and readily identify the means to control lighting, audio levels, AV

inputs, room temperature, blinds controls and other required functions;

7.8.15.3.21.(k).3 A home symbol and a “return” arrow are required on each individual page so that the user can easily navigate back one page or jump back to the home page;

7.8.15.3.21.(k).4 Room name and number is required on each home page;

7.8.15.3.21.(k).5 A time-of-day clock is required in the lower right-hand corner of each page. Display the hour: minute AM/PM. The control screen clock display is to be synchronized with the master clock system at least once per hour;

7.8.15.3.21.(k).6 Lighting control pages are to be based on the RCP drawings for each room, and indicate all fixtures and their groupings for each pre-set scene to aid the user in selecting the most suitable pre-set; and

7.8.15.3.21.(k).7 Thematic and graphic consistency is required across all GUIs through the use of common typefaces and layouts. However, controls screens for each room will be tailored to reduce clutter and include only those devices that are present in the room. For example; blinds controls will not be shown on screens in rooms that do not have external windows.

7.8.15.4 Multimedia Room and AV Equipment Requirements

7.8.15.4(1) All materials and equipment used by Design-Builder will be CSA or Underwriters Laboratories (UL) compliant and installed in accordance with manufacturer's specifications and recommendations.

7.8.15.4(2) Installation of Ultra HD digital display monitors, cameras, microphones, control devices, electronics and other dust sensitive equipment may only take place when the Multimedia Rooms are secure, clean and dust free.

7.8.15.4(3) All audio and video equipment that the Design-Builder supplies or provides will conform to IEE 802.1 Time Sensitive Networking standards.

7.8.15.4(4) At the time of the procurement the VC equipment and connectivity will comply with the Authority's latest standards.

7.8.15.4(5) Videoconference systems will be complete, including Ultra HD digital display monitors, Ultra HD cameras, Hard and Soft Codecs, microphones, automatic microphone controllers,

amplifiers, speakers, video controllers, switching units, processing equipment, remote controls, and network connectivity.

7.8.15.4(6) Hard and Soft Codecs will send and receive the audio and video signals to/from the other sites via remote VC room systems or VC bridge;

7.8.15.4(7) Audio transmission quality will be Wideband 50Hz to 7Khz or higher. Telephone voice band is not acceptable;

7.8.15.4(8) Video quality will support HD 720p and 1080p and 4K Ultra HD. Encapsulation standards will include MPEG-4, H.264, H.265, H.266, VCM, AV1, or their next generation successors as available at the time of procurement.

7.8.15.4(9) Cameras require positioning for appropriate image angles, and for complete visual coverage for all VC scenarios. Specifically, designated positions in the walls are required to accommodate the cameras.

7.8.15.4(10) Cameras will be positioned such that when participants are looking at the Ultra HD digital display monitors, they appear to be looking in the direction of the camera.

7.8.15.4(11) Cameras require appropriate protection from theft and damage.

7.8.15.5 Equipment Performance Requirements

7.8.15.5(1) Audio Systems – Digital Signal Processor

7.8.15.5(1)(a) Each Multimedia Room will utilize a digital signal processor capable of acoustic echo cancellation;

7.8.15.5(1)(b) Minimum of 128 x 128 network audio channels;

7.8.15.5(1)(c) Minimum of 16 x 16 USB audio channels;

7.8.15.5(1)(d) Minimum of 24 channels of analog I/O;

7.8.15.5(1)(e) Minimum support for Dante and AES ’67; and

7.8.15.5(1)(f) VOIP integration.

7.8.15.5(2) Audio Systems – Microphones

7.8.15.5(2)(a) Desktop microphones are not acceptable.

7.8.15.5(2)(b) All microphones will be wired. Wireless or infrared microphone systems will not be acceptable.

7.8.15.5(2)(c) Ceiling mounted microphones in Multimedia Rooms will be multi-element and, in a quantity, and

locations to provide full and even pickup and transmission.

7.8.15.5(2)(d) All ceiling mounted microphones will integrate seamlessly within a 600 mm ceiling grid installation.

7.8.15.5(2)(e) Type 1, 2, 3, 5 and 6 Multimedia Rooms will contain multiple microphones mounted in the ceiling, with pickup patterns appropriate to the space and function. At the sole discretion of the Authority, a multi-lobe microphone may replace several ceiling mounted microphones.

7.8.15.5(2)(f) Microphones will use isolation mounts in any location where there is detectable vibration.

7.8.15.5(2)(g) All ceiling microphone accessories will be approved by the Authority prior to shop drawing review and procurement.

7.8.15.5(3) Audio Systems – Amplifiers

7.8.15.5(3)(a) All amplifiers will support digital audio networking formats such as Q-SYS, Dante, AES’67 or AVB.

7.8.15.5(3)(b) All amplifier manufacturers will match the digital signal processing platform selected, unless otherwise approved.

7.8.15.5(3)(c) All audio systems are to use low impedance or LOW-Z.

7.8.15.5(3)(d) Amplifier are not permitted to be installed in plenum spaces unless approved by the Authority.

7.8.15.5(4) Audio Systems – Speakers

7.8.15.5(4)(a) Speakers in ceilings will be flush mounted.

7.8.15.5(4)(b) Speaker covers and trim rings will be in a colour that complements the surrounding surface.

7.8.15.5(4)(c) All speakers will match the brand of DSP selected unless column line arrays are used. When column line arrays are used, Renkus-Heinz or Kling & Freitag speakers or Authority approved equivalent will be used.

7.8.15.5(4)(d) Multimedia Rooms accommodating thirty (30) seats or more will use compact line array speakers. Line array speakers will also be utilized in Multimedia

Rooms with divisible partitions to support the combined function of the room when the partition is not in use.

7.8.15.5(5) Audio Systems - Input / Output

7.8.15.5(5)(a) Each Multimedia Room, with the exception of Type 4A, 4B and 5B, will have:

7.8.15.5.5.(a).1 Digital inputs and outputs;

7.8.15.5.5.(a).2 A Bluetooth input;

7.8.15.5.5.(a).3 3.5mm TRS input;

7.8.15.5.5.(a).4 Breakaway and routable stereo audio from digital video sources;

7.8.15.5.5.(a).5 All digital audio formats will be mixed down or passed as two-channel linear or non-linear pulse-code modulation; and

7.8.15.5.5.(a).6 Multimedia Rooms accommodating twenty (20) seats or more will require two (2) XLR inputs and 2 (XLR) outputs.

7.8.15.5(6) Video Systems - High Definition Multimedia Interface

7.8.15.5(6)(a) All HDMI source equipment, cabling, transmission equipment, processing equipment, and displays supplied by the Design-Builder will be HDMI 2.1 compliant or better.

7.8.15.5(7) Video Systems – Inputs

7.8.15.5(7)(a) Each Type 1 Multimedia Room will have:

7.8.15.5.7.(a).1 Two (2) – HDMI;

7.8.15.5.7.(a).2 Two (2) – USB-C;

7.8.15.5.7.(a).3 Operate in an auto-switching manner with control override; and

7.8.15.5.7.(a).4 In-room PC will act as the priority for auto-switching inputs.

7.8.15.5(8) Video Systems – Video over IP

7.8.15.5(8)(a) If the Design-Builder elects to utilize an in-room video over IP system, the Authority will have the right to choose the encoding and decoding system employed in the solution.

7.8.15.5(9) Video Systems - Ultra HD Digital Display Monitors

7.8.15.5(9)(a) All Ultra HD digital display monitors will:

7.8.15.5.9.(a).1 Be commercial grade with a minimum resolution of Ultra HD;

7.8.15.5.9.(a).2 Have a minimum brightness of 500 cd/m2;

7.8.15.5.9.(a).3 Contain narrow, even, non-reflective and uniform bezels;

7.8.15.5.9.(a).4 Be rated for 24/7 usage;

7.8.15.5.9.(a).5 Securely attach to the front wall with a commercial grade VESA and OSPHD approved mount that allows for vertical and horizontal tilting;

7.8.15.5.9.(a).6 Be of a suitable monitor size, determined by the ratio of the monitor height (MH) to the distance of the most distant viewer (MDV) not exceeding a factor of 6.0. The Authority will have the opportunity to validate screen size prior to procurement and shop drawing review;

7.8.15.5.9.(a).7 Have the ability for networked control, including remote power on/off and Wireless (Wi-Fi or Bluetooth) connectivity;

7.8.15.5.9.(a).8 Be capable of being monitored and controlled via a cloud-based monitoring platform; and

7.8.15.5.9.(a).9 Provide a TO at each screen location.

7.8.15.5(10) Video Systems – Video Projectors

7.8.15.5(10)(a) All video projectors will meet the following minimum specifications:

7.8.15.5.10.(a).1 Utilize laser phosphor technology;

7.8.15.5.10.(a).2 Be completely sealed from dust and filter free;

7.8.15.5.10.(a).3 Have an ANSI lumen rating of at least 18,000;

7.8.15.5.10.(a).4 UHD resolution or greater;

7.8.15.5.10.(a).5 Utilize interchangeable lenses; and

7.8.15.5.10.(a).6 Have a minimum warranty as per Appendix 1X [Warranty Requirements].

7.8.15.5(11) Universal Serial Bus

7.8.15.5(11)(a) All USB, USB-A, USB-B and USB-C type connections will be at a minimum standard of USB 4.0 version 2 and backwards compatible with USB 3.2 and USB 2.0.

7.8.15.5(11)(b) Extension of USB signals at USB 2.0 or USB 3.2 speed or format is not permitted. All USB cables will operate at USB 4.0 version 2 or greater regardless of cable length. The cable and method of extension for cables over 5000 mm are to be approved by the Authority. USB signals will transmit at 120 Gbit/s over Type C connector or greater.

7.8.15.5(12) Video Cameras

7.8.15.5(12)(a) All video cameras with the exception of Type 5B rooms will:

- 7.8.15.5.12.(a).1 Be manufactured by either Sony, Panasonic, Vaddio or an Authority approved alternative;
- 7.8.15.5.12.(a).2 Operate at UHD or greater resolution;
- 7.8.15.5.12.(a).3 Have 20x optical zoom or greater;
- 7.8.15.5.12.(a).4 Have full mechanical pan, tilt, zoom functionality; and
- 7.8.15.5.12.(a).5 Not employ ePTZ technology.

7.8.15.5(13) Video System – Hard Codec

7.8.15.5(13)(a) Hard Codecs will support at a minimum:

- 7.8.15.5.13.(a).1 H.323 and/or SIP up to 6 Mbps; and
- 7.8.15.5.13.(a).2 4K, 30 fps (TX and RX) from 2048 Kbps or supports resolutions up to 1080p60 from 2560 kbps.

7.8.15.5(13)(b) The model purchased will meet with the Authority standard at the time of procurement.

7.8.15.5(14) Installation Accessories

7.8.15.5(14)(a) All UltraHD Display Monitors will use OSHPD approved dual swing arm wall display mounts from the Legrand AV Chief product line unless approved by the Authority.

7.8.15.5(14)(b) All UltraHD Display Monitors will use Legrand AV Chief product line Proximity series in-wall storage boxes unless approved by the Authority.

- 7.8.15.5.14.(b).1 TO will be mounted in the in-wall storage box knockout using system compatible Category wiring strap and fittings.
- 7.8.15.5.14.(b).2 All remaining in-wall storage box knockouts will be filled with duplex receptables to support additional power. Legrand AV Chief Proximity series power kit may be substituted if approved by the Authority.

7.8.15.5(14)(c) All table AV connectivity will require, an Extron Cable Cubby or equivalent that can be readily accessed by end users in order to connect auxiliary equipment.

7.8.15.5(15) Document Cameras

7.8.15.5(15)(a) Document cameras will use UHD resolution and have a minimum 12x optical and 12x digital zoom function.

7.8.15.5(16) Control Systems

7.8.15.5(16)(a) Control Processor

7.8.15.5.16.(a).1 In rooms larger than twelve (12) persons or 30 NSM, a control processor with three or more Com Ports will be used.

7.8.15.5(16)(b) Touch Panels

7.8.15.5.16.(b).1 All Touch Panels will be ten inches (10”) measured diagonally with the exception of the Command Centre and any rooms with a moveable partition where the size will be fifteen (15”) inches measured diagonally.

7.8.15.6 Multimedia Room and AV Equipment Installation Requirements

7.8.15.6(1) Wiring, wiring infrastructure, connectors, conduits, wall floor and ceiling boxes, device boxes, connectors, brackets, mounts, fasteners and any miscellaneous material required to make the system functional is the responsibility of Design-Builder.

7.8.15.6(2) Videoconference hardware, amplifiers, acoustic echo cancelling digital signal processors and other AV components will be installed behind the Ultra HD digital display monitors. Orient such devices so that controls, connections, status lights are readily viewable by technical Staff.

7.8.15.6(3) When AV equipment cannot fit behind the Ultra HD digital display monitors in Multimedia Rooms that are 30 NSM or larger and or have seat count of thirty (30) or greater; these components will be housed within a lockable rack contained within the videoconference leader's desk supplied by the Design-Builder. The videoconference leader's desk supplied by the Design-Builder in this instance will comply with the requirements in Section 7.8.15.7(2).

7.8.15.6(4) All wall and ceiling mounted components will be seismically supported by Design-Builder in accordance with equipment manufacture's guidelines. All monitor mounts will meet OSHPD approval.

7.8.15.6(5) All cables will be hidden and run-in conduit in walls, ceilings and floors. Surface mounted Raceways are not permitted.

7.8.15.6(6) All multimedia cabling will be properly dressed and labeled at each end in a manner and to a standard developed in consultation with the Authority through the Review Procedure.

7.8.15.6(7) All Multimedia Room category data cabling for video signals, data, control, audio, lighting and interconnection will follow the

same standards as other areas of Division 27 unless the manufacturer requires a more stringent standard approved by the Authority.

7.8.15.6(8) Multimedia and data cables will be terminated with appropriate connectors in high quality faceplates that are suitable for the décor and finishes of the room. Surface mount outlet boxes and in-line connections are not to be used. Wherever possible, all faceplates will be white or closely match the room décor and approved by the Authority.

7.8.15.6(9) Design-Builder will be required to provide all necessary Tamper Resistant, Vandal Resistant and Ligature Resistant measures to protect multimedia devices mounted to a wall or ceiling in those areas of the Facility specified by the Authority. This includes such preventative measures as lockable enclosures or Millwork.

7.8.15.7 Multimedia Room Specific Requirements

7.8.15.7(1) Type 1 – Video Conference - Multimedia Rooms Functional and Technical Requirements

7.8.15.7(1)(a) All Type 1 Multimedia Rooms will be Virtual Enabled Rooms.

7.8.15.7(1)(b) Type 1 Multimedia Rooms which accommodate eight (8) seats or less will require one (1) Ultra HD display monitor.

7.8.15.7(1)(c) Type 1 Multimedia Rooms which accommodate more than eight (8) seats will require two (2) Ultra HD digital display monitors.

7.8.15.7(1)(d) Presenters will be able to easily connect and present audio, video and data content from a PC, a laptop or mobile device, document camera, and other fixed or portable auxiliary sources onto one or both of the wall mounted Ultra HD digital display monitors independently.

7.8.15.7(1)(e) Input source connections for video, audio and USB connections will be provided at an AV wall box below the display(s) as well as in at least three floor boxes to be selected by the Authority during the Review Procedure.

7.8.15.7(1)(f) In VC mode, all participants (local and distant) will clearly see, hear, and speak to each other.

7.8.15.7(1)(g) All participants at all sites will be able to clearly see (and hear, when applicable) other participants' presentation material without obstructed sightlines.

7.8.15.7(1)(h) All VC rooms will have wall mounted or ceiling mounted speakers as approved by the Authority.

7.8.15.7(1)(i) One Ultra HD PTZ videoconference camera mounted at the front of the room, between the displays. Final camera mounting location will be approved by the Authority's technical representatives.

7.8.15.7(1)(j) Type 1 Multimedia Rooms supporting thirty (30 seats or larger will have three (3) UHD PTZ cameras in locations approved by the Authority.

7.8.15.7(1)(k) Crestron wall mounted control panel and related equipment for controlling audio levels, mic muting, monitor power on/off, room lighting scenes and levels, room temperature, camera pre-sets and VC calls and sessions.

7.8.15.7(1)(l) A rectangular aspect ratio of side walls to front/back walls of 1:1.13.

7.8.15.7(1)(m) Where Type 1 Multimedia Rooms are equipped with a moveable partition, the following will be provided for each portion of the room:

- 7.8.15.7.1.(m).1 Two (2) UHD PTZ cameras for VC;
- 7.8.15.7.1.(m).2 Two (2) UHD displays to support dual-display video conferencing from a Hard and Soft Codec system;
- 7.8.15.7.1.(m).3 Two (2) USB-C input plates and four (4) HDMI input plates. All inputs will be routable within the space; and
- 7.8.15.7.1.(m).4 Two (2) Clinical Education streaming decoders devices compatible with the Type 5B – Clinical Education Source Camera system.

7.8.15.7(1)(n) Type 1 Rooms with a moveable partition will utilize an input/output card-based DSP system that supports AEC to support two independent simultaneous video conferences as well as future system expansion.

7.8.15.7(2) Type 2 - Meeting Room – EOC - Multimedia Room Functional and Technical Requirements

7.8.15.7(2)(a) The Design-Builder will equip the Meeting Room – EOC as a Type 1 Room so that it can be used daily for meetings and videoconferences.

7.8.15.7(2)(b) In addition to meeting the requirements for a Type 1 Room, the Design -builder will provide the following in the Meeting Room – EOC:

7.8.15.7.2.(b).1 A dedicated wall mounted Ultra HD digital display monitors with wall mounted or ceiling speakers that is separate from the displays used for presentations and video conferencing purposes. This Ultra HD digital display monitors will be used to screen multiple live broadcast television feeds, broadcast radio feeds, audio playback, and digital video in all common forms as well as streaming feeds and other content from the Internet;

7.8.15.7.2.(b).2 A document camera that will enable documents to be shown on any display in the room;

7.8.15.7.2.(b).3 A video conference leader’s desk that will be accessible to Persons with Disabilities and act as primary control point for room.

(b).3.1 The video conference leader's desk will house a Blu-ray or other audio/video player, computer interfaces, a Crestron touch screen, a document camera and other related technology and communications components, controls and connection points;

(b).3.2 A lockable equipment rack with power distribution, cooling fan, ventilation, and secure storage for cables, microphones and other small AV accessories is to be incorporated into the desk. All four (4) wheels or casters will be lockable;

(b).3.3 Auxiliary audio input connections will include two (2) 3.5mm TRS jack (female), Bluetooth; and

(b).3.4 Two (2) SDVOE decoders will be supplied to view dashboard feeds from the Type 3 Command Centre system.

7.8.15.7(2)(c) Additional convenience connections for auxiliary multimedia equipment will be provided in three (3)

floor boxes with data and video input connections that include four (4) HDMI, two (2) USB-C, and a TO.

7.8.15.7(2)(d) The Design-Builder will ensure that the power supply and cooling capacities of the Meeting Room – EOC is appropriately sized for 20 occupants with all equipment active.

7.8.15.7(2)(e) All power receptacles in the Meeting Room – EOC including those in floor boxes will be on vital power. Due to the additional portable equipment that would be brought into the room when in use as a Meeting Room – EOC all 120V wall mounted convenience outlets will be quad receptacles, with no point along any wall being more than 6 feet from a receptacle.

7.8.15.7(3) Type 3 - Command Centre – Multimedia Room Functional and Technical Requirements

7.8.15.7(3)(a) The Command Centre will enable the Authority to view information obtained from various systems such as building, communications, security and Clinical Information Systems, medical and administrative dashboards as well as external sources such as local news feeds and other critical computer-based information simultaneously on a large TAA compliant COB DVLED video wall solution provided by the Design-Builder.

7.8.15.7(3)(b) The Design-Builder will be responsible for integrating the video wall solution with the systems designated by the Authority during the Review Procedure;

7.8.15.7(3)(c) The Design-Builder will provide and install a custom-built mounting frame for the DVLED video wall from either “rp Visual Solutions”, Melnik Resources Ltd, Peerless-AV or an Authority approved equivalent. This mounting frame will be attached to supportive backing consisting of 24 mm thick furniture A-grade plywood to ensure the DVLED wall is mounted flush.

7.8.15.7(3)(d) The Authority requires a flush screen front installation of the DVLED video wall, and the walls will be constructed with cavities and recessed power and TOs.

7.8.15.7(3)(e) The DVLED solution will:

- 7.8.15.7.3.(e).1 Use a dot pitch lower than 1mm.
- 7.8.15.7.3.(e).2 Include five percent spare LED modules and the warranty period specified in Appendix 1X [Warranty Requirements];
- 7.8.15.7.3.(e).3 Be large enough to completely cover one wall of the Command Centre and at least 2500mm high by 9000mm wide;
- 7.8.15.7.3.(e).4 Utilize an open canvas-based matrix switcher hardware and application that supports the following inputs and outputs:
  - (e).4.1 SDVOE;
  - (e).4.2 NDI
  - (e).4.3 SRT
  - (e).4.4 H.264/H.265;
  - (e).4.5 IP KVM
  - (e).4.6 VNC
- 7.8.15.7.3.(e).5 Provide up to thirty-two (32) software-based video inputs and twenty-four (24) HDMI or USB-C baseband inputs..
  - (e).5.1 CATV service will be required on four (4) of the HDMI baseband inputs.
  - (e).5.2 All baseband video inputs will be re-encoded using SDVOE hardware for the matrix switcher application.

7.8.15.7(3)(f) The Command Centre will also include two (2) UHD PTZ cameras and function as a Type 1 room simultaneously for remote video calls. The far end and local feeds will be able to be displayed on the DVLED video wall.

7.8.15.7(3)(g) In order to support Type 1 room functions of the Command Centre, two (2) HDMI and two (2) USB-C additional baseband inputs will be required. These inputs are in addition to the input and output open canvas-based matrix switcher hardware and application.

7.8.15.7(3)(h) The Command Centre will include ten (10) video wall controllers provided by the Design-Builder that consist of hardware, software and licensing. The video wall controllers will be capable of routing local inputs to the DVLED video matrix switcher and controlling Command Centre applications via a VNC or KVM application.

7.8.15.7(4) Type 4A – Virtual Health and Workstation - Multimedia Rooms Functional and Technical Requirements

7.8.15.7(4)(a) Appendix 1J [Equipment List IM/IT] will contain a listing of all Authority provided equipment for Type 4A Virtual Health Call Centre and Workstation Multimedia Rooms.

7.8.15.7(4)(b) The general requirements for Multimedia Rooms listed in Section 7.8.15.3 apply to all type 4A rooms.

7.8.15.7(5) Type 4B – Virtual Health Mobile Solutions - Multimedia Rooms Functional and Technical Requirements

7.8.15.7(5)(a) Appendix 1J [Equipment List IM/IT] will contain a listing of all Authority provided equipment for Type 4B Virtual Health Mobile Solutions.

7.8.15.7(6) Clinical Education Camera System.

7.8.15.7(6)(a) The clinical education camera system will consist of Type 5A Clinical Education Viewing and Type 5B Source Camera Rooms.

7.8.15.7(6)(b) Type 5A Functional and Technical Requirements:

7.8.15.7.6.(b).1 The Design-Builder will design, supply, install and interconnect an audio and video over IP streaming solution that will deploy Ultra HD cameras, encoders, decoders, software and microphones in Type 5B Rooms to capture and stream images and sound to Ultra HD digital display monitors Type 5A Rooms;

7.8.15.7.6.(b).2 An SDVOE decoder will view encoded Type 5B Room video streams in Type 5A Rooms;

7.8.15.7.6.(b).3 A talkback system is required in each Type 5A to communicate with physicians and clinicians in Type 5B Rooms;

7.8.15.7.6.(b).4 The viewer in a Type 5A Room will be able to select any of the Type 5B Source Camera Room video streams for education purposes via the Crestron touch panel;

7.8.15.7.6.(b).5 The Crestron touch panel will have both pre-sets for user selection and full matrix routing of source cameras; and

7.8.15.7.6.(b).6 The Clinical education camera system will not connect with the site security camera system described in Division 28.

7.8.15.7(6)(c) Type 5B Functional and Technical Requirements:

7.8.15.7.6.(c).1 All Type 5B Rooms, the Design-Builder will provide multiple UHD PTZ cameras to

capture the FoVs required by the Authority as well as a multi-element microphone array;

7.8.15.7.6.(c).2 All source cameras will be manufactured by either Sony, Panasonic, or an Authority approved alternative;

7.8.15.7.6.(c).3 All UHD PTZ cameras provided by the Design-Builder will support H.264, NDI | HX, SRT, 12G-SDI and HDMI unless approved by the Authority;

7.8.15.7.6.(c).4 The Design-Builder will integrate with clinical equipment system cameras situated in Type 5B Rooms. This includes the provision of a SDVOE encoder to provide additional source feeds from camera equipped clinical equipment systems to Type 5A Rooms. This will be in addition to the source feeds provided from UHD PTZ cameras supplied by the Design-Builder in the Type 5B Room;

7.8.15.7.6.(c).5 Each source camera feed in a Type 5B room will have an in-room visual indicator utilizing a tally light or similar means to clearly indicate when the clinical education system camera and microphone in the room are active and in use;

7.8.15.7.6.(c).6 Each source camera feed in a Type 5B room will have a video and audio mute switch or function. A physical switch or Crestron GUI button is suitable;

7.8.15.7.6.(c).7 One TO and one duplex receptacle will be required at each camera location;

7.8.15.7.6.(c).8 Each Data Drop will be required to support POE++ to power UHD PTZ source cameras. If the UHD PTZ source cameras are to be connected to an Authority provided switch, the Design-Builder will supply power injectors when required to provide additional power;

7.8.15.7.6.(c).9 Each UHD PTZ source camera will be installed on a wall or ceiling location to provide the required FoVs; and

7.8.15.7.6.(c).10 A commercial grade camera wall mount will be supplied and approved by the Authority for all UHD PTZ cameras installed by the Design-Builder.

7.8.15.7(6)(d) The Design and Construction of the clinical education camera system will be such that it will have the capability to record audio and video (at each camera’s intended resolution) content from

Type B Rooms and send that content to a storage solution that would be provided by the Authority in the future.

7.8.15.7(7) Type 6 – UBC FoM Clinical Education Facility Requirements

7.8.15.7(7)(a) In addition to the requirements stated herein, the Design-Builder will design and construct Type 6 Multimedia Rooms in accordance with the requirements of Appendix 1T Part A [UBC FoM Design Guidelines and Functional Requirements for Learning Spaces: Small Seminar Rooms];

7.8.15.7(7)(b) If there is a conflict between a provision of those documents and a provision of this Schedule (with respect to type 6 Multimedia Rooms only) the UBC FoM provision will govern.

7.8.15.7(7)(c) Refer to Appendix 1W [Systems Responsibility Matrix] for additional details on roles and responsibilities associated with Type 6 Rooms.

7.8.15.8 Supplemental Sound Systems

7.8.15.8(1) Functional Requirement

7.8.15.8(1)(a) Supplemental audio and video playback systems connected to Ultra HD digital display monitors are required in multiple rooms throughout the Facility. The Design-Builder will provide a means of localized and focused playback audio content, with adjustable volume controls so that the sound levels are appropriate within those rooms without leaking into adjacent spaces. Full range quality audio playback that is free from distortion, hum and other noise is required. Components used will be selected for their ability to deliver clear legibility of speech and distortion free music in order to prevent the need for over amplification;

7.8.15.8(1)(b) In each Lounge in Impatient Unit, each Emergency Waiting Area, Pediatric Waiting Area and Pediatric themed Exam/Treatment Room, each Perioperative Operating Room, and in each Waiting, Exam, Treatment and Imaging rooms in the RT Delivery and Functional Imaging departments, including the PET Injection/Uptake Rooms, and with the exception of the Imaging Room – MRI – Simulation;

7.8.15.8(1)(c) The Design-Builder will provide and install:

(c).1.1 3.5 mm TRS Input in Staff area;
(c).1.2 Bluetooth input in Staff area;
(c).1.3 Amplified, flush mounted ceiling speakers with grills and trims to match or blend in with the ceiling's colour and to provide stereo playback; and
(c).1.4 The system will mute as required in the event of a Fire Alarm condition.

7.8.15.8.1.(c).2 A Crestron touch panel or keypad to control:
(c).2.1 Audio levels; and
(c).2.2 Video playback.

7.8.16 Digital Wayfinding

7.8.16.1 A digital Wayfinding system will be required by the Authority that will compliment and integrate with:

7.8.16.1(1) Traditional static Wayfinding as described in Appendix 1R [Wayfinding Standards and Requirements];

7.8.16.1(2) Real-time Parking Count System; refer to Section 4.16.13; and

7.8.16.1(3) Other tools and measures implemented by the Authority to assist in Wayfinding such as:

7.8.16.1(3)(a) A phone number to call to get appointment and Wayfinding information;

7.8.16.1(3)(b) Appointment letters with directions and a map to the appointment and parking/transit options;

7.8.16.1(3)(c) Printed maps available at information stations, reception and waiting areas; and

7.8.16.1(3)(d) Way finding features on the Authority websites.

7.8.16.2 The Design-Builder will undertake the Design and Construction of a complete, integrated, cohesive, consistent and comprehensive digital Wayfinding system in the Facility consisting of hardware, software (including licensing), maps and positioning technology and infrastructure that will:

7.8.16.2(1) Allow Patients, Staff and visitors (hereafter referred to as “users”) to navigate their arrival at the hospital from home, and also find the way inside the Facility from main entrances, their parked car or from bicycle lock-up areas; locate elevators, find departments and rooms, and make their way to and from restrooms, food options and other points of interest;

7.8.16.2(2) Enable Staff and other contract resources to login with password or NFC card swipe to obtain step-by-step directions to internal

rooms and departments and navigate to all areas of the Facility using Back-of-House corridors;

7.8.16.2(3) Direct users to available parking capacity and to the correct entrance to use based on parking availability;

7.8.16.2(4) Function seamlessly between the indoor and outdoor and within the interior of the Facility and in a manner that does not result in user hesitation or confusion, regardless of what area of the Facility is being navigated;

7.8.16.2(5) Utilize the same nomenclature, Wayfinding logic, and visual language across the system and all of the multi-channel and multi-modal options that the user will interface with;

7.8.16.2(6) Provide step-by-step direction, guidance and information through a tailored interface in a dynamic, interactive, animated and accessible manner considering low-vision, hearing impaired and wheel-chair-bound users;

7.8.16.2(7) Provide users with location-sharing to enabling people to connect inside the Facility;

7.8.16.2(8) Enable users to pan, zoom, and rotate maps in order to get acquainted with the Facility and Site;

7.8.16.2(9) Enable users to calculate the shortest route to their destination;

7.8.16.2(10) Provide various routes for users, such as accessible routes that offer alternatives to stairs;

7.8.16.2(11) Serve the hospital community of users in all relevant major languages;

7.8.16.2(12) Employ a combination of multi-channel and multi-modal options including a web version for desktop use, terminal devices and mobile Wayfinding that will function in unison to guide users to their destination;

7.8.16.2(13) Provide a meeting room booking system that allows Staff to book and manage meeting rooms, offices, and spaces via mobile device, communicate meeting status right to the conference room door, highlight vacant rooms on a 3D Wayfinding map, and drive content to the mobile devices of meeting attendee;

7.8.16.2(14) Disseminate text-based messages and notifications from the Command Centre and directly from the fire alarm system to all terminal devices and smartphones and tablets connected to the mobile Wayfinding application;

7.8.16.2(15) Constantly monitor the health of the network of terminal devices and allow administrators to remotely support and manage the system and resolve issues with digital Wayfinding hardware and software;

7.8.16.2(16) Provide location analytics including real-time occupancy, the volume of visits, historical routing and occupancy heatmaps, dwell times, space utilization rates, and app usage analytics based on a user's location; and

7.8.16.2(17) Accommodate changes to the Facility and Site in a holistic and adaptable manner that is sustainable and easy for the Authority to maintain. The solution will be able to adapt to variable conditions introduced by construction, renovation, relocation and other factors such that updated content can be delivered to the Authority website kiosks, digital signage and mobile application in sync with the permanent or temporary change being introduced to the Facility and or Site.

7.8.16.3 The digital Wayfinding system provided by the Design-Builder will be from a leading technology and solution provider in the commercial market segment with an extensive product offering and a proven track record of delivering digital Wayfinding solutions in the healthcare vertical. Independent evidence of the technology and solution provider's position in the market (e.g. Gartner Report) will be supplied by the Design-Builder along with overview of the provider's top customers, project implementations and client references.

7.8.16.4 As the Design of the digital Wayfinding system is critical to meeting the desired Wayfinding outcomes, the Design-Builder will:

7.8.16.4(1) Analyse which aspects of the Facility's Design can be enhanced or used to facilitate the orientation process without the need for signage. This includes evaluating the architecture, landscape and natural resources looking for opportunities to create intuitive Wayfinding;

7.8.16.4(2) Determine the journey paths for each major user group. This journey mapping exercise will:

7.8.16.4(2)(a) Identify the different zones of the Facility's environment;

7.8.16.4(2)(b) Define the right route for different users to move from their point of arrival to their specific destination in the Facility. The journey mapping will reflect the differences in the users associated with each group considering factors such as:

7.8.16.4.2.(b).1 Age, interests and behaviours;

7.8.16.4.2.(b).2 Accessibility requirements;

7.8.16.4.2.(b).3 Mode of travel to the Facility (car, transit, pedestrian, bicycle); and

7.8.16.4.2.(b).4 Specific purpose of visit to the Facility.

7.8.16.4(2)(c) Demonstrate how the digital Wayfinding system will provide the information that the user needs at exactly the right moment to make a decision and arrive at the next decision point successfully.

7.8.16.4(3) Create the concept designs, incorporating the Authorities' brand. Colours, shapes, materials and other inspirational features of the project including what is applied to the traditional static Wayfinding will be drawn upon to produce the concepts; and

7.8.16.4(4) Provide a design for terminal devices that includes:

7.8.16.4(4)(a) Functionality considerations encompassing elements of visibility, legibility, compliance and safety. It is necessary for the Design-Builder to ensure that all users can access the information when they need it (different times of the day and at variable distances) and that the terminal device is designed in accordance with current industry standards;

7.8.16.4(4)(b) Spatial considerations as it relates to the usage of the available space and the distribution of the pieces of information to create the desired impact or to ensure that the user is provided what they need to navigate the space; and

7.8.16.4(4)(c) Material considerations to ensure the materials selected are:

7.8.16.4.4.(c).1 Compatible with the brand look and feel and also the required longevity.

7.8.16.4.4.(c).2 Enable Wayfinding communication to be integrated with overall environment; and

7.8.16.4.4.(c).3 Durable and compliant with infection control standards.

7.8.16.5 The digital Wayfinding system provided by the Design-Builder will have the following key features:

7.8.16.5(1) Customizable UI interfaces for users and administrators;

7.8.16.5(2) Content Management System;

7.8.16.5(3) Digital Building Directory

7.8.16.5(4) Room Booking

7.8.16.5(4)(a) Meeting rooms can be booked, multiple touchpoints — mobile app, meeting room display, desktop application and through integration with Authority applications such as Microsoft Outlook;

7.8.16.5(4)(b) Staff can extend meetings and end them through the aforementioned touchpoints;

7.8.16.5(4)(c) Future meeting schedule will be viewable on meeting room displays and mobile and desktop application; and

7.8.16.5(4)(d) Identify meeting room status on interactive floor map.

7.8.16.5(5) Interactive Wayfinding

7.8.16.5(5)(a) Realistic 3D Design. Fly Over, Stacked View, multi-floor destination, 360-degree direction controls, and screen orientation;

7.8.16.5(5)(b) Intelligent built-in Wayfinding that auto-generates directions based on shortest path and ease of accessibility;

7.8.16.5(5)(c) Dynamic map pop-up descriptions and images and listed information

7.8.16.5(5)(d) Route scheduling and detour pathway re-routing

7.8.16.5(5)(e) Destination smart search capability

7.8.16.5(5)(f) Step by step direction through SMS, QR Codes, emails, and printing

7.8.16.5(5)(g) Mobile app integrated Wayfinding;

7.8.16.5(5)(h) Appointment reminders and notifications; and

7.8.16.5(5)(i) Advanced Wayfinding analytics/reporting tool.

7.8.16.6 The above features of the digital Wayfinding system will be augmented by the Design-Builder where required to meet the functional requirements stated herein and in this Agreement.

7.8.16.7 The Design-Builder will:

7.8.16.7(1) Perform all site surveys and digital mapping to create a 3D digital model of the Facility;

7.8.16.7(2) Provide, create, input and configure all the content required for an operable digital Wayfinding system including maps, points of interest, services, amenities, templates and digital directories for display on terminal devices and smart phones and tablets through the mobile application as well as a browser-based solution (e.g., MS Edge, Firefox, Chrome, etc.);

7.8.16.7(3) Integrate the digital Wayfinding system:

7.8.16.7(3)(a) Corporate directories, social media accounts, external information sources such as transit sites and transportation alternatives (Uber and Lyft) and news and weather feeds;

7.8.16.7(3)(b) Authorities' latest Microsoft platform so that meetings booked in Outlook can be synchronized to meeting room signage and mobile application and vice versa;

7.8.16.7(3)(c) EMR/EHR to enable Wayfinding to be launched directly from appointment reminder text or notifications received through the mobility application;

7.8.16.7(3)(d) Clock system so the time of day displayed on terminal devices is synchronized least once per hour; and

7.8.16.7(3)(e) Such that messages can be disseminated from the Command Centre and fire alarm system to all terminal devices and smartphones and tablets connected to the mobile Wayfinding application.

7.8.16.7(4) Undertake the Design and Construction of any mounting system, metalwork and or Millwork required to house or support terminal devices;

7.8.16.7(5) Provide seismic restraint and anchorage for all equipment and components of the digital Wayfinding systems in a manner that complies with the BCBC for a post-disaster Facility. Each instance of seismic restraint and anchorage of equipment will be reviewed by a seismic Professional Engineer registered in British Columbia for certification as being seismically restrained in accordance the BCBC for a post-disaster Facility;

7.8.16.7(6) Provide all equipment, technologies and hardware required for a complete solution including terminal devices, mounts, seismic restraints, speakers, microphones, video cameras, video distribution, signal amplification and digital signal processing equipment, servers, computers, and controls;

7.8.16.7(7) Supply and install all wiring, connection cables, patch cables, multi-cable extension snakes, connectors and terminals, fasteners, labels, required for installing, interconnecting and operating the digital Wayfinding system;

7.8.16.7(8) Prepare floors, walls and ceilings with reinforcement in locations throughout the Facility specifically in order to enable the mounting and seismic restraint of terminal devices and related components;

7.8.16.7(9) Provide all power and TOs required for equipment, and terminal devices; and

7.8.16.7(10) Train Staff and volunteers on using and maintaining the digital Wayfinding solution including terminal devices and the mobile application. Training will be role based and provided by the digital Wayfinding systems vendor and will include detailed documentation.

7.8.16.8 Terminal Devices

7.8.16.8(1) The Design-Builder will provide all terminal devices required for the digital Wayfinding solution. Types of terminal devices will include interactive digital Wayfinding kiosks and Wayfinding and meeting room displays.

7.8.16.8(2) All terminal devices required for the digital wayfinding solution will be powered from the Clinical UPS system.

7.8.16.8(3) The same software platform will be utilized across all terminal devices to ensure a harmonious experience across devices and platforms.

7.8.16.8(4) Terminal devices used for Wayfinding will be placed:

7.8.16.8(4)(a) Where users need Wayfinding guidance (“decision points”) throughout the Facility as defined by the aforementioned journey mapping including all entrance points into the Facility from the exterior and underground parking levels and all internal lobbies including elevator lobbies and or vestibules;

7.8.16.8(4)(b) Near information desks or other places where Staff or volunteers can help people use them and monitor whether they are functioning properly; and

7.8.16.8(4)(c) In coordination with static signage in order to create “Wayfinding information stations” in key areas of the Facility.

7.8.16.8(5) Interactive Digital Wayfinding Kiosk Requirements

7.8.16.8(5)(a) Interactive digital Wayfinding kiosks will:

- 7.8.16.8.5.(a).1 Require an “attract mode” or screensaver to broadcast its functionality to a passerby and distinguish itself from other types of kiosks employed in the Facility;
- 7.8.16.8.5.(a).2 Have a simple and uncluttered user interface with a prominent function to search for a destination or browse through a list of destinations;
- 7.8.16.8.5.(a).3 Use common gestures such as tap a button to activate the screen and pinch and stretch to zoom;
- 7.8.16.8.5.(a).4 Have a user interface that will allow a change language or to move the active area of the screen down for increased usability by those users in wheelchairs;
- 7.8.16.8.5.(a).5 Allow on-screen maps to be oriented to the user’s perspective (also known as “heads-up” maps) and highlight the user’s current location;
- 7.8.16.8.5.(a).6 Be equipped with “no-touch” solutions that allow touch free navigation including QR codes and voice activation and control;
- 7.8.16.8.5.(a).7 Have anti-microbial touch screens and powder coat on all surfaces;
- 7.8.16.8.5.(a).8 Offer the user the ability to text or email direction to their smartphone or tablet; and
- 7.8.16.8.5.(a).9 Be equipped with printers that will print out a customized set of directions if welcomed by those visitors who do not have access to a smartphone or tablet. If the interactive kiosk is situated in close proximity to an information station, the Design-Builder may opt to propose to the Authority for consideration, a complete solution where a customized set of directions could be printed at the information station as an alternative.

7.8.16.8(5)(b) In larger areas, such as the Main Entrance Lobby, interactive digital Wayfinding kiosks will be designed to accommodate two (2) eighty-six-inch (86”) touch enabled digital display monitors, power management, supplied system computers or digital signage players.

7.8.16.8(5)(c) In smaller areas, interactive digital Wayfinding kiosks will be designed to accommodate no less than two (2) fifty-five-inch (55”) touch enabled

digital display monitors, power management, supplied system computers or digital signage players.

7.8.16.8(5)(d) Interactive digital Wayfinding kiosks will use tempered glass, galvanized or zinc primed steel enclosures which have been powder coated and gas struts to hold servicing lids or doors. As required, additional touch overlays and componentry will be approved by the Authority during shop drawing Submittals. Plexiglass will not suitable.

7.8.16.8(5)(e) Interactive digital Wayfinding kiosks will be seismically anchored;

7.8.16.8(5)(f) All interactive digital Wayfinding kiosks will be serviceable using a hex tool to open the unit.

7.8.16.8(5)(g) Interactive digital Wayfinding kiosks will be designed to be serviceable and openable by one person.

7.8.16.8(5)(h) Refer to Appendix 1X [Warranty Requirements] for interactive digital Wayfinding kiosks.

7.8.16.8(6) Displays

7.8.16.8(6)(a) Wayfinding

7.8.16.8.6.(a).1 Wayfinding displays will be provided in all elevator lobbies and or vestibules where the design demonstrates that interactive kiosks are not necessary in order to eliminate user hesitation or confusion along their journey.

7.8.16.8.6.(a).2 All digital display monitors will be no less than fifty-five inches (55”) diagonally in size, 700 cd/mm brightness, 24/7 rated and with even bezels.

7.8.16.8(6)(b) Meeting Room Displays - The Design-Builder will supply a Crestron LED illuminated room scheduling panel outside each Type 1, 2, 3, 5A, and 6 room running the room booking solution supplied as part of the digital Wayfinding system.

7.8.16.8(6)(c) All display mounts supplied will be OSHPD certified for seismic and commercial in nature. Approved vendors are Chief Mounts and Peerless AV brand mounts.

7.8.16.9 Mobile Digital Wayfinding

7.8.16.9(1) As an integrated component of the overall digital Wayfinding system, the Design-Builder will provide a mobile Wayfinding solution for interior navigation throughout the Facility and Site by smartphone and tablet.

7.8.16.9(2) The mobile Wayfinding solution will:

7.8.16.9(2)(a) Work with all major mobile operating systems including iOS, Android, Chrome OS, Mac OS and Windows;

7.8.16.9(2)(b) Provide Patients, Staff and visitors with accurate step-by-step in 3D hospital Wayfinding to their point-of-care or room destination in the Facility;

7.8.16.9(2)(c) Provide appointment tracking with reminders;

7.8.16.9(2)(d) Provide directions for appointments without the user having to manually search for their destination;

7.8.16.9(2)(e) Provide room booking;

7.8.16.9(2)(f) Provide location aware notifications such as “you-are-here” functionality; and

7.8.16.9(2)(g) Provide custom defined routes to navigate Patients, Staff and visitors around inaccessible areas or un-preferred paths.

7.8.16.9(3) The Design-Builder will provide the positioning technology including all associated infrastructure (power, Data Drops) as is required for Wayfinding throughout the Facility.

7.8.16.9(4) The indoor positioning technology will:

7.8.16.9(4)(a) Achieve one-meter accuracy throughout the Facility even in complex indoor environments such as high ceiling atria;

7.8.16.9(4)(b) Distinguish between floors where the user is accessing the application from and provide accurate tum-by-turn directions to destinations on different floors utilizing elevators, stairs, etc.;

7.8.16.9(4)(c) Independent from the RTLS system specified in Section 7.8.24; and

7.8.16.9(4)(d) Not be Wi-Fi dependent and will not negatively affect the operation of the Authority’s Wi-Fi network

and other wireless systems that will operate in the Facility and on the Site.

7.8.16.9(5) The Design-Builder provided a mobile application platform that will include the following:

7.8.16.9(5)(a) Basic Features

7.8.16.9.5.(a).1 List of rooms and hotspots;
7.8.16.9.5.(a).2 Multiple destinations support;
7.8.16.9.5.(a).3 Step-by-step information;
7.8.16.9.5.(a).4 Visual route on map;
7.8.16.9.5.(a).5 Integrate with QR code, email, text on touchscreen;
7.8.16.9.5.(a).6 360-degree Virtual Tour (Panorama);
7.8.16.9.5.(a).7 2D Wayfinding & 3D Wayfinding;
7.8.16.9.5.(a).8 Vector-based Map;
7.8.16.9.5.(a).9 Offline Usage; and
7.8.16.9.5.(a).10 Nearby POIs (food, bus, etc.).

7.8.16.9(5)(b) Route Conditions

7.8.16.9.5.(b).1 Shortest routes;
7.8.16.9.5.(b).2 Accessible, Staff, Contractor or any special routes defined by the Authority;
7.8.16.9.5.(b).3 One-way, temporarily disabled paths and preferred paths;
7.8.16.9.5.(b).4 Time scheduled paths/doors (operation hours); and
7.8.16.9.5.(b).5 Elevated floors (buildings built on hills), tunnels, bridges, and skywalks.

7.8.16.9(5)(c) Destination Support

7.8.16.9.5.(c).1 Easily support thousands of destinations/hotspots/touchpoints;
7.8.16.9.5.(c).2 Multi-building, Multi-floor and Cross-campus; and
7.8.16.9.5.(c).3 Indoor and outdoor.

7.8.16.9(5)(d) Direction Support

7.8.16.9.5.(d).1 Step-by-Step directions; and
7.8.16.9.5.(d).2 Estimated distance and travel time.

7.8.16.9(5)(e) Map Update

7.8.16.9.5.(e).1 Reuse the same map developed for kiosk on mobile site; and
7.8.16.9.5.(e).2 1-click to publish map and routes update to mobile site

7.8.16.9(5)(f) Multi-lingual support for map, popup and turn-by-turn information with no limit of languages; and

7.8.16.9(5)(g) Augmented reality with image recognition.

7.8.17 Digital Signage

7.8.17.1 Supplementary to the digital signage requirements identified in Section 7.8.16 the Design-Builder will also prepare walls and ceilings with reinforcement in locations throughout the Facility specifically in order to enable the mounting and seismic restraint of digital signage screens and their accessories, including any PCs/digital signage player(s) and the mounting bracket for each monitor.

7.8.17.2 These monitors will be used for a variety of purposes and will be installed in either a "portrait" or "landscape" orientation depending on their intended purpose. The Design-Builder will work with the Authority to determine optimal viewing angles and distances on a screen-by-screen basis in order to precisely locate mounting and connection points at each digital signage screen location. The Authority will determine the size of the monitor screens at each location.

7.8.17.3 At each digital signage screen location, the Design-Builder will provide two duplex outlets with 5-20 RA receptacles and one TO at the required elevation. The type of power to be provided to all digital signage locations is to be vital unless otherwise approved by the Authority.

7.8.17.4 In locations that the Authority requires a flush screen front installation the walls will be constructed with cavities and recessed power and TOs to allow the digital signage screens and accessories to be recessed into the wall. The cavities will include adequate airflow capable of providing passive cooling to active components. Additionally, where the Authority employs an in-wall enclosure, the Design-Builder will provide an active cooling solution.

7.8.17.5 The Design-Builder will provide wall and or ceiling reinforcement, power and TOs in the following locations:

7.8.17.5(1) Patient Rooms

7.8.17.5(1)(a) Inside each Patient Room for installation of digital “My Stay” boards. Reinforcement, power outlets and TO will be positioned at a suitable angle and distance such that information can be seen comfortably from the bed by the Patient; and

7.8.17.5(1)(b) Outside each Patient Room for the installation of digital Critical Care Indicator (CCI) boards. Reinforcement, power outlets and TO will be positioned at an elevation that provides a clear sight line when walking towards the door; and

7.8.17.5(1)(c) At the bedside for the Integrated Bedside Terminals in accordance with requirements in Appendix 1A [Clinical Specifications and Functional Space Requirements].

7.8.17.5(2) Areas where Staff congregate:

7.8.17.5(2)(a) At each Care Team Station for the installation of multiple digital Patient status boards and other clinical electronic display boards.

7.8.17.5(2)(b) Staff Lounges

7.8.17.5(3) Perioperative Department will require clinical electronic display board screens, Patient status board screens, workflow status board screens, and dashboard screens in the following locations:

7.8.17.5(3)(a) Locations involved in perioperative command and control (e.g., Care Team Stations, Control Rooms, etc.)

7.8.17.5(3)(b) Locations where Staff congregate and may need to reference today's and/or tomorrow's slate, workflow status, Staff assignments, etc. (e.g., Staff Lounges, Locker Rooms, workrooms, key perioperative corridors and corridor intersections, etc.)

7.8.17.5(3)(c) Locations where family-members congregate and may need to reference the progress of a Patient's procedure (e.g., Waiting Rooms and Areas, outside anesthetic units in public corridors); and

7.8.17.5(3)(d) Other locations identified by the Authority through the Review Procedure.

7.8.17.5(4) Waiting rooms and areas throughout the Facility

7.8.17.5(5) Family and Visitor Lounges

7.8.17.5(6) Facilities Maintenance and Operations

7.8.17.5(6)(a) Workroom;

7.8.17.5(6)(b) Workshops; and

7.8.17.5(6)(c) Staff Lounge.

7.8.18 Patient Physiological Monitoring

7.8.18.1 Basic Requirements

7.8.18.1(1) The Patient Physiological Monitoring system comprises the following:

7.8.18.1(1)(a) Fixed and mobile physiological monitoring equipment;

7.8.18.1(1)(b) Central and remote monitoring stations;

7.8.18.1(1)(c) Dedicated wired network infrastructure and equipment separate from the Authority's IM/IT Data Network; and

7.8.18.1(1)(d) Dedicated wireless (Telemetry) networking infrastructure and equipment separate from the Authority's IM/IT Wi-Fi Network.

7.8.18.1(2) The system is entirely separate from and does not share infrastructure, equipment and/or software with the Authority's IM/IT Data or IM/IT Wi-Fi Network.

7.8.18.2 System Responsibilities

7.8.18.2(1) The Design-Builder will:

7.8.18.2(1)(a) Provide the end-to-end Structured Cabling with dedicated patch panels and electrical/UPS infrastructure as required to support the Patient Physiological Monitoring system as set out in the Appendix 1H [Equipment and Furniture];

7.8.18.2(1)(b) Furnish the Authority and system vendor with all Design documentation in the format requested by the Authority to complete a software based predictive design of the Patient Monitoring System. This includes floor plans, reflected ceiling plans, elevation and section drawings, furniture and Equipment layouts and information on building materials and finishes;

7.8.18.2(1)(c) Meet all requirements stated in Section 2.5.8;

7.8.18.2(1)(d) Provide dedicated equipment rack space complete with power supplies and wire management;

7.8.18.2(1)(e) Provide all system infrastructure including power and data. Refer to Section 5.7.6.3 for additional requirements.

7.8.18.2(1)(f) Coordinate locations of antenna access points, mounting hardware and Telecommunications enclosures required to support the dedicated, independent wireless infrastructure associated with the Patient Physiological Monitoring System. This includes identifying all infrastructure on reflected ceiling plans uniquely and providing clash detection with other ceiling infrastructure including lighting,

nurse call dome and zone lights, antennas, x-y gantry ceiling lifts and all other ceiling systems; and

7.8.18.2(1)(g) Provide basic Commissioning for field equipment power and network connectivity.

7.8.18.3 Dedicated Wired Network Infrastructure Requirements

7.8.18.3(1) TRs will contain the Patient Physiological Monitoring system equipment including PoE switches, access point controller units, and smart-hopping synchronization units. Design-Builder will ensure that each TR has sufficient rack space to support all associated Patient Physiological Monitoring network equipment.

7.8.18.3(2) Patient Physiological Monitoring network equipment and patch panels will reside within a single rack in the nearest TR, and not be spread across multiple racks.

7.8.18.3(3) Design-Builder will provide additional Data Drops on the Patient Physiological Monitoring wired network at each Care Team Station and other required areas throughout the Facility.

7.8.18.3(3)(a) Provide four (4) Data Drops per Telemetry Central Monitor;

7.8.18.3(3)(b) Provide two (2) Data Drops per Telemetry Remote Monitor; and

7.8.18.3(3)(c) Provide one (1) TO in the Biomed Workroom.

7.8.18.3(4) Design-Builder will provide two (2) additional Data Drops on the Patient Physiological Monitoring wired network at each charting workstation or alcove.

7.8.18.3(5) Design-Builder will provide two (2) Data Drops on the Patient Physiological Monitoring wired network at each headwall/ boom or other walls in rooms specified by the Authority.

7.8.18.3(6) Design-Builder will provide one (1) Data Drop on the Patient Physiological Monitoring wired network for each Patient Physiological Monitoring system wireless access point.

7.8.18.4 Dedicated Wireless (Telemetry) Networking Infrastructure Requirements

7.8.18.4(1) Design-Builder will provide detailed Facility Floor plans to the Telemetry vendor for its use in designing the Telemetry wireless access point layout. Design-Builder will ensure that the design of the Patient Physiological Monitoring system meets the vendors requirements.

7.8.18.4(2) Design-Builder will provide one (1) Data Drop on the Patient Physiological Monitoring wired network for each Patient Physiological Monitoring system wireless access point.

7.8.19 Public Address

7.8.19.1 Basic Requirements

7.8.19.1(1) In accordance with the current Authority's Overhead Paging Policy, the Public Address (PA) System is to be used for only announcing specific emergent situations such as all code calls, stat calls, unexpected systems downtimes (e.g. Meditech computer system, any Telecommunications system, etc.), fixed equipment failures (fire alarms, power testing, generator testing, alarm testing, etc.) and any extraordinary emergent conditions and or situations.

7.8.19.1(2) The PA system is viewed by the Authority as its "last line of defense" in terms of communicating with Patients, Staff and visitors on emergent conditions and situations and thus the PA system provided by Design-Builder will be reliable, resilient and easy to operate and maintain with minimal mechanical contact points.

7.8.19.1(3) The PA system will be designed as a distributed network architecture with no single point of failure.

7.8.19.1(4) The PA system will be separate from and act independently of the fire alarm system and its emergency voice communications system. Refer to Section 7.9.3 for requirements relating to integration between the fire alarm and PA system.

7.8.19.1(5) Alternative communications systems other than the PA system will be used for routine communications between Staff and other Facility occupants.

7.8.19.1(6) The Design-Builder will:

7.8.19.1(6)(a) Provide all infrastructure required for an IP-based Digital System in the Facility including a dedicated and redundant data network;

7.8.19.1(6)(b) Physically and logically integrate the Facility PA system so there is a single paging zone for the site. This includes integration with the Authority's existing contact centre interface and middleware software;

7.8.19.1(6)(c) Provide two (2) back-up microphones situated in the Facility with final locations to be determined in

consultation with the Authority through the Review Procedure;

7.8.19.1(6)(d) Provide complete speaker coverage throughout the Facility so that pages can be heard throughout with high intelligibility and low loss of articulation of consonants. Certain areas in the Facility may be excluded from the PA system and they will be identified with the Facility during User Consultation;

7.8.19.1(6)(e) Train the Authority's FMO Staff on how to maintain the PA System, and the Authority's end-users on how to use the PA system, in accordance with Section 5.6.13.5(3), notwithstanding those two (2) additional levels of training will be provided to include:

7.8.19.1.6.(e).1 Expert Training

(e).1.1 Minimum of eight (8) hours via two (2) independent non-concurrent sessions; and

(e).1.2 General Users - Minimum of four (4) hours via two independent non-concurrent sessions;

7.8.19.1.6.(e).2 On-Site courses during normal working hours; and

7.8.19.1.6.(e).3 Cover all of the items contained in the approved operating and maintenance manuals as well as a demonstration of routine maintenance operations.

7.8.19.1(6)(f) Within the following Components, provide a localized PA system that meets the requirements of Section 7.8.19 to provide overhead paging in the Waiting Area and adjacent washrooms in accordance with Appendix 1A [Clinical Specifications and Functional Space Requirements] Section 2.3.3.4(23) and acts independently of the Facility PA system in accordance with Section 7.9.3:

7.8.19.1.6.(f).1 A. Ambulatory Care (A1. Patient Arrival and Check-In);

7.8.19.1.6.(f).2 C. Emergency (C1. Patient Arrival and Check-In);

7.8.19.1.6.(f).3 D. Perioperative (D1. Patient Arrival and Check-In);

7.8.19.1.6.(f).4 E. Laboratory (E8. Outpatient Specimen Collection);

7.8.19.1.6.(f).5	F. Medical Imaging (F1. Patient Arrival and Check-In and F2. Breast Imaging);
7.8.19.1.6.(f).6	G. OACU (G1. Clinic Pods (5));
7.8.19.1.6.(f).7	I. Systemic Therapy (I1. Patient Arrival and Check-In);
7.8.19.1.6.(f).8	L. Radiation Therapy (L1. Patient Arrival and Check-In);
7.8.19.1.6.(f).9	M. Functional Imaging (M2. PET CT/Theranostics) and;
7.8.19.1.6.(f).10	T2. Public Spaces - CC (T2.01.01 – Reception – Cancer Centre).

7.8.19.1(6)(g) Provide one (1) microphone for the Emergency Department PA situated in the Emergency Department at each Patient Check-In desk to be used by Staff to call Patients in the Patient Waiting Area to come to the Patient Check-In desk.

7.8.19.1(6)(h) Provide two (2) microphones and two (2) speakers as spares for the localized PA system.

7.8.19.1(6)(i) Provide localized volume control at one (1) of the Patient Check-In desks within each Component listed in 7.8.19.1(6)(f) to manually adjust the volume of the localized PA system within pre-set limits based on the ambient noise levels in the patient Waiting Area of each Component.

7.8.19.1(6)(j) Physically and logically integrate the localized PA system with the Facility PA to mute the localized PA system when there is a concurrent page occurring from the Facility PA or the Fire Alarm System.

7.8.19.1(6)(k) Provide queuing logic and paging priority for the localized PA system so that pages initiated at the same time from any of the microphones at any Patient Check-In desk within each Component listed in 7.8.19.1(6)(f) will be placed into a queue to annunciate one at a time and not overlap.

7.8.19.1(7) Provide an IP-based means of internal and external system monitoring for the Authority, including all associated hardware and software. Send all system alarms to FMO portable pagers / handheld devices. Portable devices will show the same alarm information as displayed on the operator workstations and will be interactive. That is, the alarms will follow the same links as the workstations and be able to be silenced and acknowledged from the portable device, time stamping and recording the user ID.

7.8.19.2 Performance Requirements

7.8.19.2(1) The Design-Builder will undertake the Design and Construction of a fully operational PA system in the Facility in consultation with the Authority through the Review Procedure.

7.8.19.2(2) At a minimum, the PA system will be capable of paging to each department individually, each floor individually and site wide. Additionally, each Patient waiting area will be capable of being paged from the corresponding reception desk.

7.8.19.2(3) Each paging zone to have a minimum to two paging circuits such that failure of one zone will not leave any zone without paging notification. These diverse paging circuits will be powered by different amplifiers.

7.8.19.2(4) The Design-Builder will ensure the full functionality of the PA system is available via the existing contact centre interface.

7.8.19.2(5) Provide sound levels as follows throughout the Facility:

7.8.19.2(5)(a) Normal paging: 60 dB minimum; and

7.8.19.2(5)(b) Paging sound levels will be at least 10 dB above ambient noise levels in all locations.

7.8.19.2(6) The Design-Builder will supply and install all equipment necessary for a fully operational public-address system including:

7.8.19.2(6)(a) Two (2) DSPs (QSC Core 110f) within the MER;

7.8.19.2(6)(b) Dedicated and fully redundant network switches to connect the PA system in the Facility to the redundant DSPs in the MER. The QSC system communicates on a standard gigabit network, via QSC approved switches;

7.8.19.2(6)(c) Paging amplifiers;

7.8.19.2.6.(c).1 Amplifiers to be provided in pairs for amplifier channel redundancy;

7.8.19.2.6.(c).2 Size amplifiers to handle the total load plus 25 percent spare capacity per channel;

7.8.19.2.6.(c).3 The Design-Builder is to provide:

(c).3.1 Two (2) additional spare paging amplifiers over and above the number required to operate the Facility's PA System; and

(c).3.2 Two (2) amplifiers per output channel. Each amplifier will supply alternating speakers such that on loss of one

amplifier, 50% of the remaining speakers will continue to operate.

7.8.19.2.6.(c).4 Paging Amplifiers will be a QSC Network Multichannel Power Amplifier; and

7.8.19.2.6.(c).5 Other material types acceptable to the Authority will be considered but its approval of their use is subject to the sole discretion of the Authority.

7.8.19.2(6)(d) Speakers

7.8.19.2.6.(d).1 All speakers will be multi-tap (0.25 – 4w);

7.8.19.2.6.(d).2 Flush Tamper Resistant ceiling speakers in finished areas;

7.8.19.2.6.(d).3 Enclosed ceiling speakers in unfinished areas;

7.8.19.2.6.(d).4 Trumpet type speakers in mechanical spaces and other high ambient noise locations; and

7.8.19.2.6.(d).5 Ligature Resistant and Tamper Resistant where required.

7.8.19.2(6)(e) End-of-line resistors for audio channel supervision;

7.8.19.2(6)(f) Power supplies and other support equipment;

7.8.19.2(6)(g) Structured Cabling, wring and cable management; and

7.8.19.2(6)(h) All other dedicated network equipment required with redundancy to protect the PA system against single points of failure.

7.8.19.2(7) All components of the PA system including wiring are to be labelled in accordance with the Authority’s standards.

7.8.19.2(8) PA equipment is to be rack mounted in Communications Rooms.

7.8.19.2(9) Dedicated equipment racks are to be provided and installed for the PA System.

7.8.19.2(10) The amount of rack space provided will accommodate all the equipment required for camp plus sufficient space for 25 percent growth. Empty space dedicated for future growth of the PA system will be covered by blank panels.

7.8.19.2(11) All PA system wiring to be run in conduit, and cable tray even in fully accessible ceiling areas.

7.8.19.2(12) Maximum of one second delay between accessing the system and the ability to transmit a page from either a local station or remotely.

7.8.19.2(13) Wire alternate speakers to different amplifiers such that a fault on one channel does not render paging in an area inaudible.

7.8.19.2(14) All PA components will be continuously self-supervised with a common trouble relay. The trouble relay will be monitored by the Fire Alarm system.

7.8.20 Nurse Call Systems

7.8.20.1 Basic Requirements

7.8.20.1(1) Patient-centric design is critical to providing an effective nurse call system. Each Patient Care Area including those as set out in Appendix 1N [Electrical and Communications Matrix], will have a full suite of nurse call devices, including:

- 7.8.20.1(1)(a) Staff Consoles;
- 7.8.20.1(1)(b) Zone / Dome Lights;
- 7.8.20.1(1)(c) Patient stations;
- 7.8.20.1(1)(d) Call Cords, Pillow Speakers, Speakers and Pull Cords;
- 7.8.20.1(1)(e) Code Blue Stations;
- 7.8.20.1(1)(f) Staff Duty Stations;
- 7.8.20.1(1)(g) Staff VoIP Workflow Stations;
- 7.8.20.1(1)(h) Annunciator Panels; and
- 7.8.20.1(1)(i) 4-Button Stations.

7.8.20.1(2) The nurse call system will provide Patient assist, code call and Staff assist functions in the Facility as specified or as required by the Authority.

7.8.20.1(3) The Design-Builder will provide a full feature audio and visual nurse call system with full duplex communications in all areas where Patients are receiving care or treatment as required by, and designed in coordination with, the Authority.

7.8.20.1(4) Final locations of all head end and field end devices and equipment to be determined in consultation with the Authority through the Review Procedure.

7.8.20.1(5) Provide a nurse call system designed for use in an acute care hospital and manufactured by Austco. NOTE TO PROPONENT: If the Proponent proposes an Acceptable Equivalent under the

RFP, the Proponent should provide information regarding the capital cost, typical service contract cost, the licencing fees (etc.), and minimum requirements for the nurse call system equivalent to the Austco Tacera IP nurse call system with integration to other Facility systems as per Section 7.8.20.1(6)(d).

7.8.20.1(6) Design-Builder will provide the nurse call system complete with all licenses, hardware and software necessary to meet or exceed the requirements in this Section to create a Facility nurse call system, and will cause the nurse call manufacturer to:

7.8.20.1(6)(a) Prior to selecting, designing and installing the nurse call system and as required by the Authority, review the technical capabilities of the proposed nurse call system, hardware, redundancy issues, system layout, functionality and integration to other systems with the Authority and the Authority's Staff;

7.8.20.1.6.(a).1 For the purposes of overall and ongoing cost considerations, provide the Authority with:

(a).1.1 A detailed comparison and evaluation of each nurse call system with a recommendation for consideration based on the requirements of this Section;

(a).1.2 Ongoing licensing, software maintenance, and service level agreement requirements; and

(a).1.3 A nurse call system roadmap from the past ten years to the next thirty years, at a minimum including the length of time all components of the nurse call system will be supported for.

7.8.20.1(6)(b) Design the nurse call system in consultation with the Authority through the Review Procedure, including hardware and software functionality and system workflow; including reporting tools;

7.8.20.1(6)(c) Implement the nurse call system, including to install, program, test and Commission the system, and coordinate all workflows with the Authority;

7.8.20.1(6)(d) Integrate the nurse call system with the following systems:

7.8.20.1.6.(d).1 Public address;

7.8.20.1.6.(d).2 IM/IT voice network;

7.8.20.1.6.(d).3 Patient reading light;

7.8.20.1.6.(d).4 Patient Physiological Monitoring;

7.8.20.1.6.(d).5 Smart beds; refer to Appendix 1H [Equipment and Furniture];
7.8.20.1.6.(d).6 Wireless Staff panic duress;
7.8.20.1.6.(d).7 Fixed panic duress;
7.8.20.1.6.(d).8 Electronic health record admit transfer discharge (ADT);
7.8.20.1.6.(d).9 Fire alarm (smoke detector relay) in each Patient room;
7.8.20.1.6.(d).10 Wireless Staff communication; and
7.8.20.1.6.(d).11 RTLS.

7.8.20.1(7) Staff will have the means to disable nurse call buttons on an individual basis to prevent misuse by Patients. System to include this functionality for future implementation without the need to update or add equipment or system components.

7.8.20.1(8) System will have the capability to integrate with Staff wireless communication devices, EMR, ADT and Staff scheduling systems. For integration with hospital supplied systems the Design-Builder will be responsible to provide all components, to include infrastructure, hardware, software, licenses and interfaces to enable complete interface with hospital systems.

7.8.20.1(9) The Design-Builder will provide sufficient time to consult with the Authority and obtain Authority approval on design, supply, configuration, training, Commissioning, and hand over for integration with hospital supplied systems.

7.8.20.1(10) System will include reporting/auditing features and all required software/licensing for workstations.

7.8.20.2 Quality Requirements

7.8.20.2(1) The nurse call system in a hospital environment is a hub for wired and wireless clinical workflow communications.

7.8.20.2(2) The nurse call system will:

7.8.20.2(2)(a) Be designed to promote efficient operation for Staff. Incorporate in the planning, design and installation the multiple virtual and physical Interfaces that are required to support a seamless fixed and mobile workflow system;

7.8.20.2(2)(b) Be an IP-based full-duplex audio and visual system that will utilize the latest proven technologies and comply with all applicable system design and installation standards, including UL-1069, CSA C22.2 No. 205 and CSA Z32 Electrical Safety and

Essential Electrical Systems in Health Care Facilities;

7.8.20.2(2)(c) Provide a full range of software applications as offered by the nurse call vendors most current systems intended for use in acute care facilities. The applications will include system administration and supervision, Staff assignment and messaging, Staff presence, workload and workflow management, and statistical reporting in a centralized database;

7.8.20.2(2)(d) Be the primary emergency communication system for patients to contact Staff in each Patient care and treatment area, including all areas accessible to a Patient;

7.8.20.2(2)(e) Be the primary communication device for Authority Staff to alert other Staff that they need assistance in a Patient or treatment area;

7.8.20.2(2)(f) Be designed to promote efficient operation for Staff;

7.8.20.2(2)(g) annunciate a variety of code calls, non urgent calls, and Patient monitoring alarms on nurse call devices and through integration to all required systems based on Authority requirements; and

7.8.20.2(2)(h) Integrate with an annunciator on wireless Staff communication devices for near instant alarm response allowing full duplex, two-way voice communication into all Patient locations without loss of call or ability to answer calls.

7.8.20.3 Performance Requirements

7.8.20.3(1) Confirm all operational workflows, call flows and device locations in consultation with the Authority through the Review Procedure prior to installing or programming the system.

7.8.20.3(2) All data points within the nurse call system will be capable of being retained for the purposes of reporting for a minimum 60 days.

7.8.20.3(3) The nurse call system will continue to operate in stand-alone mode should other integrated and networked systems fail to maintain stable operation and connectivity.

7.8.20.3(4) Design-Builder will ensure that large clinical spaces as outlined in Appendix 1N [Electrical and Communications Matrix], such as

Procedure Rooms and the Exercise/Wellness Room, contain multiple nurse call audio and visual devices with code/Staff assist buttons as required by the Authority.

7.8.20.3(5) Design-Builder will supply protective covers for all code blue stations and any 4-button stations with code blue functionality.

7.8.20.3(6) Code blue stations and any 4-button stations with code blue functionality in public areas of the Facility will require a suitable physical barrier, or enclosure that enables Staff to prohibit access to the device.

7.8.20.3(7) All system equipment, excluding servers, will be from a single manufacturer and will be the same model number from that manufacturer.

7.8.20.3(8) Provide connection to the Patient Care Area's smoke detection system to annunciate on the nurse call dome lights as required by code.

7.8.20.3(9) Provide full duplex communication between VoIP workflow stations, Staff console stations, and Patient and Staff locations.

7.8.20.3(10) If calls are not answered, allow for cascading of calls to higher priorities, as determined in consultation with the Authority through the Review Procedure;

7.8.20.3(11) If calls are not cancelled, provide time-out call cascading and display such calls on the Staff console, wireless phones and any other type of call display as identified in consultation with the Authority through the Review Procedure.

7.8.20.3(12) Call Types

7.8.20.3(12)(a) Nurse call stations will be individually programmable to allow multiple call classification and priority levels. Nurse Call alarms will include the following, at a minimum, and other alarms as determined by the Authority in order that Staff and patients are able to initiate emergency and workflow notifications:

7.8.20.3.12.(a).1 code blue (cardiac arrest);
7.8.20.3.12.(a).2 code red (fire);
7.8.20.3.12.(a).3 code white;
7.8.20.3.12.(a).4 normal Patient call;
7.8.20.3.12.(a).5 priority Patient call;
7.8.20.3.12.(a).6 Staff emergency call;
7.8.20.3.12.(a).7 bathroom call;
7.8.20.3.12.(a).8 shower call;
7.8.20.3.12.(a).9 anaesthetic call;

7.8.20.3.12.(a).10 clean room call;
7.8.20.3.12.(a).11 porter call; and
7.8.20.3.12.(a).12 Patient monitoring alarms.

7.8.20.3(13) Staff Consoles

7.8.20.3(13)(a) Staff consoles will:
7.8.20.3.13.(a).1 Be coloured screens (not monochrome);
7.8.20.3.13.(a).2 Be user configurable;
7.8.20.3.13.(a).3 Be VoIP;
7.8.20.3.13.(a).4 Allow multiple screens;
7.8.20.3.13.(a).5 Be soft key enabled;
7.8.20.3.13.(a).6 Be capable of hands-free full duplex communication with other nurse call audio devices and the Authority wireless Staff communication system;
7.8.20.3.13.(a).7 Be capable of full duplex private communication via the handset with other nurse call audio devices and the Authority wireless Staff communication system;
7.8.20.3.13.(a).8 Have the capability to redirect all calls to other Staff consoles on a manual, call escalation, or console failure basis; and
7.8.20.3.13.(a).9 Allow for audible room monitoring.

7.8.20.3(13)(b) Design-Builder will confirm programming through user group meetings and in consultation with the Authority and their nurse call compliance agent.

7.8.20.3(13)(c) Design-Builder will supply and install Staff consoles in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff will have ready access to Staff consoles in any locations where Staff may reasonably be expected to gather to monitor Patients or manage work:
7.8.20.3.13.(c).1 Control Desk;
7.8.20.3.13.(c).2 Security Station;
7.8.20.3.13.(c).3 Reception, registration, and triage areas;
7.8.20.3.13.(c).4 As indicated in Appendix 1N [Electrical and Communications Matrix]; and
7.8.20.3.13.(c).5 Command Centre.

7.8.20.3(14) Zone / Dome Lights

7.8.20.3(14)(a) Provide multi-call classification dome and zone lights (minimum 4 LEDs) to annunciate calls at each room or bay with a nurse call device.

7.8.20.3(14)(b) Locate dome lights in a manner that allow Authority Staff the best possible view from the outside of the room where the nurse call device is located.

7.8.20.3(14)(c) Dome lights will be centred above the entrance of a room if the light is not obstructed by columns or other infrastructure. If view is impeded the dome light will be mounted in the ceiling, in line with the centre of the entrance of a room.

7.8.20.3(14)(d) Provide zone lights at all corridor intersections or as determined by the Authority to direct and lead Staff from anywhere within or outside the unit to the origin of the call.

7.8.20.3(14)(e) Exact location and final placement of zone and dome lights will be as directed by the Authority and determined in consultation with the Authority's clinical Staff, code response team lead, Clinical Lead and nurse call manufacturer.

7.8.20.3(14)(f) Final placement of dome and zone lights will not interfere or obstruct other ceiling mounted devices such as fire alarms, air handling vents, and exit signs.

7.8.20.3(15) Patient Stations

7.8.20.3(15)(a) Patient stations will be individually programmable to allow multiple call classification and priority levels. Patient stations will be capable of connecting nurse call devices (such as call cords and pillow speakers), smart beds, and auxiliary alarm inputs.

7.8.20.3(15)(b) Patient stations will fully interface with the full range of smart:

7.8.20.3.15.(b).1 bed call and audio functions using standard 37-pin (or latest connection protocol in place at the time of procurement to meet this requirement based on the chosen nurse call vendor) bed connectors. Design-Builder will be responsible for supplying any additional cords, adapters, or connectors required to facilitate this interface; and

7.8.20.3.15.(b).2 devices in the room to provide an enhanced Patient and caregiver experience in these rooms.

7.8.20.3(15)(c) Where there are multiple Patient areas within a given location, Design-Builder will provide one (1) Patient station for each bed, recliner, chair and stretcher, excluding visitor only areas.

7.8.20.3(15)(d) All Patient stations will have a minimum of two separate input connections with the ability to interface with relay/dry contact medical equipment alarms for medical equipment monitoring and peripheral monitoring (such as bed exit).

7.8.20.3(15)(e) All Patient stations will have the ability to be reprogrammed to be used as a dual bed station in the event a single Patient room is converted to a dual Patient room.

7.8.20.3(15)(f) Design-Builder will supply and install Patient stations in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff and Patients will have immediate access to Patient stations in any locations where Patients may reasonably be expected to be left alone and/or receiving treatment:

- 7.8.20.3.15.(f).1 Exam/Treatment Rooms and Bays;
- 7.8.20.3.15.(f).2 Exam Rooms;
- 7.8.20.3.15.(f).3 Procedure Rooms and Bays;
- 7.8.20.3.15.(f).4 Isolation Rooms;
- 7.8.20.3.15.(f).5 As indicated in Appendix 1N [Electrical and Communications Matrix]; and
- 7.8.20.3.15.(f).6 Any other Patient location with a bed, recliner, chair, exam table, and/or stretcher.

7.8.20.3(16) Call Cords, Pillow Speakers and Pull Cords

7.8.20.3(16)(a) Call Cords

- 7.8.20.3.16.(a).1 All call cords will be washable and compliant with the Authority's infection control policies. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs.
- 7.8.20.3.16.(a).2 Provide call cords for each Patient station that is not assigned a pillow speaker, as determined in consultation with the Authority.
- 7.8.20.3.16.(a).3 Provide additional spare call cords equal to 10% of the amount provided for Substantial Completion.

7.8.20.3.16.(a).4 Provide additional limited dexterity call cords equal to 5% of the amount provided for Substantial Completion.

7.8.20.3(16)(b) Pillow Speakers

7.8.20.3.16.(b).1 Provide enhanced pillow speakers for control of room lights within Patient spaces and as indicated in Appendix 1N [Electrical and Communications Matrix].

7.8.20.3.16.(b).2 Provide additional spare pillow speakers equal to 10% of the amount provided for Substantial Completion.

7.8.20.3.16.(b).3 Approval of pillow speaker type and functionality will be as directed by the Authority and determined in consultation with the Authority's clinical Staff.

7.8.20.3(16)(c) Pull Cords and Audio Pull Cord Stations

7.8.20.3.16.(c).1 Pull cords will be washable and compliant with the Authority's infection control policies.

7.8.20.3.16.(c).2 Design-Builder will supply and install audio pull cord stations with audio and Staff assist buttons in the following locations, at a minimum, and in other locations as determined by the Authority in order that Patients will have immediate access to audio pull cord stations in any locations where Patients receive treatment and/or may reasonably be expected to be left unsupervised and the Authority determines that a Patient station is not required:

(c).2.1 Patient and public washrooms in each stall;

(c).2.2 Patient and family lounges;

(c).2.3 Change rooms, cubicles and all locations where a Patient may be changing; and

(c).2.4 As indicated in Appendix 1N [Electrical and Communications Matrix].

7.8.20.3.16.(c).3 Provide pullcords for each pull cord station plus 10% spare if they are not connected directly as part of the audio pull cord station.

7.8.20.3(17) Code Blue Stations

7.8.20.3(17)(a) Code buttons may be incorporated into Patient stations and 4-button stations as long as other nurse call functionality is not attributed to 4 buttons in consultation with the Authority.

7.8.20.3(17)(b) All code blue stations are to have a protective flip up cover over the code blue button to prevent false alarms.

7.8.20.3(17)(c) Code button/functionality is not to be incorporated into any Staff VoIP workflow stations.

7.8.20.3(17)(d) Design-Builder will provide code blue buttons in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff have immediate access to code blue buttons in any locations where Patients receive treatment and/or may reasonably be expected to be situated:

- 7.8.20.3.17.(d).1 Control Desk;
- 7.8.20.3.17.(d).2 Consult rooms;
- 7.8.20.3.17.(d).3 Reception, registration, and triage areas;
- 7.8.20.3.17.(d).4 Administrative areas;
- 7.8.20.3.17.(d).5 Patient therapy and gym;
- 7.8.20.3.17.(d).6 Quiet rooms;
- 7.8.20.3.17.(d).7 Viewing room;
- 7.8.20.3.17.(d).8 Meeting rooms;
- 7.8.20.3.17.(d).9 Group rooms and rehabilitation meetings (both sides of dividable rooms); and
- 7.8.20.3.17.(d).10 As indicated in Appendix 1N [Electrical and Communications Matrix].

7.8.20.3(18) Code Blue Sequence

7.8.20.3(18)(a) Provide an integrated nurse call system that achieves the following sequence of operations:

- 7.8.20.3.18.(a).1 Upon a code blue button activation, a priority call signal will be annunciated at multiple Staff consoles and the Staff console located at the Facility switchboard location. A pop-up message will also be displayed on all switchboard workstations that will indicate the precise origin of the code blue call.
- 7.8.20.3.18.(a).2 A code blue signal will be automatically generated by the system. The code blue signal will comprise an automated and coded message on the public address system, a text message that is sent to the code blue response teams and wireless Staff communication devices through the integration methods described in Section 7.8.25.1. Allow for a manual verification sequence and programming prior to initiating

the code blue signal, for Staff to manually verify the code blue call.

7.8.20.3.18.(a).3 Dome/zone lights at all corridor intersections and elevator lobbies will direct and lead the code response team to the origin of the code blue call. Design-Builder will ensure that these devices are visible along the entire length of the corridor and will install additional dome/zone lights at each doorway in the corridor, and as required to provide visibility where line-of-sight may be obstructed by signage or other wall/ceiling mounted obstructions.

7.8.20.3.18.(a).4 Each code blue team member will have the ability to recall any elevator from any elevator lobby by means of an elevator recall key switch and card swipe. The code blue team will assume control of the elevator by means of a code blue key switch located inside each elevator cab.

7.8.20.3.18.(a).5 Upon cancellation of the code blue call at the originating station all systems will reset and resume normal operation.

7.8.20.3(19) Staff Duty Stations

7.8.20.3(19)(a) Provide adequate Staff duty stations for each nurse call system to ensure that tones are heard throughout each department.

7.8.20.3(19)(b) Design-Builder will supply and install Staff Duty Stations in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff will have ready access to Staff duty stations in any locations where Staff may reasonably be expected to be working alone and need the ability to see and/or hear all Nurse Call alerts:

7.8.20.3.19.(b).1 Clean supply storage rooms;

7.8.20.3.19.(b).2 Soiled Utility and Soiled Equipment Hold rooms;

7.8.20.3.19.(b).3 Medication rooms;

7.8.20.3.19.(b).4 Equipment store rooms supporting clinical components;

7.8.20.3.19.(b).5 Phlebotomy Rooms; and

7.8.20.3.19.(b).6 Satellite Scope Reprocessing, Clean Scopes storerooms, and Ultrasound Probe Cleaning.

7.8.20.3(19)(c) Provide the capability to mute each Staff duty station.

7.8.20.3(20) Typical Patient Rooms

7.8.20.3(20)(a) In each Patient Room with an ensuite washroom include the following:

- 7.8.20.3.20.(a).1 one (1) Patient station for each headwall location off centre towards the nursing side of the Patient bed;
- 7.8.20.3.20.(a).2 one (1) 4-button station for each headwall location off centre towards the non-nursing side of the Patient bed;
- 7.8.20.3.20.(a).3 one (1) water resistant audio pull cord station in the ensuite;
- 7.8.20.3.20.(a).4 one (1 waterproof (IP68 rated) audio pull cord station (that does not create feedback) in the bath/shower of the ensuite;
- 7.8.20.3.20.(a).5 one (1) Staff VoIP workflow station near the entrance to the room; and
- 7.8.20.3.20.(a).6 one (1) dome light outside the room.

7.8.20.3(21) Staff VoIP Workflow Stations

7.8.20.3(21)(a) Provide programmable Staff VoIP Workflow Stations with touchscreens and integrated full duplex audio at locations as determined in consultation with the Authority.

7.8.20.3(21)(b) Staff VoIP Workflow Stations will have a programmable touch screen functionality that will enable the Authority to program workflow applications.

7.8.20.3(21)(c) Locate Staff VoIP Workflow Stations separate from Patient stations close to the room entrance, not at the Patient bedside or at the side of the Patient exam table. If the Staff VoIP Workflow Station is not UL-1069 certified an additional 4-button station is required close to the room entrance, inside the room, for code and urgent call response such as code blue, code white, Staff assist.

7.8.20.3(21)(d) Exact location of Staff VoIP Workflow Stations will be as directed by the Authority and determined in consultation with the Authority’s clinical Staff and nurse call manufacturer. Depending on the nurse call manufacturer and the overall functionality of the Staff VoIP Workflow Station, the Authority may

choose to locate the Staff VoIP Workflow Station outside of the Patient room near the entrance to the room.

7.8.20.3(21)(e) Design-Builder will supply and install Staff VoIP Workflow Stations in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff will have ready access to Staff VoIP Workflow Stations in any locations where Staff may reasonably be expected to initiate workflow processes through the nurse call system, voice communication and/or visual alert:

7.8.20.3.21.(e).1 Anterooms attached to Isolation Rooms
7.8.20.3.21.(e).2 Staff lounges;
7.8.20.3.21.(e).3 Consult rooms;
7.8.20.3.21.(e).4 Locker rooms;
7.8.20.3.21.(e).5 Meeting Rooms; and
7.8.20.3.21.(e).6 As indicated in Appendix 1N [Electrical and Communications Matrix].

7.8.20.3(22) Annunciator Panels

7.8.20.3(22)(a) Design-Builder will supply and install wall-mounted annunciator panels:

7.8.20.3.22.(a).1 In hallways and Patient Care Areas;
7.8.20.3.22.(a).2 In large Care Team Bases (where the Staff Console does not provide adequate visual annunciation of calls);
7.8.20.3.22.(a).3 As indicated in Appendix 1N [Electrical and Communications Matrix]; and
7.8.20.3.22.(a).4 In consultation with the Authority to provide a fully functional visual and audible nurse call system.

7.8.20.3(22)(b) Annunciator Panels will provide the same functionality as a Staff Console.

7.8.20.3(23) 4-Button Stations

7.8.20.3(23)(a) Design-Builder will supply and install 4-button stations in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff, Patients or guests will have immediate access to 4-button stations in any locations where they may reasonably be expected to gather in shared areas:

7.8.20.3.23.(a).1 Family rooms and lounges;
7.8.20.3.23.(a).2 Patient lounges and quiet rooms;

7.8.20.3.23.(a).3 Patient therapy, gym, rehabilitation, and ADL rooms;

7.8.20.3.23.(a).4 Near the entrance of inpatient rooms if the Staff VoIP Workflow Stations is not UL-1069 certified;

7.8.20.3.23.(a).5 Conference/Meeting Rooms (both sides of dividable rooms); and

7.8.20.3.23.(a).6 As indicated in Appendix 1N [Electrical and Communications Matrix].

7.8.20.3(23)(b) Provide an additional 4-button station with dome light at the hall calls for the clean and soiled elevators serving each Sterile Supply Core and MDR.

7.8.20.3(24) Infrastructure Requirements

7.8.20.3(24)(a) Provide a separate physical network, as per the manufacturer's requirements, and all servers and network equipment for the nurse call system and integrate this network with other Facility networks, as determined in consultation with the Authority through the Review Procedure. The servers for this system will reside in the MER. Design-Builder will coordinate installation of these servers with the Authority.

7.8.20.3(24)(b) Connections from the nurse call system to the Authority network will utilize Category 6A or OM5 in accordance with Section 7.8 Communications (Division 27).

7.8.20.3(24)(c) All nurse call network horizontal runs between nurse call devices and to Communication Rooms will be:

7.8.20.3.24.(c).1 Terminated on separate and dedicated patch panels if the nurse call head-end equipment is installed in floor mounted racks. If the nurse call head-end equipment is to be mounted in wall cabinets, the location of the cabinets will be determined in consultation with and as approved by the Authority;

7.8.20.3.24.(c).2 Bundled separately from and will not be intertwined with other horizontal cables;

7.8.20.3.24.(c).3 Terminated and labelled in accordance with Section 7.8 Communications (Division 27); and

7.8.20.3.24.(c).4 Installed using standard purple sheathed Category 6, or greater based on standard in

place at the time of procurement, copper cabling and connectors for nurse call cabling as required by the manufacturer. Cabling to be supplied by approved cabling manufacturer as set out in the PHSA Communications Infrastructure Standard.

7.8.20.3(24)(d) The nurse call system will be supplied by power from the central IM/IT UPS system with backup from the vital power system.

7.8.20.3(25) System Configuration

7.8.20.3(25)(a) Design-Builder will review with the Authority's clinical Staff the technical capabilities of the nurse call system including hardware and software functionality and system workflow; including reporting tools;

7.8.20.3(25)(b) The Design-Builder will train the Authority's FMO Staff on how to maintain the nurse call System, and the Authority's clinical and non-clinical end-users on how to use the nurse call system, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.8.20.3(25)(c) Design-Builder will confirm all operational workflows, call flows and device locations through user group meetings prior to installing or programming the system.

7.8.20.3(25)(d) Installation of the nurse call system will be to the satisfaction of the Authority including device installation, programming, configuration, interfacing integration to other systems, testing and Commissioning of the system.

7.8.20.3(26) Integration Requirements:

7.8.20.3(26)(a) The nurse call system will be integrated with other systems in a seamless manner to achieve the integrated functional requirements as determined in consultation with the Authority.

7.8.20.3(26)(b) The nurse call system will allow the Authority's EHR to report from the nurse call system and pull data from the nurse call system for the purposes of reporting and analytics for items such as workflow

optimization. All data points within the nurse call system will be available for EHR access. No Patient data will be stored within the nurse call system database.

7.8.20.3(26)(c) Integrate the nurse call system with the:

- 7.8.20.3.26.(c).1 Wireless Staff Communication system for additional monitoring and vectoring of calls;
- 7.8.20.3.26.(c).2 Authority's VoIP network and provide integration to the wireless Staff communications system. Provide sufficient audio channels to meet the Authority's interface requirements, as determined in consultation with the Authority;
- 7.8.20.3.26.(c).3 Authority's wireless Staff communication devices (Staff communication device, wireless phone devices, PDA's, radios or phones) for near instant alarm response as a secondary alerting system. The nurse call system will operate seamlessly and allow two-way full duplex VoIP communication into all Patient locations. Design-Builder will provide all interfaces and programming;
- 7.8.20.3.26.(c).4 Public Address system to broadcast automated pre-recorded messages as determined by the Authority;
- 7.8.20.3.26.(c).5 Fixed panic duress systems such that when an alarm is initiated the location of the alarm will appear on the Staff console and annunciator panels in each Component; and
- 7.8.20.3.26.(c).6 RTLS system such that non-urgent calls may be cancelled, and dome lights illuminated based on tag presence in the room.

7.8.20.3(26)(d) The nurse call system will provide an interface such that the audio from the "My Stay" Patient room boards will be connected and audible through the smart bed speakers and/or the nurse call pillow speakers. This interface will also allow the Patient to control the "My Stay" room board and Patient headwall lighting. Infrastructure is to allow for future interface of blinds and climate control.

7.8.20.3(26)(e) Design-Builder will provide a 25 mm conduit in the ceiling above the Patient room and in the wall from the Patient station gang box to the location of the "My Stay" room board gang box.

7.8.20.3(26)(f) Design-Builder will highlight integration issues and provide recommendations regarding system layout, configuration, programming, integration and functionality prior to designing and installing the system.

7.8.20.3(26)(g) Provide hard-wired connection to each Patient room smoke detections system to annunciate smoke alarms on the nurse call system console and associated dome lights. Program this integration such that it can be turned off on a departmental basis for annual fire alarm testing and smudging requirements.

7.8.20.3(27) Provide programming servers and wireless Staff communication device allocation server locally on the Facility network to allow Care Team Base computer access to monitor status of the system and with appropriate password implement program changes.

7.8.20.3(28) Provide a fully functioning and portable demo kit with all nurse call devices to be used by the Authority in the Facility for ongoing training purposes.

7.8.21 Clock System

7.8.21.1 Basic Requirements

7.8.21.1(1) Provide a synchronized wireless clock system to assure accurate consistent time is available at key clinical and support spaces in the Facility; refer to Appendix 1N [Electrical and Communications Matrix]. Provide a network time server for synchronization of all clocks throughout the Facility.

7.8.21.1(2) The system will provide automatic correction for daylight savings time and self-correct if power fails.

7.8.21.1(3) Supply master time controllers and all clocks by a recognized industry leader with all components by the same manufacturer.

7.8.21.2 Performance Criteria

7.8.21.2(1) Provide 120 V-powered synchronized clocks that receive correction signals from the network time server. Clocks to have polycarbonate lens.

7.8.21.2(2) Provide a deep recessed outlet box and connector, concealed behind the clock, to accommodate the clock power connection. Cord length to be suitable for this application. Clocks to be powered from vital, on circuits shared with the room lighting.

7.8.21.2(3) The finish and appearance of the clocks are to complement the architectural finishes and be semi-flush mount type within rooms.

7.8.21.2(4) Locate analog clocks in rooms and areas to meet the clinical and support functions as required in Appendix 1N [Electrical and Communications Matrix], including:

7.8.21.2(4)(a) Lobbies (main and elevator) and atriums;

7.8.21.2(4)(b) Staff locker rooms, family rooms, reception desks, Staff workstation rooms; and

7.8.21.2(4)(c) Treatment rooms, consultation/therapy rooms, Patient therapy rooms, waiting areas, life skills assessment, Dining/Activity Areas and lounges.

7.8.21.2(5) Locate digital elapsed time (countdown/count up) clocks in procedure and treatment rooms, including:

7.8.21.2(5)(a) Operating rooms, Trauma Room, minor and major procedure rooms.

7.8.21.2(6) Provide a digital clock that indicate AM/PM and date for areas where there is no access to daylight.

7.8.21.2(7) In addition to the locations noted above, provide clocks in the types, quantities and locations indicated in Appendix 1N [Electrical and Communications Matrix].

7.8.21.2(8) Provide local transmitters such that the system is capable of providing sufficient coverage throughout the entire Facility.

7.8.21.2(9) Install main transmitter and satellite transmitters located for correct system operation. Connect transmitter to UPS power, complete with handle lock on device on the circuit breaker. Manufacturer to confirm transmitter locations and power requirements for the entire Facility, including areas designated for Future Expansion, by completing site survey. Transmitters will not cause interference with other wireless or radio functions in the Facility.

7.8.22 Distributed Antenna System (DAS)

7.8.22.1 System Description

7.8.22.1(1) The Authority will deploy a DAS system in the Facility that will consist of:

7.8.22.1(1)(a) A Hybrid-Fibre-Coax DAS where single mode fibre connects the DAS head end in the MER to radio repeaters situated in the Facility’s TRs to distribute

the required frequencies and bands. From the radio repeaters, RF energy is distributed to passive antennas located throughout the Facility over horizontal coax cabling; and

7.8.22.1(1)(b) An Active DAS where single mode fibre connects the DAS head end in the MER to expansion units situated in the Facility's TRs to distribute the required frequencies and bands. From the expansion units, signals are distributed to active cellular access points located throughout the Facility over hybrid cabling that has both fibre and copper conductors for DC power distribution.

7.8.22.1(2) The non-commercial low band services provided over the Hybrid-Fibre-Coax DAS will be paging, ECOMM, and private two-way radio services for building security and FMO.

7.8.22.1(3) The cellular services provided over the Active DAS will operate in the LTE, HSPA and 5G bands offered by Bell, Rogers, TELUS, and Freedom Mobile.

7.8.22.1(4) The DAS will provide coverage for the above services in all rooms, areas and spaces within the Facility. This includes internal courtyards, Utility rooms (mechanical, electrical, elevator machine, Communications Rooms), interstitial floors, stairwells, parking levels, service links, bridges and tunnels.

7.8.22.1(5) The EF Room will accommodate Telecommunications carriers' base transceiver stations or Node B equipment for LTE, HSPA and 5G bands, as well as fibre connectivity to enable backhauling of cellular traffic to the Telecommunications carriers' network. If additional space is required, Telecommunications carriers' base transceiver stations or Node B equipment will also be housed in the EF Room of the Facility.

7.8.22.2 Design and Construction Coordination

7.8.22.2(1) The Design of the DAS is largely dependent on the Design of the Facility. As such, the Design of the DAS will be iterative and commence once the Design-Builder can confirm that the shell and core of Facility is largely finalized. The final iteration of the Design of the DAS will be complete after the IFC submission is issued by the Design-Builder.

7.8.22.2(2) The Design-Builder will:

7.8.22.2(2)(a) Provide, in the format requested by the Authority, all Design documentation related to the Facility that is required to complete an accurate software based

predictive Design of the DAS. This includes floor plans, reflected ceiling plans, elevation and section drawings, furniture and equipment layouts and information on building materials and finishes.

7.8.22.2(2)(b) Provide, in the format requested by the Authority, a progress update of all of the Facility's architectural floor plans every three months during the Construction period reflecting all accepted changes to the Design.

7.8.22.2(2)(c) Meet all requirements stated in Section 2.5.9 of this Schedule s as it relates to:

- 7.8.22.2.2.(c).1 Identifying specific elements of the DAS Design on the construction drawings;
- 7.8.22.2.2.(c).2 Coordinating specific elements of the DAS Design on the construction drawings; and
- 7.8.22.2.2.(c).3 Updating the construction drawings to reflect changes to the DAS Design throughout the duration of the Project.

7.8.22.2(2)(d) Ensure the proper operation of the DAS system by:

- 7.8.22.2.2.(d).1 Keeping all metal 1200 mm away from DAS antennas and cellular access points and placing no metal underneath DAS antennas and cellular access points. This includes pipes and ducting (insulated or otherwise) and EMT conduits of all sizes. If this requirement is not achieved during Construction, the Design-Builder will be responsible to re-locate the metal infrastructure at no cost to the Authority; and
- 7.8.22.2.2.(d).2 Adequately spacing all RF emitting devices and antennas provided by the Design-Builder 1200 mm from DAS antennas and cellular access points to ensure sufficient isolation. If this requirement is not achieved during Construction, the Design-Builder will be responsible to re-locate its RF emitting device and antennas at no cost to the Authority.

7.8.22.2(2)(e) Provide the Authority and its representatives with all access to the Site as required to complete the Design and Construction of the DAS.

7.8.22.3 Responsibility Matrix

7.8.22.3(1) The following responsibility matrix outlines the responsibilities of the Design-Builder and the Authority as it relates to the DAS.

Deliverable	Responsibility		Comments
	Design-Builder	Authority	
Communications Pathway System			
Cable Tray, Conduits and Sleeves	X		SOR 7.8.8
Backbone Communications Pathway System	X		SOR 7.8.8
Rooftop Communications Pathway System	X		SOR 7.8.8
Enclosures, Electrical Boxes and Access Panels	X		SOR 7.8.22.4(2)
Communications Rooms			
Wall space	X		SOR 7.8.22.5
Rack space	X		SOR 7.8.22.6, 7.8.9.9
Electrical			
Power for wall mounted equipment	X		SOR 7.8.22.5
Power for rack mounted equipment	X		SOR 7.8.22.6, 7.8.9.7(4), 7.8.9.9
Lightning Protection	X		SOR 7.8.22.4(2), 7.7.12
Mechanical			
Cooling for wall mounted equipment	X		SOR 7.8.22.5
Cooling for rack mounted equipment	X		SOR 7.8.22.6, 7.8.9.7(3)
Cabling Infrastructure			
Inter-Building Fibre Backbone	X		SOR 7.8.22.5(2), 7.8.10.3
Coaxial Cabling	X	X	SOR 7.8.22.6(3)
Hybrid Fibre / Copper Cabling	X	X	SOR 7.8.22.4(1), 7.8.22.5(2), 7.8.10.5
Patch Cords / Jumpers	X	X	SOR 7.8.22.4(1), 7.8.22.4(2), 7.8.10.3
Labelling	X	X	SOR 7.8.22.5(2), 7.8.10.3
DAS			
Design		X	SOR 7.8.22.4(1)
Third-party / Carrier Coordination and Connection		X	SOR 7.8.22.4(1)
Procurement of Passive / Active Components		X	SOR 7.8.22.4(1)
Installation of Passive / Active Components		X	SOR 7.8.22.4(1)
Labelling of Passive / Active Components		X	SOR 7.8.22.4(1)
Commissioning		X	SOR 7.8.22.4(1)

7.8.22.4 General Requirements

7.8.22.4(1) The Authority will:

7.8.22.4(1)(a) Design the DAS system;

7.8.22.4(1)(b) Procure, configure, install and Commission all passive components and active equipment required to make the DAS fully operational including cellular access points, antennas, radio, repeaters, expansion hubs, donor antennas, BDAs, element management hardware and software, combiners, splitters, antenna power supplies and head end equipment;

7.8.22.4(1)(c) Label DAS components and equipment, cable ends close to connectors and patch panels used for the termination of hybrid fibre / copper cabling;

7.8.22.4(1)(d) Supply and install coax jumpers and specialized fibre patch cords (ex. patch cords with E2000 connectors) that connect to DAS components and equipment; and

7.8.22.4(1)(e) Coordinate with the Telecommunications carriers and other third parties to provide the equipment and services required to connect the DAS to cellular, paging and the emergency communication networks. This includes the Design and Construction of additional Point of Interconnect (POI) cabling between the DAS headend and Telecommunications carriers' base transceiver stations or Node B equipment for LTE, HSPA and 5G bands.

7.8.22.4(2) The Design-Builder will:

7.8.22.4(2)(a) Obtain, if required, a code variance from the AHJ to ensure DAS antennas and cellular access points can be placed in stairwells to provide low band and cellular service coverage to the stairwell. Coverage in stairwells is essential for first responder, security and critical communications in the Facility and it standard practice for Authority to place DAS antennas and cellular access points in stairwell landings in all of its buildings;

7.8.22.4(2)(b) Undertake the Design and Construction of a Communications Pathway System that will support all DAS cabling in accordance with the requirements stated in Section 7.8.8;

7.8.22.4(2)(c) Supply and install all copper cabling required to bond rooftop antenna mounts to the Facility's lightning protection system;

7.8.22.4(2)(d) Supply, install and label indoor/outdoor NEMA rated cellular access point enclosures to protect DAS equipment from the environment, theft or vandalism in the parking levels and other areas inside the Facility as specified by the Authority;

7.8.22.4.2.(d).1 Enclosures will be UV stabilized for exposure to direct sunlight, virtually transparent to

wireless signals and work with all variations of Authority provided DAS equipment;

7.8.22.4.2.(d).2 Enclosures provided will come with locking hardware; and

7.8.22.4.2.(d).3 The Design-Builder, if requested, will provide samples of the enclosure to Authority for RF testing purposes and to check for interoperability with DAS equipment.

7.8.22.4(2)(e) Supply, install and label ceiling (hard cap and tile) enclosures to house DAS equipment in areas of the Facility where the Authority identifies a high risk to Patient and Staff safety. These enclosures will hide wireless equipment from view and prevent unauthorized access to the access point and the connecting cabling.

7.8.22.4.2.(e).1 Enclosures will be high abuse security grade, Ligature Resistant, Tamper Resistant, and Vandal Resistant;

7.8.22.4.2.(e).2 Enclosures provided will come with locking hardware;

7.8.22.4.2.(e).3 Enclosures will work with all variations of Authority provided DAS equipment, allow RF transmissions to penetrate with little or no attenuation and match the surrounding ceiling colour; and

7.8.22.4.2.(e).4 The Design-Builder, if requested, will provide samples of the enclosure to Authority for RF testing purposes and to check for interoperability with DAS equipment.

7.8.22.4(2)(f) Supply, install and label electrical boxes of suitable dimensions as approved by the Authority in locations determined by the Authority for mounting or housing DAS components and equipment;

7.8.22.4(2)(g) Supply, install and label access panels of suitable dimensions as approved for housing DAS components and equipment in areas inside the Facility that have inaccessible ceilings (where an enclosure is not required by the Authority). Access panels will be of high abuse security grade, Ligature Resistant, Tamper Resistant, and Vandal Resistant where required by the Authority;

7.8.22.4(2)(h) Supply and install in all inaccessible and exposed ceilings, the conduits necessary to connect enclosures, electrical boxes and access panels used for mounting or housing DAS components and

equipment to each other and to the nearest communications cable tray or Communications Room;

7.8.22.4(2)(i) Supply and install coloured vanity skins or covers for DAS equipment where required by the Authority or Design-Builder for aesthetic reasons;

7.8.22.4(2)(j) Supply and install specialized or customized mounts and brackets to install and or suspend DAS equipment;

7.8.22.4(2)(k) Take on full responsibility (including cost) for all alterations in the Design and Construction of the Facility required to install any aspect of the DAS and to support all rooftop mounted antennas including:

7.8.22.4.2.(k).1 Structural reinforcement of roof perimeter walls; and

7.8.22.4.2.(k).2 The provision of antenna shrouds that are lightweight and will conceal rooftop antennas in order to meet aesthetic and any local bylaw requirement while maintaining radio frequency transparency.

7.8.22.4(2)(l) Replace ceiling tiles and repair walls and ceilings in the Facility when necessary, in the event that DAS equipment needs to be moved prior to Substantial Completion to improve coverage and or prevent sources of interference;

7.8.22.4(2)(m) Supply and install labeling in accordance with the following requirements:

7.8.22.4.2.(m).1 A temporary (hand generated) label at the ends of each coaxial and hybrid fibre / copper cable at the time of rough-in. This label will reflect the cable ID provided in the cable routing report supplied by the Authority; and

7.8.22.4.2.(m).2 Apply a label to each coaxial and hybrid fibre / copper cable every 6m when installed in cable tray as well as within 1 m of entering or exiting a conduit or sleeve. These specific labels will convey information as to what DAS system the cable belongs to. The specifics of what information will be on the label will be provided by the Authority prior to shop drawing Submittal. In those instances where DAS cabling enters into conduit, the Design-Builder will label the conduit with a disclaimer

stating: “DO NOT BEND OR MOVE THIS CONDUIT”. These labels will be applied every 6 metres along the entire length of the conduit.

7.8.22.5 Hybrid-Fibre-Coax DAS

7.8.22.5(1) MER and TRs

7.8.22.5(1)(a) In the MER the Design-Builder will provide:

7.8.22.5.1.(a).1 6 m2 (8 ft. x 8 ft.) of contiguous dedicated wall space for active and passive DAS components; and

7.8.22.5.1.(a).2 A working area in front of the dedicated wall space to enable serviceability of the equipment. Considering the depth of the radio repeater equipment 1.5m of space in front of the wall will be required.

7.8.22.5(1)(b) In each TR in the Facility, the Design-Builder will provide:

7.8.22.5.1.(b).1 3 m2 (4 ft. wide x 8 ft. high) of contiguous dedicated wall space for active and passive DAS components; and

7.8.22.5.1.(b).2 A working area in front of the dedicated wall space to enable serviceability of the equipment. Considering the depth of the radio repeater equipment 1.5 m of space in front of the wall will be required.

7.8.22.5(1)(c) Should it be required to meet the space requirements for DAS equipment and cabling in a TR, the Design-Builder will, in accordance with Section 7.8.9, enlarge the TR to accommodate the additional wall space and all required clearances.

7.8.22.5(1)(d) For each 1219 mm (4 ft.) vertical section of wall space allocated for DAS wall mounted equipment, the Design-Builder will supply and install two duplex 5-20R receptacles; one from the IM/IT UPS branch and the other from the vital branch. Receptacles are to be mounted beneath the perimeter cable tray.

7.8.22.5(1)(e) The heat load of the wall mounted DAS equipment is estimated at 2500 BTU/hr at full capacity. This heat load will be included as part of the overall heat load calculated at the time of the Design and will factor into the cooling capacity that is supplied and

installed by the Design-Builder in the MER and in each of the TRs.

7.8.22.5(2) DAS Intra-Building Fibre Backbone

7.8.22.5(2)(a) The Design-Builder will undertake the Design and Construction of an intra-building fibre backbone that is dedicated for the DAS system in the Facility.

7.8.22.5(2)(b) The dedicated intra-building fibre backbone for the DAS system will be considered part of the backbone cabling subsystem in the Facility and, as such, its Design and Construction will conform to all requirements stated herein and in Section 7.8.10.3.

7.8.22.5(2)(c) The configuration of the dedicated intra-building fibre backbone for the DAS system will be a hierarchical star topology where separate dedicated primary and secondary single mode fibre optic cables will be installed between the MER and each TR in the Facility.

7.8.22.5.2.(c).1 Primary and secondary single mode fibre optic cables will be installed utilizing the physically route diverse backbone Communications Pathway System between the MER and each TR; and

7.8.22.5.2.(c).2 Minimum strand count for each primary and secondary single mode fibre optic cable running between the MER and each TR will be twelve (12).

7.8.22.5(2)(d) All fibres in the dedicated intra-building fibre backbone for the DAS system will to be terminated using connectors that are approved by the Authority.

7.8.22.5.2.(d).1 Different types of optical connectors will not be mated as this may damage the fibres and connectors;

7.8.22.5.2.(d).2 All intra-building fibre cables will be OTDR-tested in accordance with the PHSA Communications Infrastructure Standards and Specifications and the requirements of the Authority’s DAS supplier; and

7.8.22.5.2.(d).3 All test results for the dedicated DAS intra-building fibre backbone are to be provided to the Authority at the same time as the test results for all other intra-building fibre backbone cables.

7.8.22.5(2)(e) The Design-Builder will supply all fibre patch cords for the DAS intra-building fibre backbone unless otherwise stated herein.

7.8.22.5(3) Coaxial Cabling

7.8.22.5(3)(a) The Design-Builder will:

7.8.22.5.3.(a).1 Supply and install 4500 m of coaxial cable. This cable will be installed in segments of varying lengths as determined by the Authority's Design of the DAS;

7.8.22.5.3.(a).2 Coax cable will be installed from the Communications Room to passive and active components of the DAS in a tree and branch topology as per the Authority's Design of the DAS;

7.8.22.5.3.(a).3 Two (2) meter loops will be left at the ends of each segment of coax installed to enable termination and connection to passive and active components of the DAS; and

7.8.22.5.3.(a).4 The ends of each segment of coax will be wrapped in electrical tape to protect the cable from dust and moisture.

7.8.22.5(3)(b) Prior to installation, the Authority will provide cable routing reports to the Design-Builder that will specify the budgetary lengths for each coaxial cable run.

7.8.22.5.3.(b).1 The Design-Builder will then verify exact install lengths for each cable run and inform the Authority as cable installation is occurring when actual lengths differ from what has been budgeted by 15% or more; and

7.8.22.5.3.(b).2 Provide an updated cable routing report with adjusted lengths along with mark-ups illustrating adjusted routing. Updated cable routing report and mark-ups will be immediately after the installation of cable has been completed on each floor in the Facility.

7.8.22.5(3)(c) The coaxial cable supplied and installed by the Design-Builder to each DAS antenna will be equal to CommScope HL4RPV-50 or LDF4RK-50A depending on the Flame Test (FT) rating of the cable required by the AHJ. The Design-Builder will identify which of the two types of approved coax cable it will install in the Facility prior to the Authority commencing its Design of the DAS.

7.8.22.5(3)(d) The Authority will terminate and conduct VSWR (Voltage Standing Wave Ratio) and sweep tests on all coaxial cable that are installed as part of the Hybrid-Fibre-Coax DAS system. If the Authority determines a coaxial cable has been damaged and/or that there is a performance issue with the coaxial cable such as excessive uplink noise, the Design-Builder will be responsible for replacement and re-installation of the entire affected segment of cable at no additional cost to the Authority.

7.8.22.6 Active DAS

7.8.22.6(1) MER and TRs

7.8.22.6(1)(a) In the MER, two of the equipment racks already specified in Section 7.8.9.9 will be used for DAS equipment and cabling.

7.8.22.6(1)(b) In each TR in the Facility the Design-Builder will allocate half of a full height equipment rack (as defined in Section 7.8.9.9 for DAS equipment and cabling. This allocation of space will not be in an equipment rack that is dedicated for IM/IT Data, Wi-Fi and Voice network equipment and cabling.

7.8.22.6(1)(c) Should it be required to meet the space requirements for DAS equipment and cabling in a TR, the Design-Builder will, in accordance with Section 7.8.9.9 provide any combination of the following:

7.8.22.6.1.(c).1 Supply and install an additional full height equipment rack (including cable management and ePDUs) over and above the minimum quantity required;

7.8.22.6.1.(c).2 The enlargement of the TR to accommodate the additional equipment rack and all required clearances;

7.8.22.6.1.(c).3 Provide power to the additional equipment rack. The average peak demand of an equipment rack that houses DAS equipment will be 4kW, but the Design will allow for the demand to scale to 8kW; and

7.8.22.6.1.(c).4 Provide 6000 BTUs of cooling capacity to the additional equipment rack.

7.8.22.6(2) No additional intra-building fibre backbone cabling is required for the Active DAS over and above what is to be provided for Hybrid-Fibre-Coax DAS. Refer to Section 7.8.22.5 for further details.

7.8.22.6(3) Hybrid Fibre / Copper Cabling

7.8.22.6(3)(a) The Design-Builder will:

7.8.22.6.3.(a).1 Supply and install 14500m of hybrid fibre / copper cable. This cable will be installed in segments of varying lengths as determined by the Authority's design of the DAS;

7.8.22.6.3.(a).2 Hybrid fibre / copper cable will be installed from the Communications Room to each cellular access point in a star structure where each separate dedicated segment will be installed in a continuous fashion with no splices from the TR or MER to each cellular access point location specified on the Authority's Design of the DAS; and

7.8.22.6.3.(a).3 Two (2) meter loops will be left at the ends of each segment of hybrid fibre / copper cable to enable termination and connection to passive and active components of the DAS.

7.8.22.6(3)(b) The hybrid fibre / copper cable supplied and installed by the Design-Builder to each DAS antenna will be manufactured either by Commscope or Belden. The cable hybrid fibre / copper cable will:

7.8.22.6.3.(b).1 Be indoor / outdoor rated;

7.8.22.6.3.(b).2 Consist of four (4) single mode fiber strands and four (4) conductors (12 AWG);

7.8.22.6.3.(b).3 Meet the requirements of the DAS solution provided by the Authority; and

7.8.22.6.3.(b).4 Meet the Flame Test (FT) rating required by the AHJ.

7.8.22.6(3)(c) The Authority will terminate and test all hybrid fibre / copper on dedicated patch panels and DC power distribution equipment that it will provide and install in the equipment rack space allocated for DAS equipment. In the event a cable fails to pass testing, the Design-Builder will be responsible for replacement and re-installation of the entire affected segment of cable at no additional cost to the Authority.

7.8.23 CATV

7.8.23.1 The CATV system will provide television content to select locations throughout in the Facility.

7.8.23.2 The Authority will:

7.8.23.2(1) Coordinate with its designated telecommunications carrier and/or hospitality service provider to bring CATV services into the Facility and to extend those services from the EF Room to the required TRs. This includes the Design and Construction of a backbone riser, active equipment and passive components;

7.8.23.2(2) Procure Ultra HD digital display monitors (functioning as televisions), mounts and associated components required in the Facility with the exception of the Meeting Room – EOC which is the responsibility of the Design-Builder; refer to Section 7.8.15.7 for further details; and

7.8.23.2(3) Provide AV component mounts of suitable dimensions for each CATV Outlet to support a cable box or other AV component..

7.8.23.3 Design-Builder will:

7.8.23.3(1) Supply and install CATV Outlets in the Facility in accordance with the Authority's requirements. This includes the following rooms and areas Facility:

7.8.23.3(1)(a) Meeting Room – EOC;

7.8.23.3(1)(b) Command Centre;

7.8.23.3(1)(c) Meeting Room – 50 Seat;

7.8.23.3(1)(d) Staff Lounge (Y1.16); and

7.8.23.3(1)(e) Family/Visitor Lounges (B4.01) on IPUs.

7.8.23.3(2) Ensure that the location of the CATV Outlet and the associated power outlet is coordinated with the location and elevation of the Ultra HD digital display monitors such that cables and power cords will be hidden from view;

7.8.23.3(3) Install Ultra HD digital display monitors and mounts. Refer to Appendix 1J [Equipment List IM/IT] for further details;

7.8.23.3(4) Undertake the Design and Construction of the Communications Pathway System required for the CATV system in the Facility in accordance with requirements of this Section and Section 7.8.8;

7.8.23.3(5) Supply and install conditional power for each Ultra HD digital display monitor (designated for use as a television by the Authority) in the Facility. The only exception will be that the Ultra HD digital display monitor (television) in the Meeting Room – EOC will be on vital power;

7.8.23.3(6) Supply and install 1200 mm x 2400 mm of wall space dedicated for CATV use only in the EF Room, MER and each individual TR in the Facility;

7.8.23.3(7) Supply and install two (2) 15 Amp, 120V AC duplex receptacles on a dedicated circuit for CATV equipment in the EF Room, MER and each individual TR in the Facility;

7.8.23.3(7)(a) Receptacles will be located on the dedicated wall space allocated for CATV equipment mounted at the top of the plywood beneath the perimeter cable tray; and

7.8.23.3(7)(b) One receptacle will be on conditional power and the other receptacle will be on vital at each of the locations in noted above.

7.8.23.3(8) Allocate four (4) rack units of space for CATV equipment in the MER and in each individual TR in the Facility;

7.8.23.3(9) Integrate Ultra HD digital display monitors and mounts and associated components seamlessly into the Design of the Facility and provide any wall and ceiling reinforcement required to support the Meeting Room – EOC, mounts and associated components;

7.8.23.3(10) Work with the Authority to assess the ideal viewing angles in each applicable area and room within the Facility in order to determine the precise location and elevation of each Ultra HD digital display monitor. Refer to and meet the Design requirements stated in the Section 2.5.9;

7.8.23.3(11) Provide all necessary measures to eliminate sources of glare coming from interior and exterior sources of light that will impact the ability to view an Ultra HD digital display monitor. This includes window coverings, paint colour, lighting and lighting control and the correct placement of Ultra HD digital display monitors relative to sources of light; and

7.8.23.3(12) Provide all necessary Ligature Resistant, Tamper Resistant and Vandal Resistant measures as required by the Authority in the Facility to house, protect and prevent unwanted access to the Ultra HD digital display monitors, mounts and associated components and cabling. This includes such preventative measures as lockable enclosures or Millwork and anti-glare, non-breakable transparent polycarbonate panels.

7.8.23.4 A CATV Outlet will:

7.8.23.4(1) Include one (1) coaxial non-flooded, non-messengered RG6 or RG11 horizontal cable and two Category 6A horizontal cables. The configuration of CATV system will be a star structure where the coaxial cable and Category 6A horizontal cables will be run in a continuous fashion with no splices from the designated MER or TR to the CATV Outlet on the same floor;

7.8.23.4(2) Connect to the nearest communications cable tray by a 35 mm conduit; and

7.8.23.4(3) Consist of a 72171 backbox complete with a two-gang GB ring, faceplate and inserts for the coaxial cable and Category 6A cables.

7.8.23.5 Coaxial Horizontal Cable

7.8.23.5(1) The length of RG6 horizontal cable between the CATV Outlet and the designated MER or TR will not exceed 46 m.

7.8.23.5(2) Where the length of the horizontal cable between the CATV Outlet and the Communications Room exceeds 46 m, RG11 will be used.

7.8.23.5(3) The length of horizontal runs between the CATV Outlet and the designed Communications Room using RG11 will not exceed 75 m.

7.8.23.5(4) RG6 and RG 11 coaxial cable will be equal or better than CommScope Tri-shield Video Coaxial Cable. The Flame Test (FT) rating of the cables will be as required by the AHJ.

7.8.23.5(5) The Design-Builder will adhere to the latest version of the ANSI/TIA-568-C.4 standard and manufacturer's specifications for pulling tension, minimum bend radii and sidewall pressure when installing coaxial cable.

7.8.23.5(6) When installing, the Design-Builder will ensure the coaxial cable is not subjected to stress due to contact with tray/conduit support mechanisms, bonding lugs or any metal burrs within the support structure. Particular care will be taken around corners and offsets. Pulling lubrication will be used at all times to ensure a stress-free installation.

7.8.23.5(7) Any coaxial cable damaged or exceeding recommended installation parameters during installation will be replaced by the Design-Builder prior to final acceptance at no cost to the Authority.

7.8.23.5(8) A minimum of 200 mm of excess cable will be stored at each CATV Outlet, adhering to the minimum bend radius specified by

the manufacturer. Provide an additional three (3) metres of slack cable coiled above the dedicated wall space in the designated MER or TR.

7.8.23.5(9) Coax connectors will be a one-piece F-type compression connector, nickel plated with molded-in gasket. Wall plates will have F-connector plate adaptors to match the Structured Cabling manufacturer.

7.8.23.6 Category 6A horizontal cable will be supplied and installed in accordance with Section 7.8.10.

7.8.23.7 All horizontal cables will be identified by a self-adhesive label. The cable label will be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate and at each patch panel. Cable labels will identify site/building name, Communications Room ID as well as the ID of the patch panel and port in the TR (where the cable is terminated) in accordance with Appendix 1M [PHSA Communications Infrastructure Standards and Specifications].

7.8.23.8 Faceplates and jacks will be labelled in accordance with Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] to identify site/building name, Communications Room ID as well as the ID of the patch panel and port in the TR (where the cable is terminated).

7.8.24 Real Time Location System (RTLS)

7.8.24.1 System Overview

7.8.24.1(1) The Design-Builder will provide an integrated RTLS solution that will:

7.8.24.1(1)(a) Track and manage assets, supplies, specimens, implants, Staff and Patients (hereafter referred to as “entities”) in real time to support a variety of use cases;

7.8.24.1(1)(b) Produce, aggregate, distill, analyze, and share actionable location-tracking data with various “Authority owned” and “Design-Builder supplied” application systems for the purpose of displaying and exploiting the real-time location and status information of tracked entities;

7.8.24.1(1)(c) Be independent and physically separate from the digital Wayfinding system all other tracking systems specified in Division 28; and

7.8.24.1(1)(d) Employ technologies that are not Wi-Fi dependent and will not negatively affect the operation of the

Authority's Wi-Fi network and other wireless systems that will operate in the Facility and on the Site.

7.8.24.2 The Design-Builder provide a complete RTLS consisting of:

7.8.24.2(1) Different types of tags that can be attached a variety of different trackable entities,

7.8.24.2(2) Tag testing stations;

7.8.24.2(3) Sensors, beacons and readers;

7.8.24.2(4) Servers, database and database storage;

7.8.24.2(5) Location Engine;

7.8.24.2(6) Licensing;

7.8.24.2(7) Browser based client software application that can be accessed by operators and systems administrators using any computer and mobile device on the Authority network;

7.8.24.2(8) Middleware; refer to Section 7.8.25; and

7.8.24.2(9) All other components required to provide a complete and operating system that meets all Authority requirements stated herein and in the Agreement as a whole.

7.8.24.3 Systems Responsibilities

7.8.24.3(1) The Authority will:

7.8.24.3(1)(a) Provide elaborated use cases and user and functional requirements through the user consultation process to inform the Design and Construction of the RTLS;

7.8.24.3(1)(b) Analyze 'as is' and 'to be' business flows for each use case. The Design-Builder will work with the Authority to finalize the 'to be' processes in order to best integrate revised business processes with the RTLS system;

7.8.24.3(1)(c) Identify all entities to be tagged;

7.8.24.3(1)(d) Confirm the "Authority owned" application systems that require integration with the RTLS;

7.8.24.3(1)(e) Collaborate and contribute input into the requirements definition, design and testing of the

interfaces between the RTLS “Authority owned” application systems including the provision a conceptual data model for all data that must flow between the RTLS and Authority owned” application systems to allow for clarity and consistency of data;

7.8.24.3(1)(f) Augment, modify and configure “Authority owned” application systems as required to allow for the exchange of data to and from the RTLS; and

7.8.24.3(1)(g) Provide access to test data and systems for verification of any interfaces developed by the Design-Builder to Authority owned” application systems.

7.8.24.3(2) The Design-Builder will:

7.8.24.3(2)(a) Provide the RTLS along with all associated infrastructure including systems wiring (Structured Cabling, Extra-low Voltage cabling) and power in accordance with the requirements in this Agreement. This includes:

- 7.8.24.3.2.(a).1 Defining all system requirements, including systems integration;
- 7.8.24.3.2.(a).2 Verification of use cases;
- 7.8.24.3.2.(a).3 Determining the physical location where RTLS hardware will be located in the Facility and on the Site;
- 7.8.24.3.2.(a).4 Installation of hardware;
- 7.8.24.3.2.(a).5 Coverage surveys;
- 7.8.24.3.2.(a).6 System configuration and programming (hardware / software);
- 7.8.24.3.2.(a).7 Complete system Commissioning including integration / interface, performance and user acceptance testing; and
- 7.8.24.3.2.(a).8 Training of designated Staff on system application and use, technical maintenance and repair as well as system administration.

7.8.24.3(2)(b) Determine, in conjunction with the Authority, the point(s) in the business processes where RTLS will be introduced (i.e., at what points in the process should tags be read, etc.);

7.8.24.3(2)(c) Conduct an analysis of the points in the business processes where data must be transferred to and from the RTLS and other designated application systems;

7.8.24.3(2)(d) Provide a written summary on how existing business processes could be improved suggesting areas for automation utilizing RTLS technology along with potential qualitative/quantitative measurements for improvement;

7.8.24.3(2)(e) Provide a graphic representation (workflow diagram) and written narrative of the future “To Be” processes associated with each use case indicating where the RTLS system and its integrations with other application systems will be employed;

7.8.24.3(2)(f) Evaluate the user interface to the RTLS with Authority stakeholders to ensure usability requirements are defined, tested and met;

7.8.24.3(2)(g) Identify the quantity and locations of data network connections required for the RTLS;

7.8.24.3(2)(h) Work with the Authority to ensure installation of the appropriate number of network connections in the required locations;

7.8.24.3(2)(i) Seamlessly integrate the RTLS with both “Authority owned” and “Design-Builder supplied” application systems to exchange location-tracking data and to process and present such in a manner that addresses Authority functional requirements;

7.8.24.3(2)(j) Create all required interfaces, from end-to-end, in accordance with industry standards, so that the RTLS can communicate with “Authority owned” and “Design-Builder supplied” application systems;

7.8.24.3(2)(k) Track all interfaces developed and store common interface code;

7.8.24.3(2)(l) Ensure RTLS data is integrated through common industry standards for data transport, data transformation, and routing. This includes:

7.8.24.3.2.(l).1 The methods for transferring data between application systems such as standard methods for transferring data between application systems such as standard industry protocols (i.e., TCP/IP);

7.8.24.3.2.(l).2 Data transformation actions for converting RTLS data from one data format (source) to another (destination); and

7.8.24.3.2.(l).3 The real-time communication of data (such as an RTLS location event) from one application to another (i.e., synchronously - pull model or asynchronously - push model).

7.8.24.3(2)(m) Provide all necessary data profiling and mapping data mapping;

7.8.24.3.2.(m).1 Implement, upon Authority approval of the standard naming convention, and then map / translate data elements from databases to the RTLS standard terms when necessary; and

7.8.24.3.2.(m).2 To preserve data integrity, the Design-Builder will provide a drop-down list of standardized data elements in selected data entry screens and permissions to edit these lists will be restricted through hierarchical controls.

7.8.24.3(2)(n) Document:

7.8.24.3.2.(n).1 All interface details (and provide, as part of that documentation, a chart indicating relevant factors for calculation of response time of data transfer rates between interface databases. The chart will include parameters required to accomplish industry-standard response times;

7.8.24.3.2.(n).2 All workflows, business rules, queries and reports including instructions on how to modify or add workflows and business rules to the RTLS;

7.8.24.3.2.(n).3 The installation and configuration of the RTLS; and

7.8.24.3.2.(n).4 See Section 2.5.8 for additional requirements.

7.8.24.3(2)(o) Provide a development and test environment for the RTLS solution;

7.8.24.3(2)(p) Verify that all system interfaces are operational and all data is transferred to and from the appropriate system according to the business requirement;

7.8.24.3(2)(q) Verify that the RTLS is fully operational and meets all the performance requirements with no unwanted effects, such as signal distortion, interference with other Facility devices, etc. are present;

7.8.24.3(2)(r) Meet all other Commissioning requirements as set out in this Agreement;

7.8.24.3(2)(s) Affix tags/labels or etching as appropriate to the entities that will be tracked and completing necessary data entry, and system configuration to fully activate these individual items within the RTLS. This work, where required, will be coordinated with the various Authority equipment teams; and

7.8.24.3(2)(t) Identify training requirements, obtain or develop training programs and conduct training for systems, applications and products associated with the RTLS. This includes:

7.8.24.3.2.(t).1 Developing and or procuring training plans, manuals and other training documentation or training aids. Electronic training tools such as video teleconferencing and computer-based training will be employed to enhance the effectiveness of training materials and courses;

7.8.24.3.2.(t).2 System user training will include the following topics at a minimum:

(t).2.1 Operations and set-up;
(t).2.2 Report and query generation;
(t).2.3 User maintenance;
(t).2.4 User troubleshooting; and
(t).2.5 User tips.

7.8.24.3.2.(t).3 Technical maintenance and repair training. The Design-Builder will provide each trained Staff member with all service tools, service keys and other diagnostic software, technical documentation, and accessories necessary to service the RTLS; and

7.8.24.3.2.(t).4 System Administrator training such that the system administrator(s) are capable of providing all levels of application support to users. The Design-Builder will provide each trained Staff member with all application and support tools necessary to configure and use the system.

7.8.24.4 Functional and Performance Requirements

7.8.24.4(1) The Design-Builder will provide a RTLS technology from a leading technology and solution provider in the commercial market segment to meet the Authority's functional and performance requirements as stated in the herein and in the Agreement as a whole. Independent evidence of the technology and solution provider's position in the market (e.g. Gartner Report) will be supplied by the Design-Builder along with

overview of the provider's top customers, project implementations and client references.

7.8.24.4(2) The Design-Builder may employ an assortment of different technologies to meet the Authority's functional and performance requirements as long as they are part of one overall solution provided by a single vendor. However, if the Design-Builder can demonstrate that more than one vendor is required to provide the RTLS solution, the Authority, acting reasonably, will allow additional vendors as long as the requirement to provide a single User Interface (UI) is achieved.

7.8.24.4(3) The Design-Builder will provide a flexible standardized system architecture that can accommodate numerous interfaces to application systems.

7.8.24.4(4) The RTLS will be designed with built-in redundancy and fault tolerance commensurate with a mission-critical system.

7.8.24.4(4)(a) As an enterprise-wide system, RTLS is going to require a minimum of two levels of disaster recovery, dependent on the final architecture and placement of the various infrastructure components.

7.8.24.4(4)(b) Requirements are defined below:

7.8.24.4.4.(b).1 In disaster recovery situations, RTLS will be restored to full operation within 12 hours;

7.8.24.4.4.(b).2 The RTLS will be designed to facilitate database backups;

7.8.24.4.4.(b).3 The RTLS will be designed to be easily reloaded from a backup image and placed back into service; and

7.8.24.4.4.(b).4 The RTLS and NDR will be designed to prevent the loss of critical data.

7.8.24.4(5) The RTLS system is expected to grow over time, as new use cases are added. The Design-Builder will provide a system architecture capable of supporting the increasing magnitude of data anticipated, without redesign or degradation of existing capabilities. The architecture will also be expandable to accommodate new use cases, without requiring changes to the architecture or third-party intervention. This includes the future ability to track entities between buildings as the Site develops over time;

7.8.24.4(6) The RTLS system will provide coverage:

7.8.24.4(6)(a) Within the Facility. This includes utility rooms, (mechanical, electrical, elevator machine, Communications Rooms), interstitial floors, stairwells, parking levels, service links, bridges and tunnels; and

7.8.24.4(6)(b) On the exterior of the Facility and within the boundary of the Site to provide coverage to the property line. This includes patios, courtyards, roofs, pedestrian pathways, surface parking lots, MMU parking area, Loading Dock, and the External Ambulance Canopy/Vehicle Bay.

7.8.24.4(7) The level of resolution and accuracy provided by the RTLS system in the coverage areas will be certainty-based or clinical grade locating. This means the RTLS system will be able to identify with 100% absolute certainty a tracked entity's exact position with a high level of precision (ex. individual workspace (designated area within a room or zone such as bed or bay area) or to a cabinet, shelf or bin) even as it moves throughout the required coverage areas;

7.8.24.4(8) If it is determined through the user consultation process that the level of resolution and accuracy can be adjusted from certainty based or clinical grade precision to a lesser degree of resolution and accuracy for specific tracked entities or categories of tracked entities, the Design-Builder may be permitted with Authority approval to adjust the level of resolution and accuracy on a case-by-case basis. Other acceptable levels of precision that might be assigned by the Authority to specific and categories of entities in this instance are as follows;

7.8.24.4(8)(a) Presence-based locating: RTLS returns tag location as to whether it is present in a given (relatively wide) area (ex. Site, Facility, floor or zone);

7.8.24.4(8)(b) Locating at room level: RTLS returns tag location as present in a specific room;

7.8.24.4(8)(c) Locating at choke points: tag location is returned by a specific choke point (an entry or exit point, such as a ward entrance; it is assumed that individuals or assets move from one area to another through these points). By monitoring the time, a tag was detected at specific points, one can also determine the direction the tag is moving; and

7.8.24.4(8)(d) Locating by associating: tag location is returned as proximity with respect to another tag, e.g., if each

Patient in a hospital wears a tag and each IVF (intravenous fluid) pump has a tag, the location of a given IVF pump can be returned as present next to a specific Patient (and for how long).

7.8.24.4(9) The RTLS will provide location-tracking data to application systems every (3) three seconds. However, if it is determined through the user consultation process that the transmission of location-tracking data can be less frequent for specific tracked entities or groups of tracked entities, the Design-Builder may be permitted with Authority approval to adjust the interval of transmission on a case-by-case basis;

7.8.24.4(10) The RTLS must be capable of supporting a variety of use cases such as:

7.8.24.4(10)(a) Equipment and Asset tracking and inventory management including PAR (Periodic Automatic Replacement), Asset utilization, shrink control, and preventive maintenance;

7.8.24.4(10)(b) Patient flow and movement (tracking of Patient, Patient proximity to location, Patient duration in location and Patient proximity to other tagged items or persons);

7.8.24.4(10)(c) Hand Hygiene compliance;

7.8.24.4(10)(d) Contact Tracing / Infectious Disease Tracking;

7.8.24.4(10)(e) Automated temperature monitoring capability;

7.8.24.4(10)(f) Medication flow;

7.8.24.4(10)(g) Staff location;

7.8.24.4(10)(h) Staff to Patient interactions;

7.8.24.4(10)(i) Work-flow analysis to enable time-in-room tracking for RTLS tagged Staff members;

7.8.24.4(10)(j) Patient to medical device assignment;

7.8.24.4(10)(k) Room utilization;

7.8.24.4(10)(l) Staff presence within a treatment/procedure area and inpatient room with automatic association to the nurse call system whereby calls from the Nurse Call system are automatically acknowledged when an RTLS tagged Staff member enters the treatment/procedure area or inpatient room; and

7.8.24.4(10)(m) Workflow automation, analysis and reporting.

7.8.24.4(11) The RTLS will:

7.8.24.4(11)(a) Allow for the definition of an unlimited number of zones and allow entities to be tracked at varying levels of specificity;

7.8.24.4(11)(b) Discriminate between indoor and outdoor locations;

7.8.24.4(11)(c) Manage the discrimination between designated location quadrants in the Facility (floor, zone, room, etc.). Floor-to-floor discrimination is required in all zones including stairwells and elevators;

7.8.24.4(11)(d) Detect, record, and display tag travel direction (examples include the ability to discriminate between exiting versus entering specified egress points for Patients, Staff, or other critical entities);

7.8.24.4(11)(e) Segment large rooms, spaces and corridors into smaller zones that are meaningful from a clinical and operational perspective including defining “virtual walls” for refined granularity within these zones;

7.8.24.4(11)(f) Accept data from mobile and fixed data capture devices;

7.8.24.4(11)(g) Integrate with mobile and fixed output devices;

7.8.24.4(11)(h) Display selected RTLS data on large flat screen wall-mounted monitors and receive / display alerts on these monitors as required to support Authority use cases. If touch-screen monitors are provided by the Authority, the RTLS software will work with a touch-screen interface;

7.8.24.4(11)(i) Orchestrate RTLS-related end-to-end processes by:

7.8.24.4.11.(i).1 Supporting machine-to-machine communication in systems environment; and

7.8.24.4.11.(i).2 Providing seamless integration with workflow, rules management, role management and UI (user-interface) tools.

7.8.24.4(11)(j) Integrate with Authority owned” application systems:

7.8.24.4.11.(j).1 Meditech clinical information system;

7.8.24.4.11.(j).2 Cerner clinical information system;

7.8.24.4.11.(j).3 Surgical Patient tracking system;
7.8.24.4.11.(j).4 Asset Tracking system;
7.8.24.4.11.(j).5 Computerized Maintenance Management System (CMMS);
7.8.24.4.11.(j).6 Inventory management control system; and
7.8.24.4.11.(j).7 Materials management system.

7.8.24.4(11)(k) Integrate with “Design-Builder supplied” application systems provided under this Agreement as required by the Authority to support use case requirements including the communication of alert messages based predefined alarm events;

7.8.24.4(11)(l) Integrate with communication systems to support Authority use cases for the purposes of generating and sending alerting / alarming and messaging of all forms to various external communication and notification systems including email, two-way paging systems, nurse call systems, VoIP communication systems, cell phones and pagers, instant text messaging, in-house wireless communication devices, as well as to other computer systems;

7.8.24.4(11)(m) Be capable of designating one or more alert notification mechanisms based on the location or movement of a tag;

7.8.24.4(11)(n) Provide for a wide variety of alerting to support Authority use cases including:

7.8.24.4.11.(n).1 Geo-spatial and time-based alerting where the RTLS will:

(n).1.1 Be configurable to alert when a geo-fence region is entered, exited, or if a tag dwells within the region for a specified period of time;
(n).1.2 Provide automatic, proactive area entrance and exit alerts for all designated zones; and
(n).1.3 Generate alerts when:

(n).1.3.1 A tag enters, exists or dwells in a coverage area;
(n).1.3.2 A tag enters, exists or dwells in a reader coverage area;
(n).1.3.3 A tracked entity designated as stationary is moved;
(n).1.3.4 A tracked entity assigned to certain locations are removed from those approved locations;

(n).1.3.5 A tag signal has not been received for greater than a specified period of time;

(n).1.3.6 A tracked entity reappears into the system after not being visible for more than a specified period of time; and

(n).1.3.7 A previously active tag that has gone outside of a detection area for a specified period of time re-enters a zone and becomes active. Detection delay will be programmable.

7.8.24.4.11.(n).2 Sensory alerting where the RTLS will:

(n).2.1 Allow a user to program the environmental limits on a tag with environmental monitoring capabilities;

(n).2.2 Alarm when tags with environmental monitoring capabilities are outside preprogrammed limits; and

(n).2.3 Sending an alert from a tagged Patient when he or she falls to the ground.

7.8.24.4.11.(n).3 Status alerting where the RTLS will:

(n).3.1 Provide the capability to associate a status with a tag, and to modify the status of a tag;

(n).3.2 Provide the capability to configure business rules for alerts based on tag status being changed;

(n).3.3 Notify appropriate systems or users when the tag status is changed; and

(n).3.4 Generate an alarm when there is a tag failure, probe failure (for externally mounted tags) and tampering with or removal of a tag.

7.8.24.4(11)(o) Allow for the creation of workflow rules, reports alarm triggers, etc. to be Facility centric and have the ability to be customizable for any building that might be added to the Site in the future;

7.8.24.4(11)(p) Accept user status updates through some combination of tag buttons and direct input into the UI;

7.8.24.4(11)(q) Be designed to have tracking with alerts for specific, Authority-defined workflows that require a predefined sequence of events.

7.8.24.4.11.(q).1 The process for creation of custom workflows and reports will be simple and easy to understand, requiring minimal application training;

7.8.24.4.11.(q).2 To achieve workflow in certain use case applications, the RTLS will meet the following requirements:

(q).2.1 Tags must have the ability to have defined relationships with one another, regardless of tag type or application from which tagged item is used (ex. A Patient record could be updated (based upon set business rules) when the following tagged items enter a surgical field during a procedure; Patient, Staff, surgical instrument, medical device, or supply item.);

(q).2.2 The RTLS will have the ability to define the status of a tagged item based on applicable business rules (ex. A medical device could be assumed to be dirty or clean based upon its location or activation of a programmed button on the tag);

(q).2.3 Tags will have the ability to be linked or grouped with each other in the software (ex. Tagged Surgical Instruments can be linked together for use in a tagged surgical tray.); and

(q).2.4 The RTLS have the ability to assign short-term use tags (ex. Tags can be assigned on a daily basis for contractors working at the Facility).

7.8.24.4(11)(r) Provide standard reporting capability at a campus and Facility level.

7.8.24.4.11.(r).1 The RTLS will provide users with the ability to create and save ad-hoc reports. The Design-Builder will provide training and support for user ad-hoc reporting features;

7.8.24.4.11.(r).2 The RTLS will provide the following additional reporting capabilities:

(r).2.1 Report generation and modification based on defined access level by user group/category;

(r).2.2 Prescheduled reporting and automated delivery to an e-mail distribution list;

(r).2.3 Reporting capable of both periodic and on-demand frequencies;

(r).2.4 Report generation based on defined access level by user group or category;

(r).2.5 Graphical reports to include: time-based charts, bar charts, line charts, digital dashboards and other standard commercially available visualization capabilities;

(r).2.6 Report layout tool for designing data connections and report layout;

(r).2.7 Exporting report data: It will be possible to save report output in file formats compatible with Microsoft Office products (principally Word and Excel) and in PDF format;

(r).2.8 Allow the ability to make report templates un-editable;

(r).2.9 Provide a status indicator of query and report generation and estimated time to complete (prior to submission of the task); and

(r).2.10 Provide customizable dashboards so that the end users can gain critical business intelligence data. These dashboards will include metrics and measurements defined in each Authority use case.

7.8.24.4.11.(r).3 The RTLS will provide various administrative system reports including:

(r).3.1 The number of users logging in, when, and for how long;

(r).3.2 The type of content that is accessed;

(r).3.3 Malfunctioning hardware;

(r).3.4 Tag health and availability;

(r).3.5 Available disk space;

(r).3.6 Overall system status and/or health; and

(r).3.7 Other system management reports required by the Authority.

7.8.24.4(11)(s) Retain all data points for a minimum of twenty-four (24) months for the purposes of reporting.

7.8.24.4(12) RTLS Software Application and Database Requirements

7.8.24.4(12)(a) A key component of the RTLS capability is the functionality presented to the system operators and administrators as well as stakeholders. The Design-Builder will provide a RTLS user-facing browser-based application in accordance with common user interface standards and conventions that is configurable and uses rule-based mapping.

- 7.8.24.4.12.(a).1 Browser and desktop configuration will be in accordance with Authority standards;
- 7.8.24.4.12.(a).2 The Design-Builder will specify any plug-ins required for client software and approved version numbers; and
- 7.8.24.4.12.(a).3 The RTLS will be compatible with Authority OS and web browser standards and will remain compatible with newer versions as they are implemented by the Authority over time.

7.8.24.4(12)(b) The application will:

- 7.8.24.4.12.(b).1 Have an intuitive User Interface (UI). The UI will be customizable as well as easy and implicit in its design taking into consideration; colours, icons, graphs, pick lists, free form text, notes, forms, point and click, drop and drag, copy and paste and other normalized capabilities that are critical to reducing errors.
  - (b).1.1 The UI will be customizable based upon class of user (e.g., view of certain items, locations, etc.);
  - (b).1.2 The system will remember the user's default view and their last view; and
  - (b).1.3 The initial display at the initiation of a new session will be user configurable based on the user’s selection.
- 7.8.24.4.12.(b).2 Track and display the location of all entities and their movement within the designated coverage area;
- 7.8.24.4.12.(b).3 Provide tag location, using a location coordinate system, so position can be overlaid on a floor and Site plan to the level of accuracy required by the Authority;
- 7.8.24.4.12.(b).4 Generate alerts and alarms based on Authority specified events such as the movement of Patients and other tracked entities into or out of a specified area, the state of a tag, etc.;
- 7.8.24.4.12.(b).5 Be capable of event history playback or look-up;

7.8.24.4.12.(b).6 Be capable of displaying at least two photographic images of each tagged entity;

7.8.24.4.12.(b).7 Visually depict assets within a zone, several zones or within an entire building and Site;

7.8.24.4.12.(b).8 Provide customizable viewing options for users (e.g., lists, maps, dashboard views, location of items on screen, favorite reports, other graphical views, etc.);

7.8.24.4.12.(b).9 Have a method for time-lapse location monitoring with a playback mode in real time or rapid mode for an entity's movement (report and graphical views). The duration of location memory will be selectable by the Authority based on the type of tagged entity with a maximum play-back period of 48 hours;

7.8.24.4.12.(b).10 Provide a graphical map display with search capabilities based the type of entity or specific ID of an entity;

7.8.24.4.12.(b).11 Allow users' map views to be tailored or limited based on their user group and its associated access privileges;

7.8.24.4.12.(b).12 Have a searchable help function accessible to all users;

7.8.24.4.12.(b).13 Support alert rule configuration:

(b).13.1 Alerts and alarms will be configurable and programmable through the UI;

(b).13.2 Alerts and alarms will be configurable and programmable based on business rules, types and categories of tracked entities (on a per tag basis if required) as well as specific users and groups of users;

(b).13.3 During system installation, a designated number of notifications will be pre-configured as defined by the user team;

(b).13.4 Authorized users will be capable of modifying existing notifications and adding additional notifications after initial installation;

(b).13.5 Notifications will be capable of registering a status of acknowledged or closed; and

(b).13.6 Notifications will be capable of being automatically forwarded to the next tier of responsibility if there is no closure of the alert within a specified time period.

7.8.24.4.12.(b).14 Allow users to query any or all of the tracked entities for the Facility

(b).14.1 Users will have the ability to perform drill-down searching by multiple filters (i.e. Site > building > floor > area/zone > room > Patient Care Area);

(b).14.2 The mechanisms for querying results will be forms-based or graphical;

(b).14.3 Search capability will be provided to users for multiple options to include: current / past location, item demographics, time in a location, and relationship to other tagged items;

(b).14.4 The RTLS will include a standard base set of queries. This base set of will be further defined, enhanced and or modified in accordance with the requirements of the Authority; and

(b).14.5 The RTLS solution will provide users the ability to create and save their own queries.

7.8.24.4.12.(b).15 Provide hierarchical access for users.

(b).15.1 Access levels will be configurable by the Authority through role-based group privileges;

(b).15.2 Access to information and creation of custom workflows and reports will be limited to users with appropriate access based on their group; and

(b).15.3 The RTLS will lock out a user who is not approved to perform a particular process based on user group membership, and will log certain security incidents, as specified by the Authority's RTLS administrators.

7.8.24.4(12)(c) The RTLS provided will meet the following system administration requirements:

7.8.24.4.12.(c).1 The storage system and database will notify the system administrator(s)in the event of a failure.

(c).1.1 The notification system will include storage failures, as well as failures of other hardware components; and

(c).1.2 The system will notify system administrator(s) by dialing out to multiple phone/pager numbers as well

as by email in the event of such a failure.

7.8.24.4.12.(c).2 The system will:

(c).2.1 Allow the Authority to manage firmware/software/system configuration remotely for all components of the RTLS;

(c).2.2 Dynamically monitor each component of the RTLS to ensure it is working properly; and

(c).2.3 Send alerts to a system administrator whenever there is a loss in connectivity or failure of any of the hardware and/or infrastructure components.

7.8.24.4.12.(c).3 Authority system administrators will have full access to the hardware, software and programs that constitute the RTLS, including any diagnostic software features and tools, and full administrative rights.

7.8.24.4(12)(d) The Design-Builder will create a standard database schema for the RTLS integrating information from multiple tags and technologies into a single database accessible to the user through a single unified UI from which information about any tagged entity can be obtained. Users will not be required to navigate from one RTLS subsystem database to another in order to effectively use the system;

7.8.24.4(12)(e) The database provided will:

7.8.24.4.12.(e).1 Store images of a tagged entity, as well as a description (caption) for each image;

7.8.24.4.12.(e).2 Store the relationships between tags;

7.8.24.4.12.(e).3 Distinguish the ownership of a tracked entity;

7.8.24.4.12.(e).4 Incorporate and maintain information on all tagged items. This information may be imported from application systems, manually entered by Facility personnel, or inputted by devices (e.g. scanners); and

7.8.24.4.12.(e).5 Be accessible from a standardized database management tool that allows the system administrators and select users the ability to administrate all aspects of the database and its container.

7.8.24.4(13) RTLS Tag Requirements

7.8.24.4(13)(a) The Design-Builder will provide a variety of tag types and technologies that will be used for multiple applications. Each tag will be able to accomplish all of the requirements of the specific use case for which it is intended;

7.8.24.4(13)(b) The Design-Builder will provide the environmental range capability specifications for all tag models supplied;

7.8.24.4(13)(c) The quantities of tags to be provided are as follows:

7.8.24.4.13.(c).1 Patient tags: 2000;

7.8.24.4.13.(c).2 Staff tags: 2500; and

7.8.24.4.13.(c).3 Asset tags: 3500

7.8.24.4(13)(d) The tags provided will:

7.8.24.4.13.(d).1 Come in a variety of shapes and sizes to fit a variety of entities;

7.8.24.4.13.(d).2 Have a small footprint so as not to interfere with the operation of the equipment and will be able to be attached in an inconspicuous location. Tags will have the ability to be attached to surgical instruments in a variety of sizes from 25 mm to 305 mm;

7.8.24.4.13.(d).3 Be able to withstand cleaning and sterilization (liquid steam) using various techniques at high temperatures. The Design-Builder will provide documentation on procedures for cleaning/maintaining tags;

7.8.24.4.13.(d).4 Be resistant to chemical agents. Tags will be able to endure multiple cleaning protocols from low level disinfection to sterilization;

7.8.24.4.13.(d).5 Be resistant to high pressure fluids;

7.8.24.4.13.(d).6 Be safe to use around electrical equipment items that are known sources of interference;

7.8.24.4.13.(d).7 Withstand shock and shear forces to the greatest extent possible;

7.8.24.4.13.(d).8 Be water-tight, hermetically sealed, autoclavable when used in instrument trays;

7.8.24.4.13.(d).9 Be capable of excitation and sensing with both mounted and hand-held readers;

7.8.24.4.13.(d).10 Be capable of being attached to Patient ID bracelets and Staff badges;

7.8.24.4.13.(d).11 Be capable of working when covered by clothing and sheets;

7.8.24.4.13.(d).12 Have an onboard battery voltage monitor and automatic signaling when battery life reaches a pre-defined threshold level. If battery-

powered tags are used, the power level will be read using the readers;

7.8.24.4.13.(d).13 Be able to sense when they are tampered with or removed from the object from which it was attached;

7.8.24.4.13.(d).14 Be Tamper Resistant, reusable, durable and properly sealed to guard against damage from exposure to liquid, dust and debris;

7.8.24.4.13.(d).15 Be capable of being mounted to metal surfaces and read when affixed to metal assets;

7.8.24.4.13.(d).16 Be remotely programmable over the air;

7.8.24.4.13.(d).17 Be firmware upgradeable over the air;

7.8.24.4.13.(d).18 Be capable of operating in multiple environments including sterile storage, the energy plant, wet, oxygen rich, and indoor/outdoor areas; and

7.8.24.4.13.(d).19 Have unique tag numbers that is displayed for visual verification.

7.8.24.4(13)(e) Depending on the application and use case, the Design-Builder will provide tags equipped with:

7.8.24.4.13.(e).1 Sensors. Tags with temperature and humidity monitoring capability will have external probes that can be calibrated;

7.8.24.4.13.(e).2 On-tag button(s) for information to be communicated back to the RTLS server;

7.8.24.4.13.(e).3 Audible or a vibration alert capability;

7.8.24.4.13.(e).4 Adjustable motion sensitivity thresholds and motion timeout settings;

7.8.24.4.13.(e).5 Voice to voice capability;

7.8.24.4.13.(e).6 LEDs emitting different colours and blinking patterns; and

7.8.24.4.13.(e).7 Screens (ex. LCD, OLED, e-ink) to display information such as environmental conditions (temperature, humidity), battery status, alarms, probe/sensor failures, control inventory, Asset Management (display bar codes, QR Codes, etc.) and, machine info such as maintenance status as well as to communicate with an individual who is wearing the tag or is transporting or checking the tagged Asset.

7.8.24.4(13)(f) Battery equipped tags will have a minimum of 12 months of battery life in a typical usage scenario.

7.8.24.4(13)(g) The Design-Builder will provide:

7.8.24.4.13.(g).1 Tag testing Stations:

(g).1.1 A manufacturer-approved tag testing station will be provided in each department using the RTLS, so that Staff can test battery status, and that tags are functioning properly.

(g).1.2 Tag testing will allow for a tag alarm to be verified, without activating a real system alarm.

7.8.24.4.13.(g).2 Printers in each department using the RTLS with the capability of printing human readable information and barcodes on tags.

7.8.24.4(14) RTLS Reader Requirements

7.8.24.4(14)(a) The Design-Builder will provide, where required, fixed readers powered via PoE throughout the coverage area. The readers will:

7.8.24.4.14.(a).1 Operate and communicate at a power level and frequency that does not interfere with any other devices or wireless networks that will exist within the Facility and Site;

7.8.24.4.14.(a).2 Function in a variety of environments in the Facility and on the Site;

7.8.24.4.14.(a).3 Function in a dense Asset identification environment such as a warehouse storage room or clean utility room be able to discretely identify all tagged items in such a location without false positive or false negative identification; and

7.8.24.4.14.(a).4 Be able to be dynamically monitored by the RTLS to ensure that all reader components are working properly. If the readers experience any loss in connectivity, the RTLS will be alerted.

7.8.24.4(14)(b) The Design-Builder will provide handheld readers in each department using the RTLS that downloads and uploads wirelessly current information from the RTLS database to better reconcile equipment assigned to various zones.

7.8.24.4.14.(b).1 These readers will have the ability to determine location and associate it to the tagged item that was scanned without having to scan a bar code when entering a location; and

7.8.24.4.14.(b).2 All fixed reader requirements mentioned in the previous section will apply to the handheld readers.

7.8.25 Systems Integration

7.8.25.1 The Design-Builder will meet the integration scope defined in the Agreement by employing one or combination of the following:

7.8.25.1(1) Hardwired interfaces between systems;

7.8.25.1(2) Native system to system integrations;

7.8.25.1(3) Application Program Interfaces (APIs) to facilitate integration between systems; and / or

7.8.25.1(4) Integration engine to seamlessly achieve interfaces between “Design-Builder supplied” application systems, and in addition, between “Design-Builder supplied” application systems and “Authority owned” application systems.

7.8.25.2 For the communication of alarms, troubles and code call events associated with fire alarm, medical gas, BMS (ex. fridge temperature), vacuum/suction and nurse call (including code, pink, white and blue) to the Authority’s regional contact centre, the Design-Builder will use the Authority’s instance of Connexall.

7.8.25.3 The Design-Builder provided integration engine will be:

7.8.25.3(1) Independent from the existing Authority integration engine;

7.8.25.3(2) A commercial product with a proven track record for healthcare integrations in acute care environments;

7.8.25.3(3) A complete system, consisting of all requisite hardware and software components and licensing including software middleware, direct connect, manufacturer supported applications programming interfaces (API) and licensing; and

7.8.25.3(4) Capable of bidirectional communication, such that it will be able to receive events from one system and send notifications to other systems.

7.8.25.4 The Authority will provide the licensing, hardware, software, professional services, programming and configuration and commissioning for Authority owned and supplied application systems (including the Authority’s instance of Connexall) required to meet the integration scope defined in the Agreement.

7.9 Electronic Safety and Security (Division 28)

7.9.1 General

7.9.1.1 The Design-Builder will:

7.9.1.1(1) Commission a reputable security company that specializes in preparing Crime Prevention Through Environmental Design (CPTED) and CAP Index Reports for Acute Care Facilities.

7.9.1.1(2) Minimize the visibility of security devices in Patient Care Areas to reinforce the therapeutic nature of treatment spaces. In interior and exterior public spaces such as lobbies, reception and waiting areas, rest areas, and access and egress points, security devices may be visible. Design the Facility and all outdoor areas with Users' safety and security in mind;

7.9.1.1(3) Ensure a safe environment for Facility Users through proper utilization of Electronic Safety and Security (ESS) systems; and

7.9.1.1(4) Work with Integrated Protection Services (IPS) at all stages of the Design process to develop suitable solutions for ESS systems.

7.9.1.1(5) Design all ESS systems infrastructure to comply with all applicable infrastructure requirements of the Communication systems set out in Section 7.8.

7.9.1.1(6) Design all ESS systems in accordance with Lower Mainland Health Organizations Integrated Protection Services – Electronic Security Systems Specifications.

7.9.2 Principles, Guidelines and Requirements

7.9.2.1 Ensure a safe environment for Staff, Patients and visitors by proper utilization of ESS systems as described in this Agreement. ESS systems include all systems within Division 28, excluding fire alarm.

7.9.2.2 The Design-Builder will:

7.9.2.2(1) Provide a complete, integrated security system to meet the Authority's security programs within a health care facility environment;

7.9.2.2(2) be responsible for providing all equipment, hardware, software, licensing, and all associated infrastructure required for full and complete security systems as specified. The ESS systems will reside on the Authority's IM/IT network;

7.9.2.2(3) Provide the complete IPVS systems including server, hardware, and software;

7.9.2.2(4) Install the ESS applications software on the Design-Builder provided physical or virtual servers;

7.9.2.2(5) Ensure security technicians or installers approved by the Authority and fully licensed per the BC Security Services Act are retained for the installation, implementation and programming of all ESS systems;

7.9.2.2(6) Design all ESS systems to reside on dedicated security systems VLAN as part of the Authority's IM/IT data network connected via the Structured Cabling system and network devices to allow the Authority the opportunity to review events and monitor the status of security systems from Off-Site locations. The system will be accessible through the Authority's IM/IT data network, in accordance with Authority policies;

7.9.2.2(7) Utilize an Authority provided NTP time-sync server to ensure continuity of all ESS systems' archived data;

7.9.2.2(8) Locate all security devices and provide monitoring and alarm annunciation requirements to the satisfaction of the Authority;

7.9.2.2(9) Arrange meetings with the Authority to coordinate system design, interconnections and programming requirements of the ESS systems; and

7.9.2.2(10) Deploy ESS IP devices as determined in consultation with the Authority, including network configuration, to ensure that the network complies with Authority standards.

7.9.2.3 Where software licensing is applicable, the Design-Builder will supply a complete enterprise software package for Design-Builder supplied systems. Where available, provide perpetual software licenses for all systems provided by the Design-Builder. Software as a Service (SaaS) packages with ongoing payments will not be purchased without written approval from the Authority.

7.9.2.4 ESS systems will be scalable to allow for future additions and interconnections of many devices and subsystems from different manufacturers. All required integrations will use the integration methods described in Section 7.8.25.1 unless such integration violates the requirements of the AHJ. If so, integrations will utilize commercial, off-the-shelf hardware or API/SDK. Provide a scalability value set for each system within the ESS as follows:

7.9.2.4(1) The DVMS will be licensed for 10% more cameras;

7.9.2.4(2) The ACS, intrusion system, intercoms, patient wandering, fixed panic and wireless panic system device scalability value will be 20%; and

7.9.2.4(3) Overdose notification system scalability value will be 10%.

7.9.2.5 The ESS systems will incorporate commercial off-the-shelf equipment and proven designs from manufacturers regularly engaged in the production of models and

types of equipment used in the security industry. Products will be quality control tested and verified for the intended operation prior to installation at Site. All integrations and interconnections will not experience failures resulting from software or firmware updates to any single system.

7.9.2.6 All materials, including hardware and software provided will be fully compatible with the Authority's head-end systems and be the most current version or production model.

7.9.2.7 ESS systems will maintain dependability and reliability under all operational environmental conditions and be capable of 24 hours-a-day, seven (7) days-a-week continuous operation.

7.9.2.8 Interconnect security systems to the fire alarm system and other systems as required by applicable codes and standards.

7.9.2.9 The Design-Builder will provide detailed floorplans with doorways, room names, and other map features clearly visible for use as the background for the ESS mapping. ESS devices and alarms will be programmed onto these floorplans according to their physical location within the Facility.

7.9.2.10 The Design-Builder will ensure the primary ESS User Interface will allow for integration-to and show real-time device status and annunciation where applicable from any Division 27 or 28 systems required by the Authority.

7.9.2.10(1) The ACS or IP video management system will be the primary interfaces due to the embedded graphical mapping and therefore system integration will be made possible by software licensing between these systems.

7.9.2.10(2) Custom integrations and software development will not be accepted for this interoperability and the systems will be able to be added to the overall integration if required.

7.9.2.11 The Design-Builder will consult with the Authority to determine integration and views between multiple ESS systems and customizations for Authority user groups.

7.9.2.12 ESS systems infrastructure will comply with the manufacturer's technical specifications and configuration requirements.

7.9.2.13 The Design-Builder will supply all baluns, converters, and PoE extenders as approved by the Authority and as required to provide functioning system components in elevators.

7.9.2.14 The Design-Builder will ensure that all networked ESS systems will utilize manufacturer hardening for best-practice cyber security and meet the Authority's requirements for network security.

7.9.2.15 The Design-Builder will develop a security plan as determined in consultation with the Authority and submit it as part of the security documents.

7.9.2.16 All ESS systems will:

7.9.2.16(1) Successfully complete the Authority's solution assessment process;

7.9.2.16(2) Satisfy the current documentation requirements; and

7.9.2.16(3) Resolve any identified security, architecture and privacy considerations in consultation with the Authority.

7.9.2.17 The Design-Builder will consult with the Authority to develop customized training plans for each system and program the systems as determined in consultation with the Authority.

7.9.2.17(1) Train Authority Staff (minimum 8 hours per user group, per system) on the use and operation of ESS systems and the location of all ESS devices, in accordance with Section 5.6.13.5(3).

7.9.2.18 All cabling and communications infrastructure will meet Authority standards; refer to the Appendix 1M [PHSA Communications Infrastructure Standards and Specifications] and Section 7.8 for details.

7.9.3 Fire Alarm System

7.9.3.1 Basic Requirements

7.9.3.1(1) The fire alarm system will meet the latest applicable versions of the standards set out in Section 2.4.6.

7.9.3.1(2) Provide a fire alarm system for the Facility, including coverage of all buildings, for fire detection and signalling of alarms, trouble, and supervisory conditions while maintaining secure conditions for all Facility Users.

7.9.3.1(3) Coordinate device types and locations to provide complete fire detection and audible/visible signal coverage and minimize access issues for regular testing and maintenance.

7.9.3.1(4) Ensure the fire alarm system is of a type that permits failed devices to be rapidly replaced and activated by FMO and does not require On-Site presence of a manufacturer's representative, with verification able to be done by any third-party or employee with suitable credentials recognized by the City.

7.9.3.1(5) Provide a complete two-stage, addressable, zoned, fully supervised, self-testing, networked, microprocessor-based fire detection and alarm system that includes addressable, intelligent,

automatic and manual initiating devices and addressable audible/visible notification devices with voice evacuation capabilities. Provide alarm indication consisting of individual or combination audible/visible devices.

7.9.3.1(6) The fire alarm system will have provisions to allow for future growth in order to accommodate the Future Expansion; refer to Section 4.2.1.

7.9.3.1(7) The fire alarm system will be a networked solution such that the loss of one (1) panel does not affect the remaining panels ability to communicate with each other.

7.9.3.1(8) Unless otherwise required by the Authority, provide workstations for the system in the EC1.1 Control Room, in the CACF and in the Office – Security.

7.9.3.1(9) Design the fire alarm system by locating components in such a way that maintenance and testing can be performed with minimal risk to infection control or interruption of areas where Patients are receiving care or treatment, and to mitigate disruption to operations. Devices will be located such that they can be routinely accessed without the need for temporary infection control barriers or ventilation, man lifts or staging. When components are installed in an otherwise inaccessible location (such as high ceilings), access will be provided by means of a fixed access system such as a moving gantry or overhead maintenance walkways (or catwalks), or by means of an aspirating-type system with active components in accessible locations.

7.9.3.1(10) Install a fire command centre at the main fire department response point for the Facility, including a Central Alarm and Control Facility (CACF) and an active graphic annunciator for Facility-wide alarm, trouble, and supervisory annunciation, voice communications and control of firefighting from a single location. Reserve space directly adjacent to the CACF and active graphic annunciator to allow for 100% expansion of the system in the future.

7.9.3.1(11) Coordinate location of the fire command centre with the fire department and install additional remote annunciators as required by the fire department at designated entrances.

7.9.3.1(12) Provide stand-alone spark/flame detectors to mitigate drug use in public washrooms. Detectors to have a hard-wired power source and be separate from the fire alarm system. On activation, detectors to annunciate with local pre-programmed voice

notifications and an alert signal at the nearest Security kiosk and the main Security Office.

7.9.3.1(13) Provide a fire alarm system designed for use in an acute care hospital. Fire alarm system to be Simplex 4100ES or Siemens Desigo Modular. [NOTE TO PROPONENT: If the Proponent proposes an Acceptable Equivalent under the RFP, the Proponent should provide information regarding the capital cost, typical service contract cost, the licencing fees (etc.), and minimum requirements for the fire alarm system equivalent to the Simplex 4100ES system with parallel programming uploading function and integration to other Facility systems as required by this Agreement].

7.9.3.2 Performance Criteria

7.9.3.2(1) Install all fire alarm wiring in conduit. Use approved fire rated wiring methods where required by the BCBC.

7.9.3.2(2) Provide addressable smoke detectors of self-correcting type to maintain consistent sensitivity. The following areas will be provided with smoke detector coverage in addition to sprinklers for early detection:

7.9.3.2(2)(a) All areas required by code;

7.9.3.2(2)(b) All corridors except Back-of-House corridors providing access to shops or similar uses to be determined in consultation with the Authority;

7.9.3.2(2)(c) Electrical Rooms;

7.9.3.2(2)(d) Communications Rooms; and

7.9.3.2(2)(e) The Authority understands that if the vortex and pre-action systems in the areas mentioned include addressable and self-correcting smoke detection functionality, then a separate smoke detector is not required in these areas.

7.9.3.2(3) All smoke detectors will have bypass capabilities to allow them to be temporarily disabled. The bypass functions will be available at the fire alarm system computer workstations.

7.9.3.2(4) Any fire detectors serving elevator shafts will be of the air sampling or linear heat detection cable type with active components located outside the elevator shaft to allow detector testing and maintenance without entering the shafts.

7.9.3.2(5) Provide two-stage manual stations at all exits. In parking and areas accessible to Patients, manual stations will have flush-mount Tamper Resistant tough polycarbonate cover with horn. Horn to be powered by independent direct power connection (not battery).

7.9.3.2(6) Fire alarm devices will be Vandal Resistant and Tamper Resistant where installed outdoors and accessible to the public (including underground parking areas).

7.9.3.2(7) Provide emergency telephone handsets in lockable enclosures adjacent to all exit stairs located within arm's reach of each stair access door.

7.9.3.2(8) Provide addressable visible signal devices in all corridors, public spaces, Staff and Patient washrooms and common use spaces, excluding ensuite washrooms.

7.9.3.2(9) Provide addressable fire alarm EVAC speakers throughout the Facility. The EVAC speaker system will be used to broadcast all alarm conditions and emergency voice communication paging. The system will accommodate the use of pre-programmed messages transmitted to annunciate origin of the alarm. Message format will be as determined in consultation with the Authority prior to programming.

7.9.3.2(10) Provide electronic interlocking between the general paging system and the fire alarm EVAC system to provide the following functionality:

7.9.3.2(10)(a) After the fire alarm EVAC signals have sounded for at least 10 seconds, it will be possible to page the Facility from the Authority’s Contact Centre or the On-Site paging microphone by use of the building’s public address system. Obtain any necessary variances from the AHJ; and

7.9.3.2(10)(b) General paging announcements will be muted when the fire department is utilizing the EVAC microphone located I the CACF to provide evacuation instructions.

7.9.3.2(11) Use combination audible/visible signal devices where applicable.

7.9.3.2(12) Include control devices and connections to close fire and smoke doors on activation of local smoke detection or alarm condition.

7.9.3.2(13) Incorporate relays, monitor modules, and direct digital BMS communications into the fire alarm interface for the smoke control

and smoke venting systems, including fans, dampers, sensors and associated control devices.

7.9.3.2(14) Provide Class A addressable loops for all detection circuits. Provide isolation modules at each penetration of a fire separation or fire alarm zone, and wire to prevent wiring faults in any zone from affecting detection capabilities in adjacent zones.

7.9.3.2(15) Where booster panels are required, provide synchronization for all strobes on any given floor. Booster panels will be in Electrical Rooms and provided with vital power.

7.9.3.2(16) Each connection between the fire alarm system and mechanical smoke control components will be located entirely within a single fire compartment and protected from fires in adjacent compartments. This includes connections from BMS controllers to any motor controls, dampers or sensors used for smoke control or smoke venting, as well as connections from these BMS controllers to the fire alarm system.

7.9.3.2(17) Provide functionality for the fire alarm system to automatically broadcast EVAC voice messages through the radio system to all maintenance radios. Provide all required middleware, converters and connections to the radio system. Confirm actual programming, priorities, and overrides with the Authority prior to implementation.

7.9.3.2(18) Provide a main annunciator at the fire command centre complete with:

7.9.3.2(18)(a) LCD alphanumeric display of all alarm, trouble, and supervisory conditions including zone and individual addressable device descriptions;

7.9.3.2(18)(b) A main active graphic annunciator as approved by the local fire department, including scaled floor plans of each level of the Facility showing all zone boundaries, initiating device types, the CACF location and all designated firefighter entrances; and

7.9.3.2(18)(c) Individual LEDs on the graphic annunciator for each zone, initiating device type, trouble and supervisory conditions on the system.

7.9.3.2(19) Provide an EVAC system to give the fire department the capability of providing evacuation instructions to all or selected areas of the Facility from the fire command centre. Include two-way voice communication capability from the fire command

centre to the firefighters' emergency telephone handsets on each floor.

7.9.3.2(20) Provide LED type indicators for remote indication that a fire detector has been activated in a space with limited access by first responders, including detectors serving an elevator shaft (located at elevator lobby ceiling) or duct smoke detectors that are not readily visible (located on ceiling or at visible location nearest to duct smoke detector installation).

7.9.3.2(21) Provide electronic interlocking between the PA and the fire alarm EVAC systems to provide the following functionality:

7.9.3.2(21)(a) After the fire alarm EVAC signals have sounded for at least ten (10) seconds, it will be possible to page the Facility from the Authority’s Contact Centre or the PA microphone using the PA system. Any necessary variances will be obtained from the AHJ; and

7.9.3.2(21)(b) The PA systems will be muted when the emergency responders are utilizing the EVAC microphone located in the CACF to provide evacuation instructions.

7.9.3.2(22) As determined in consultation with the Authority, provide remote annunciators at key locations throughout the Facility. At a minimum, these will include all secondary entrances to all buildings for firefighters' use. Remote annunciators will be complete with an alphanumeric LCD annunciator displaying details of all alarm, trouble, and supervisory conditions and will include a microphone for “all-call” EVAC paging and a remote master firefighters' emergency telephone handset.

7.9.3.2(23) Provide LCD annunciators at each Care Team Station where annunciation of Patient Room smoke detectors is required. Confirm annunciator locations with the Authority. To mitigate nuisance noise, program the system to omit audible notification of events not requiring local care team Staff response occurring from system testing, upgrades, faults, etc.

7.9.3.2(24) Design remote fire alarm panels (or control units) to operate in a stand-alone mode and transmit data using a multiplex data line connecting the entire Facility via a full complement of communication cable. Provide the fire alarm cable network with a redundant backbone taking different physical paths to enhance reliability of communication. A trouble status indicator will annunciate if a partial break or fault occurs in the data link between any two control panels.

7.9.3.2(25) Ensure the fire alarm system has an appropriate electronic interlocking with the general paging system to ensure automatic priority is given to operating the fire alarm during initial time periods as required by the BCBC. Fire alarm system will not be used for general paging.

7.9.3.2(26) Coordinate with the Authority to establish a secure backup of the fire alarm system event log at regular intervals.

7.9.3.2(27) Provide three (3) fire alarm system computer workstations with high-resolution colour touch screen monitors capable of monitoring system performance and annunciation. Include hardware and software for complete interface suitable to annunciate all alarm, trouble and supervisory conditions on the system and enable examination of the status of individual devices, implement bypasses and ancillary functions, and set parameters as allowed by applicable codes. The computer workstations will be located as set out in Section 7.9.3.1(8). Each will be provided with an IM/IT UPS power outlet and a printer able to generate a hard copy of the system's event log.

7.9.3.2(28) Provide gel electrolyte type batteries with overcharge protection for all fire alarm control panels and transponders. Provide solid state battery charger(s) with capacity to recharge the entire battery system in accordance with ULC requirements. Ensure batteries will have sufficient capacity for emergency power backup of the entire system (except magnetic door holders), in accordance with the BCBC, plus 20% spare capacity for future renovations.

7.9.3.2(29) Locate duct smoke detectors such that they are easily maintainable and accessible. In CSA Z317.13 Population Risk Group 4 areas, provide access to any duct smoke detectors where they can be tested or replaced without having to enter the room or adjacent Restricted Corridor or sterile area.

7.9.3.2(30) The system will be capable of self testing and confirming operational status with a report sent to FMO once testing is complete. Self testing will include addressable speakers.

7.9.3.2(31) The system will connect to the Crestron lighting control required in Multimedia Rooms and spaces to override audio signals and turn lights on in the event of a Stage 2 alarm in the same fire compartment as the activated initiating devices.

7.9.3.3 Operational requirements:

7.9.3.3(1) Design the fire alarm system to incorporate the following operations to provide a safe environment for all Facility Users:

7.9.3.3(1)(a) Stage 1:

- 7.9.3.3.1.(a).1 Silent stage 1 alert throughout the Facility except where noted otherwise.
- 7.9.3.3.1.(a).2 Audible alert signal at FMO offices, Care Team Stations and Fire Command Centre.
- 7.9.3.3.1.(a).3 Zone and device type alarm indication on fire alarm annunciators.
- 7.9.3.3.1.(a).4 The alarm can be cancelled by authorized personnel at any annunciator, control panel or transponder within five minutes if investigation reveals false alarm.
- 7.9.3.3.1.(a).5 Authorized third-party (external) monitoring agency contracted by the Authority for monitoring of the fire alarm system is notified.
- 7.9.3.3.1.(a).6 Release magnetically held open doors in the zone with the activated initiating device.
- 7.9.3.3.1.(a).7 Activate any HVAC equipment required to maintain pressurization, or smoke exhaust as determined by the Design-Builder's Mechanical Engineer.

7.9.3.3(1)(b) Stage 2:

- 7.9.3.3.1.(b).1 A stage 2 alarm may be initiated by any of the following:
  - (b).1.1 If a stage 1 alert has not been acknowledged after 5 minutes;
  - (b).1.2 A key inserted in a key switch at a manual pull station;
  - (b).1.3 A key inserted in a key switch in a Staff workstation annunciator;
  - (b).1.4 Initiation by security or FMO; and
  - (b).1.5 A second initiating device in the same floor area is activated.
- 7.9.3.3.1.(b).2 For stage 2 alarm, speakers will sound in the ISO 8201 emergency evacuation temporal pattern in all zones where initiating devices have been activated.
- 7.9.3.3.1.(b).3 Speakers will sound an alert signal in any adjacent zone (vertically or horizontally).
- 7.9.3.3.1.(b).4 Release electronically locked doors on fire alarm in zones with activated initiating devices.
- 7.9.3.3.1.(b).5 Release magnetically held open doors in adjacent zones to the zone in stage 2.
- 7.9.3.3.1.(b).6 Home Elevators.
- 7.9.3.3.1.(b).7 Activate any HVAC equipment required to maintain pressurization or smoke exhaust as

determined by the Design-Builder's Mechanical Engineer.

7.9.3.3.1.(b).8 Send a signal to the fire department with the affected zones and device type.

7.9.3.3(2) Ensure smoke and heat detectors are individually field programmable, include multiple elements for earliest detection and are individually adjustable for ambient environmental conditions.

7.9.3.3(3) Design the fire alarm system to monitor:

7.9.3.3(3)(a) Isolation valve positions of sprinkler system zones;

7.9.3.3(3)(b) All generators for run and trouble conditions;

7.9.3.3(3)(c) Any pre-action or dry agent fire suppression systems for alarm, trouble and supervisory conditions;

7.9.3.3(3)(d) Status of any electric fire/smoke dampers;

7.9.3.3(3)(e) Any electric heat tracing for wet sprinkler systems in cold areas;

7.9.3.3(3)(f) Low air pressurization for dry sprinkler systems;

7.9.3.3(3)(g) Any Kitchen suppression systems; and

7.9.3.3(3)(h) Fire pumps for the statuses of pump running, loss of phase, phase reversal and connected to alternate source.

7.9.3.3(4) Synchronize the fire alarm system clock with the security systems and the synchronized clock system.

7.9.3.3(5) Provide signals to all elevator controllers for elevator recall operation and elevator homing functions.

7.9.3.3(6) Provide audible override to A/V sound systems in meeting rooms and similar spaces.

7.9.3.3(7) Provide signal to the nurse call system for 'Code Red' signal.

7.9.3.3(8) Provide signal from the lighting control system to turn lighting 100% on in the event of a fire.

7.9.3.3(9) The Design-Builder will train the Authority's FMO Staff on how to maintain the FA System, and the Authority's clinical and non-clinical end-users on how to use the FA system as applicable, in accordance with Section 5.6.13.5(3).

7.9.3.4 Integration:

7.9.3.4(1) Ensure the fire alarm system is monitored by the Authority's approved third-party monitoring agency.

7.9.3.4(2) Ensure the fire alarm system is fully integrated with ancillary systems, including the Crestron room systems, and all integrations are fully functional prior to the Substantial Completion Date.

7.9.3.4(3) Perform integrated Life Safety System testing to comply with CAN/ULC-S1001, with a complete list of operational sequences provided to the Authority for review prior to system programming.

7.9.3.4(3)(a) Testing will include power notification systems, smoke control and smoke venting systems, nurse call Wayfinding, and door holder and lock releasing functions.

7.9.4 Access Control

7.9.4.1 Basic Requirements

7.9.4.1(1) System Overview

7.9.4.1(1)(a) An access control system (ACS) will be installed throughout the Facility for the purpose of allowing access to secure or restricted spaces by authorized users as well as allowing authorized remote control of door-lock status.

7.9.4.1(1)(b) All components of the ACS will be compatible with and integrated to the Authority's existing Lenel OnGuard system.

7.9.4.1(1)(c) All global operations, user, and group definitions, reporting parameters and system accessibility will be aligned with software and hardware currently operational.

7.9.4.1(1)(d) Implementation of new doors, door groups, inputs/outputs, integrations, and HR database will be coordinated in consultation with the Authority to ensure a seamless integration and transition with minimal unplanned impact on any user-groups.

7.9.4.1(1)(e) All areas where access is required with the ACS must use hinging doors not sliding with the exception of exterior doors.

7.9.4.1(1)(f) Provide a Lenel Visitor Management module as part of the ACS system.

7.9.4.1(2) Applicable Area

7.9.4.1(2)(a) The Design-Builder will provide ACS devices at:

7.9.4.1.2.(a).1 Any door with means of access to any rooftop location;

7.9.4.1.2.(a).2 Locations specified in Appendix 1O [Security Operations Matrix] at a minimum; and

7.9.4.1.2.(a).3 Up to twenty other locations as determined by the Authority where it is reasonably necessary to restrict and audit access, to modify access control in real-time, and/or to support integration with electronic safety and security systems.

7.9.4.1(3) System Responsibilities

7.9.4.1(3)(a) Refer to Appendix 1W [Systems Responsibility Matrix] for Authority and Design-Builder scope summaries.

7.9.4.1(3)(b) Authority will:

7.9.4.1.3.(b).1 Select the system: Lenel Onguard; and

7.9.4.1.3.(b).2 Provide design feedback to the Design-Builder.

7.9.4.1(3)(c) The Design-Builder will:

7.9.4.1.3.(c).1 Provide all infrastructure and equipment for a fully functioning system as determined in consultation with the Authority.

7.9.4.1.3.(c).2 Integrate the system to the following systems:

(c).2.1 Fire alarm (as required by code);

(c).2.2 Intercommunications;

(c).2.3 IPVS;

(c).2.4 Patient Wandering; and

(c).2.5 Integration methods described in Section 7.8.25.1.

7.9.4.2 Performance Criteria

7.9.4.2(1) General

7.9.4.2(1)(a) The ACS will be interconnected to the electronic locking hardware to lock and unlock doors via time schedule and card readers utilizing proximity field effect technology. Requirements for doors will be determined through user group meetings. The ACS will grant or restrict access to employees on a door-

by-door basis via a programmable classification system and will operate over the Authority's IM/IT data network.

7.9.4.2(1)(b) The Design-Builder will coordinate all aspects of the ACS that affect door hardware with the architectural door and hardware consultant and identify any conflicts or code issues to the Authority.

7.9.4.2(1)(c) The ACS will have the capability for Staff to remotely control groups of perimeter doors to restrict entry to units/Components, the perimeter of the entire Facility, or other areas identified by the Authority in the event of an emergency or global command. Determine and program final access control system configuration as determined in consultation with the Authority.

7.9.4.2(1)(d) The Design-Builder will provide Lockdown functionality at the following locations and areas, at a minimum, and other locations as determined by the Authority:

- 7.9.4.2.1.(d).1 Emergency Department;
- 7.9.4.2.1.(d).2 Outbreak Control Zones;
- 7.9.4.2.1.(d).3 perimeter doors or department doors that are intended to be on an unlock schedule; and
- 7.9.4.2.1.(d).4 entry doors intended for public use.

7.9.4.2(1)(e) In the event of network disruption or loss of connectivity to the server, the ACS will function in non-degraded mode of operation at the field panel or controller level. All electronic locking hardware will be hard wired to the field control panels. The field controllers will be in Communications Rooms (Refer to Section 7.8 Division 27) and will be connected to the access control server via TCP/IP using the Structured Cabling.

7.9.4.2(1)(f) Access controlled doors will have a local sounder (independent of the card reader) to annunciate door held open and door forced open alarms. The tone will be adjustable in volume and will have a programmable option allowing the tone to be turned on/off via the ACS graphical user interface (GUI) by authorized system administrators. The configuration of each door alarm will be as determined in consultation with the Authority. By default, door held open and door forced open alarms will be programmed in the off position.

7.9.4.2(1)(g) The ACS will be complete with graphical mapping and will be implemented to match the Authority's existing system with a format developed as determined in consultation with the Authority. The maps will include interactive alarm points for all access doors.

7.9.4.2(1)(h) The ACS will use hard-wired proximity type readers and will be capable of reusing all existing cards presently distributed across the Authority's facilities.

7.9.4.2(1)(i) The ACS will be compatible with the Authority's existing systems to allow existing Authority cards to work on the system and allow new cards for the Facility to work on systems in the rest of the Authority's regions:

7.9.4.2.1.(i).1 Existing cards are HID Corporate 1000, 35 bit, with embedded Gemalto .net V2 chip for single sign on (where applicable) to client PCs; and

7.9.4.2.1.(i).2 The Design-Builder will provide one thousand (1000) blank proximity cards for Authority Staff. Confirm card type with the Authority prior to purchase.

7.9.4.2(1)(j) Provide card readers, locking hardware (refer to Division 8), request-to-exit devices, door position/alarm contacts with all associated mechanical and electric hardware and field devices, including power supplies for a fully operational system. Wiring to card readers will allow for OSDP, and the system will adhere to the OSDP standard.

7.9.4.2(1)(k) All access-controlled doors will be provided with keyed hardware, on both sides of the door if required, to override all access controls and allow passage through the door in either direction. Physical keys will be used only for bypass in the event of local system failure. Coordinate key and key hierarchy with the Authority.

7.9.4.2(1)(l) For all access-controlled door locations, provide a DPDT-type door contact.

7.9.4.2(1)(m) Power supplies will be on a dedicated UPS vital circuit and centralized within the Communications Rooms. Refer to Section 7.8 of this document. All access control and door hardware components will be powered via individual self-resetting positive

temperature coefficient device outputs from the power supplies.

7.9.4.2(1)(n) Individual power supplies will not serve more than eight doors, more than one department, or multiple floors in the Facility. Power supplies will individually control the power output based on the fire alarm relay input.

7.9.4.2(1)(o) The use of system integration points, such as SIP boards or Division 8 hardware integration boards, within the access control system is not permitted.

7.9.4.2(1)(p) Provide secure, simplified local door control button(s) for manual control of local department doors, or doors within the department. The manual control is to be provided by a dedicated physical button (not via intercom or software) located such that the buttons are accessible only to Staff and that Staff have visibility to the door while using the button. Manual control buttons are required at Patient Check-Ins, Reception desks, Lab, Vestibule - Shipping/Receiving, and other similar locations as determined by the Authority during the design development process.

7.9.4.2.1.(p).1 Door controls to provide momentary lock/unlock, permanent lock/unlock, and other functions as required by Staff in order to meet functional requirements.

7.9.4.2.1.(p).2 Door controls to provide LED status indicators to indicate the state of the door.

7.9.4.2(1)(q) Access control card readers will provide LED status indicators to indicate device status. The Design-Builder will confirm the LED status colours with the Authority prior to programming. All readers will be proximity field effect readers.

7.9.4.2(1)(r) Refer to Appendix 1O [Security Operation Matrix] and Section 7.9.4.1(2) for preliminary card reader locations and types. Additional card reader locations will be as determined in consultation with the Authority.

7.9.4.2(1)(s) The Design-Builder will provide card readers at all required access/egress locations to/from all controlled areas identified in Appendix 1O [Security Operation Matrix] and Section 7.9.4.1(2) and as determined in consultation with the Authority.

Functional programming requiring dual authentication will be done at the direction of the Authority for specific doors. Combination card readers will facilitate access by the following methods:

7.9.4.2.1.(s).1 pin code only;

7.9.4.2.1.(s).2 card read only; and

7.9.4.2.1.(s).3 pin code and card read.

7.9.4.2(1)(t) Where combination card readers are required (PIN code and proximity field effect), the PIN code feature will be fully integrated into the card reader with full functionality in the access system and software. Parallel, separately installed pin devices are not acceptable.

7.9.4.2(1)(u) The Design-Builder will be responsible for the initial programming of access control proximity cards.

7.9.4.2(1)(v) The ACS will be interconnected to the elevator controls for floor-by-floor access control via card readers in all elevators and elevator lobbies.

7.9.4.2(1)(w) Card readers in elevator cabs are to be slim/thin line devices providing the appearance of being integrated with the elevator cab controls, and not protruding from the elevator panel.

7.9.4.2(1)(x) The Design-Builder will supply clear, permanent signage indicating entry procedures and secure access areas. Wording and signage locations will be developed in consultation with the Authority.

7.9.4.2(1)(y) Intercommunication devices (intercoms) with integrated momentary remote door release are required at designated restricted access entry/exit points. Refer to Appendix 1O [Security Operations Matrix] and Section 7.9.8 for functional requirements and ensure that unlock is initiated from the ACS and not from the intercom master direct to door lock. Determine, through the consultation process, the placement of all intercom locations within the Facility.

7.9.4.2.1.(y).1 The intercommunications device will provide an input to the ACS to notify it of door unlock.

7.9.4.2(2) Impeded Egress Doors

7.9.4.2(2)(a) The Design-Builder will provide impeded egress operation and alarms at emergency exit doors as determined in consultation with the Authority and with the Design-Builder's BC Building Code consultant. Alarms will annunciate locally at the door and closest Care Team Station (if applicable), and via the integrated ACS.

7.9.4.2(2)(b) ACS functionality in impeded egress zones will be determined by the Design-Builder as determined in consultation with the Authority and with the BC Building Code consultant.

7.9.4.2(2)(c) Impeded egress doors will not allow egress without valid access control card-swipe. The Design-Builder will coordinate all BC Building Code exemptions required to achieve this with the BC Building Code consultant and the relevant AHJ.

7.9.4.2(3) Delayed Egress Doors

7.9.4.2(3)(a) The Design-Builder will coordinate architectural design, exiting strategies and door hardware to eliminate the use of delayed egress doors in close consultation with its architect, security consultants, BC Building Code consultants and the Authority.

7.9.4.2(3)(b) The Design-Builder will provide delayed-egress doors in areas identified in Appendix 1O [Security Operations Matrix];

7.9.4.2(3)(c) Where all other viable design options for alternates to delayed-egress doors have been ruled out, notify the Authority in writing for approval. If approved by the Authority, the following clauses will apply:

7.9.4.2.3.(c).1 Delay time will be programmed as determined in consultation with the Authority and with the Design-Builder's BC Building Code consultant;

7.9.4.2.3.(c).2 All delayed-egress alarms will be silenced using a key-switch integral to the panic hardware. The key cylinder will be keyed to match the Facility master key; and

7.9.4.2.3.(c).3 The Design-Builder will ensure that the delayed egress crash bar has an auxiliary output for additional alarm monitoring.

7.9.4.2(4) Programming

7.9.4.2(4)(a) The Design-Builder will be responsible for programming all systems including the initial programming of Staff proximity cards (including existing cards as approved by the Authority). Programming will include the programming of access levels and the assignment of access levels to individual Staff.

7.9.4.2(4)(b) The Design-Builder will retain the VAR of the Authority's choice to program all devices, data bases, and schedules as well as coordinate software integration with the Authority's existing Lenel OnGuard system. Coordinate meetings as required. The associated cost is the responsibility of the Design-Builder.

7.9.4.2(4)(c) All programming by the VAR will be completed prior to Substantial Completion. The VAR will also be responsible for the programming of any proximity cards required during construction up until Commissioning acceptance.

7.9.4.2(4)(d) The Design-Builder will train the Authority's Staff on how to maintain and use the ACS system, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.4.2(5) All security alarms will be logged for a minimum period of two (2) years. Logging system will be capable of external archiving/backup on external storage.

7.9.4.2(6) Security recording will provide, as a minimum, the following information for each alarm:

7.9.4.2.6.(a).1 date;
7.9.4.2.6.(a).2 time;
7.9.4.2.6.(a).3 device identification;
7.9.4.2.6.(a).4 descriptive code;
7.9.4.2.6.(a).5 user/cardholder ID (when applicable); and
7.9.4.2.6.(a).6 acknowledgement and action taken (when applicable).

7.9.4.2(7) Integration Requirements

7.9.4.2(7)(a) The ACS will interface and integrate with the:

7.9.4.2.7.(a).1 IPVS system through manufacturer-supported APIs such that when:

(a).1.1 an alarm is initiated at an access-controlled door, all local IPVS cameras associated with the door are displayed at the local security and site workstations.

7.9.4.2.7.(a).2 Intercommunications system to allow remote access to specified areas where video intercom does not suffice.

7.9.4.2.7.(a).3 Fire alarm system to release doors in the event of a fire as required by applicable laws and or standards.

7.9.4.2.7.(a).4 Patient Wandering System to prevent unauthorized egress.

7.9.4.2.7.(a).5 Network using Integration methods described in Section 7.8.25.1 such that events from the ACS can be sent to other systems on the network.

7.9.4.2(7)(b) Provide interconnection of the ACS with other security systems as required.

7.9.5 Fixed Panic Duress System

7.9.5.1 Basic Requirements

7.9.5.1(1) System Overview

7.9.5.1(1)(a) The fixed panic duress system consists of:

7.9.5.1.1.(a).1 High visibility buttons;

7.9.5.1.1.(a).2 Concealed buttons;

7.9.5.1.1.(a).3 Public duress buttons;

7.9.5.1.1.(a).4 Wireless Staff panic duress system;

7.9.5.1.1.(a).5 Personal panic alarm systems;

7.9.5.1.1.(a).6 Public emergency stations; and

7.9.5.1.1.(a).7 Sirens, strobes, and their associated hardware and infrastructure.

7.9.5.1(2) Applicable Area

7.9.5.1(2)(a) The Design-Builder will provide fixed panic duress system equipment in the following locations, at a minimum, and in other locations, as determined in consultation with the Authority so that Staff will have ready access to initiate emergency assistance calls in any locations where their safety may reasonably be expected to be at risk:

7.9.5.1.2.(a).1 All Care Team Station(s);

7.9.5.1.2.(a).2 Isolated work areas (night use);

7.9.5.1.2.(a).3 Stairwells at each floor level including parkade;
7.9.5.1.2.(a).4 Dedicated Staff entrances;
7.9.5.1.2.(a).5 Patient Check-In;
7.9.5.1.2.(a).6 Pharmacy;
7.9.5.1.2.(a).7 Oncology Pharmacy;
7.9.5.1.2.(a).8 Retail – Food
7.9.5.1.2.(a).9 Retail - Pharmacy; and
7.9.5.1.2.(a).10 Areas identified in Appendix 1O [Security Operations Matrix].

7.9.5.1(3) System Responsibilities

7.9.5.1(3)(a) Refer to Appendix 1W [Systems Responsibility Matrix] for Authority and Design-Builder scope summaries.

7.9.5.1(3)(b) Authority will:
7.9.5.1.3.(b).1 Provide design feedback to the Design-Builder; and
7.9.5.1.3.(b).2 Review and approve the systems proposed by the Design-Builder.

7.9.5.1(3)(c) The Design-Builder will:
7.9.5.1.3.(c).1 Provide all system infrastructure including hardware, equipment and software as determined in consultation with the Authority;
7.9.5.1.3.(c).2 Ensure all manufacturer's warranties will be transferable to the Authority at the completion of the project;
7.9.5.1.3.(c).3 Integrate the system with the following systems:
(c).3.1 Wireless Staff panic duress;
(c).3.2 Intrusion detection;
(c).3.3 IPVS; and
(c).3.4 Integration methods described in Section 7.8.25.1.
7.9.5.1.3.(c).4 Train the Authority's Staff on how to maintain and use the fixed duress system, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.5.1(4) Integration Requirements

7.9.5.1(4)(a) Wireless Staff panic duress

7.9.5.1.4.(a).1 The fixed panic duress system will integrate with the wireless Staff panic duress system, such that all points including the name, type, and exact location of each device is displayed on a common graphical map at security workstation(s).

7.9.5.1.4.(a).2 The wireless Staff panic duress system will provide direct integration of all fixed panic duress system points within a unified software platform.

7.9.5.1(4)(b) IPVS

7.9.5.1.4.(b).1 The fixed panic duress system will integrate with the IPVS system to provide video popups of cameras located closest to the location of the activated duress alarm.

7.9.5.1(4)(c) Intrusion detection

7.9.5.1.4.(c).1 The fixed panic duress system will integrate with the intrusion detection system to report the alarm location to a remote ULC-listed central alarm monitoring station chosen by the Authority using a duress system specific monitoring/ control panel.

7.9.5.1.4.(c).2 Design-Builder will coordinate directly with the Authority's service provider as required to configure and confirm this integration.

7.9.5.1.4.(c).3 Alarm location will include the building, floor level, and room in which the alarm originated.

7.9.5.1(4)(d) Lighting controls

7.9.5.1.4.(d).1 The fixed panic duress system will integrate with the lighting control system such that activating a fixed panic duress button in a public space will cause all lights in nearby lighting zones to be brought to full illumination.

7.9.5.1(4)(e) Wireless Staff communications for secondary annunciation to supplement the strobes and sirens.

7.9.5.2 Performance Criteria

7.9.5.2(1) General

7.9.5.2(1)(a) Fixed duress system buttons will be strategically located, suitably sized, clearly identified, and suitable for the application. Buttons will latch when pressed and require physical attendance by

Security or authorized personnel to reset and verify the integrity of the device.

7.9.5.2(1)(b) Provide fixed duress system buttons in two form factors:

7.9.5.2.1.(b).1 Button Type 1: Fixed duress buttons in areas intended for Staff safety will be a latching single button device requiring a deliberate insertion of a finger, to activate the alarm, installed such that they can be easily reached and operated inconspicuously. These buttons will be located at:

(b).1.1 Cash offices;
(b).1.2 Pharmacy;
(b).1.3 Oncology Pharmacy;
(b).1.4 Point of sale terminal locations;
(b).1.5 Reception; and
(b).1.6 Other areas as determined in consultation with the Authority.

7.9.5.2.1.(b).2 Button Type 2: Fixed panic buttons in areas intended for Staff and public safety use will be wall mounted and located in areas easily seen to the user. These fixed duress buttons will have a mushroom-style push button that will illuminate when pushed and activated and reset to illuminated and ready for next use when twisted. These buttons will be located at:

(b).2.1 Consult rooms; and
(b).2.2 Other areas as determined in consultations with the Authority.

7.9.5.2(1)(c) Fixed duress system buttons upon activation will report the alarm to the system control panel and report out to the remote monitoring station.

7.9.5.2(1)(d) Affixed wireless buttons are not acceptable; fixed duress system buttons are to be hard wired.

7.9.5.2(1)(e) All fixed duress system buttons and stations that are publicly visible will be clearly marked with signage indicating their use. Wording and signage type will be as determined in consultation with the Authority.

7.9.5.2(1)(f) Upon activation of a fixed duress system button or emergency station, a signal will identify the exact location of the event while providing the name and location of the device that initiated the alarm on

graphical mapping software (where RTLS is present) at the Security Station, specified Care Team Stations, and the Workroom - Command Centre. For areas/departments where wireless staff panic duress systems (Wireless RTLS) are not present LED/LCD keypads will be provided to annunciate the fixed duress system button locations. All areas/departments require a minimum of one (1) LCD/LED panel centrally located dedicated to panic alarms only. Based on the department size and layout, additional LCD/LED panels may be required to ensure Staff notification and response throughout the department. Also, local audible and visual alarms will be seen, heard and annunciated on LCD/LED panels within the departments.

7.9.5.2(1)(g) The entire fixed duress system will be supervised for the following:

- 7.9.5.2.1.(g).1 Power loss;
- 7.9.5.2.1.(g).2 System trouble;
- 7.9.5.2.1.(g).3 Communication loss; and
- 7.9.5.2.1.(g).4 Wiring and device (including short, ground fault, open circuit).

7.9.5.3 Wireless Staff Panic Duress System (Wireless RTLS)

7.9.5.3(1) System Overview

7.9.5.3(1)(a) A wireless Staff panic duress system will be installed in the Facility for the purpose of alerting and reporting Staff duress events.

7.9.5.3(1)(b) The system will consist of field antennas, Structured Cabling, software, tags/badges, sirens, strobes, monitors, and all associated hardware and controller infrastructure.

7.9.5.3(1)(c) The wireless Staff panic duress system will supplement the installation of, and be a subset of, the fixed duress system for reliable and dependable operation under all operational and environmental conditions. The wireless Staff panic duress system will not be affected by or interfere with any equipment in use in the Facility.

7.9.5.3(1)(d) The wireless Staff panic duress system design is to be developed as determined in consultation with the Authority.

7.9.5.3(2) Applicable Area

7.9.5.3(2)(a) The Design-Builder will provide wireless Staff panic duress system coverage in the following locations in order that Staff will be able to wirelessly initiate emergency assistance calls in any locations where their safety may reasonably be expected to be at risk within the:

7.9.5.3.2.(a).1 Emergency Component; and

7.9.5.3.2.(a).2 Anesthetic Care Unit (ACU).

7.9.5.3(3) Performance Criteria

7.9.5.3(3)(a) The wireless Staff panic duress system will provide reliable and dedicated coverage and allow multiple workstations to access the system for supervision, control and reporting purposes.

7.9.5.3(3)(b) The wireless Staff panic duress systems will be fully integrated onto a graphical mapping software platform for reporting, alarm response and annunciation purposes. Graphical user interface and reporting requirements will be programmed as determined in consultation with the Authority.

7.9.5.3(3)(c) Access to the wireless Staff panic duress software will be restricted to specific user groups as determined by the Authority. The Design-Builder to provide programming to support the Authority's IM/IT data network security requirements and user group authentication.

7.9.5.3(3)(d) The wireless Staff panic duress system will not be part of or use the same infrastructure as the Real Time Locating System (RTLS).

7.9.5.3(3)(e) Provide a complete Structured Cabling infrastructure that will allow the installation of the complete wireless Staff panic duress network, including access points, exciters, and/or ultrasonic receivers if applicable.

7.9.5.3(3)(f) Upon activation of any wireless Staff panic duress tag, the exact unit ID, and room/zone location are to be annunciated to the graphical mapping software and Staff workstation locations. The system will continue tracking the location of the tag in real-time until the alarm is cancelled.

7.9.5.3(3)(g) The wireless Staff panic duress system will provide the following functionalities:

- 7.9.5.3.3.(g).1 Tracking of Staff locations in all areas where the system is installed to floor and room level;
- 7.9.5.3.3.(g).2 The ability to segment larger rooms, open areas, and corridors into smaller zones as determined by the Authority;
- 7.9.5.3.3.(g).3 Tags that are non-Line of Sight and will work when covered with bed sheets and shirt sleeves;
- 7.9.5.3.3.(g).4 Identification of Staff panic duress location within the Facility by floor and room;
- 7.9.5.3.3.(g).5 Reporting on tag and wireless Staff duress infrastructure health and availability;
- 7.9.5.3.3.(g).6 Reporting on tag button press and alerting based on button press;
- 7.9.5.3.3.(g).7 Tags that are water-resistant and cleanable within the Authority's infection control standards. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs;
- 7.9.5.3.3.(g).8 Tags that support configuration in "always on" mode;
- 7.9.5.3.3.(g).9 Tags that have a visual alerting option (LED or light on tag); and
- 7.9.5.3.3.(g).10 Tags that have multiple attachment options.

7.9.5.3(3)(h) The Authority's IM/IT data network will be designed to maximize use for voice and data. The Design-Builder may use this network for transmitting data of the wireless Staff duress system, subject to the following conditions:

- 7.9.5.3.3.(h).1 The Design-Builder will not be permitted to add to, modify, reconfigure or tune the IM/IT wireless network to facilitate use by the wireless Staff panic duress system;
- 7.9.5.3.3.(h).2 Use of the IM/IT wireless network by the wireless Staff panic duress system will not negatively impact the performance of the IM/IT wireless network; and
- 7.9.5.3.3.(h).3 The system will not use the IM/IT wireless network as its sole communications method. The wireless Staff panic duress system will remain operational with redundant gateways if the IM/IT wireless network is unavailable.

7.9.5.3(3)(i) The Design-Builders will provide monitors displaying the graphical mapping software in each Component utilizing the system.

7.9.5.3(3)(j) All data points within the system will be capable of being archived for the purposes of reporting.

7.9.5.3(3)(k) Provide 150 Staff tags for use with the wireless Staff panic duress system. Tags will have minimum one-year battery life, LED indicator and be provided with attachment accessories. Tags will have the ability to be tested and will provide warning signal to monitoring software indicating advance warning of low battery.

7.9.5.3(3)(l) Each unit utilizing the system will be provided with a manufacturer-approved tag test device that audibly and visually indicates on a pass / fail basis the functionality and battery life of the tag. The testing device will be a closed loop device / station that allows for full Functional Testing without activating alarm system and will provide audit function as required.

7.9.5.3(3)(m) The entire wireless Staff panic duress system will be supervised for the following:

- 7.9.5.3.3.(m).1 Power loss;
- 7.9.5.3.3.(m).2 System trouble;
- 7.9.5.3.3.(m).3 Communication loss; and
- 7.9.5.3.3.(m).4 Wiring and device (including short, ground fault, open circuit).

7.9.5.3(3)(n) The Design-Builder will train the Authority's Staff on how to maintain and use the wireless Staff panic duress system, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.5.4 Personal Panic Alarm System (Wireless Non-RTLS)

7.9.5.4(1) System Overview

7.9.5.4(1)(a) A Component specific personal panic alarm system (PPA) will:

- 7.9.5.4.1.(a).1 Be installed in specific Components of the Facility for the purpose of alerting and reporting mobile duress events;

7.9.5.4.1.(a).2 Consist of field antennas, Structured Cabling, software, tags/badges, sirens, strobes and all associated hardware and controller infrastructure;

7.9.5.4.1.(a).3 Supplement the installation of, and be a be a subset of, the fixed duress system for reliable and dependable operation under all operational and environmental conditions;

7.9.5.4.1.(a).4 Not be affected by or interfere with any Equipment in use in the Facility;

7.9.5.4.1.(a).5 Be designed and developed in consultation with the Authority; and

7.9.5.4.1.(a).6 include portable Staff personal panic alarm devices that only work with their assigned unit specific PPA.

7.9.5.4(2) Applicable Area

7.9.5.4(2)(a) The Design-Builder will provide Component specific PPA coverage in the following Components for Staff to wirelessly initiate emergency assistance calls in any locations where their safety may reasonably be expected to be at risk:

7.9.5.4.2.(a).1 Pharmacy;

7.9.5.4.2.(a).2 Oncology Pharmacy; and

7.9.5.4.2.(a).3 Morgue.

7.9.5.4(3) Performance Criteria

7.9.5.4(3)(a) The PPA will provide reliable and dedicated coverage in the specified Components.

7.9.5.4(3)(b) Access to the PPA software will be restricted to specific user groups as determined by the Authority.

7.9.5.4(3)(c) The PPA will not be part of or use the same infrastructure as the RTLS.

7.9.5.4(3)(d) Upon activation of any PPA device, the exact Component ID, must be annunciated to the intrusion/dsc panel that sends out to third-party monitoring station for call outs to security radios.

7.9.5.4(3)(e) The PPA will provide the following functionalities:

7.9.5.4.3.(e).1 PPA devices that are non-Line of Sight and will work when covered with bed sheets and shirt sleeves;

7.9.5.4.3.(e).2 Reporting on PPA devices infrastructure health and availability;

7.9.5.4.3.(e).3 Reporting on PPA button press and alerting based on button press;

7.9.5.4.3.(e).4 PPA devices that are water-resistant and cleanable within the Authority's infection control standards. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs;

7.9.5.4.3.(e).5 PPA devices that support configuration in "always on" mode;

7.9.5.4.3.(e).6 PPA devices that have:

(e).6.1 a visual alerting option (LED or light on tag); and

(e).6.2 multiple attachment options.

7.9.5.4(3)(f) Provide 150 Staff PPA devices for use with the PPA including a minimum one-year battery life, LED indicator and accompanying attachment accessories.

7.9.5.4(3)(g) PPA devices will have the ability to be tested and will provide warning signal to monitoring software indicating advance warning of low battery.

7.9.5.4(3)(h) Each Component utilizing the PPA will be provided with a manufacturer approved PPA test device that audibly and visually indicates on a pass / fail basis the functionality and battery life of the PPA. The testing device will be a closed loop device / station that allows for auditing and full Functional Testing without activating the alarm system.

7.9.5.4(3)(i) The Design-Builder will train the Authority's Staff on how to maintain and use the PPA, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.5.5 Public Emergency Stations

7.9.5.5(1) System Overview

7.9.5.5(1)(a) Provide public emergency stations that are highly visible, illuminated, and accessible. Emergency stations upon activation will annunciate locally by

means of a siren/strobe unit(s), as well as reporting the alarm to the system network for alarm annunciation and reporting.

7.9.5.5(1)(b) Emergency stations will be wall or floor mounted, rated for exterior use, and come equipped with built in strobe and phone / intercom capabilities.

7.9.5.5(1)(c) Public Emergency Stations are to be self-diagnostic, monitored, and self-reporting.

7.9.5.5(1)(d) Provide all areas of parking including the underground parking with emergency stations such that no location is more than 30 m distant from an emergency station and within 5 m of pedestrian entrances/exits from underground parking. Ensure each emergency station is clearly visible from at least one surveillance camera.

7.9.5.5(2) Applicable Area

7.9.5.5(2)(a) The Design-Builder will provide public emergency stations in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff and public will have ready access to initiate emergency assistance calls in any locations where their safety may reasonably be expected to be at risk:

7.9.5.5.2.(a).1 Staff and public parking areas;
7.9.5.5.2.(a).2 Exterior walkways and courtyards;
7.9.5.5.2.(a).3 Areas identified in Appendix 1O [Security Operations Matrix]; and
7.9.5.5.2.(a).4 Certain areas as determined in consultation with the Authority.

7.9.6 Intrusion Detection System

7.9.6.1 Basic Requirements

7.9.6.1(1) System Overview

7.9.6.1(1)(a) The intrusion detection system consists of alarm controllers, local keypads, motion sensors, door contacts, strobes, sirens and other alarm initiating devices as needed for a reliable and fully operational system.

7.9.6.1(1)(b) Intrusion detection systems will be installed in all areas where the protection of physical Assets and

information is deemed critical by the Authority, and as applicable;

7.9.6.1.1.(b).1 In Pharmacy;

7.9.6.1.1.(b).2 In Oncology Pharmacy; and

7.9.6.1.1.(b).3 As a CNSC requirement in HDR OR.

7.9.6.1(1)(c) The intrusion detection system and all associated alarm panels will be remotely programmable and will be programmed to the satisfaction of the Authority.

7.9.6.1(2) Applicable Area

7.9.6.1(2)(a) The Design-Builder will provide intrusion detection system coverage in the following locations, at a minimum, and in other locations as determined by the Authority in order that areas with valuable physical Assets will be protected and/or to achieve compliance with regulatory requirements:

7.9.6.1.2.(a).1 Departmental office suites (e.g. administration; outpatient services);

7.9.6.1.2.(a).2 Cashier;

7.9.6.1.2.(a).3 Cash offices and any area where money is stored;

7.9.6.1.2.(a).4 Critical infrastructure areas;

7.9.6.1.2.(a).5 Service Entrance (shipping/receiving);

7.9.6.1.2.(a).6 Ground level departments that are not occupied 24/7;

7.9.6.1.2.(a).7 Computer Training Room;

7.9.6.1.2.(a).8 Perimeter windows and openings that may compromise integral security of the Facility in areas that are not occupied 24/7;

7.9.6.1.2.(a).9 Areas identified within Appendix 1A [Clinical Specifications and Functional Space Requirements];

7.9.6.1.2.(a).10 Other areas where a regulatory body requires the use of a system (Cobalt/blood irradiator) etc.;

7.9.6.1.2.(a).11 Areas identified in Appendix 1O [Security Operations Matrix]; and

7.9.6.1.2.(a).12 High-risk areas as designated by the Authority.

7.9.6.1(3) System Responsibilities

7.9.6.1(3)(a) Refer to Appendix 1W [Systems Responsibility Matrix] for Authority and Design-Builder scope summaries.

7.9.6.1(3)(b) Authority will:

7.9.6.1.3.(b).1 Provide design feedback to the Design-Builder.

7.9.6.1(3)(c) The Design-Builder will:

7.9.6.1.3.(c).1 Provide all system infrastructure including hardware, equipment and software as determined in consultation with the Authority;

7.9.6.1.3.(c).2 Integrate the system with the following systems:

(c).2.1 Fixed panic duress;

(c).2.2 IPVS; and

(c).2.3 Integration methods described in Section 7.8.25.1.

7.9.6.2 Performance Criteria

7.9.6.2(1) General

7.9.6.2(1)(a) The intrusion detection system will utilize industry proven devices for intrusion alarm detection and reporting capable of 24 hours-a-day, seven (7) days-a-week continuous operation and be connected to the Facility UPS in the even of power outages.

7.9.6.2(1)(b) The intrusion detection system will have GSM communications as a back-up to standard phone lines.

7.9.6.2(1)(c) The Design-Builder will complete all system programming in accordance with the monitoring company requirements.

7.9.6.2(1)(d) The system will be compatible with the Authority’s existing administrative software.

7.9.6.2(1)(e) The entire intrusion detection system will be supervised for the following:

7.9.6.2.1.(e).1 Power loss;

7.9.6.2.1.(e).2 System trouble;

7.9.6.2.1.(e).3 Communication loss; and

7.9.6.2.1.(e).4 Wiring and device (including short, ground fault, open circuit).

7.9.6.2(1)(f) Control of the system for each partition will be provided by keypad(s) located inside the department, Component or area being protected.

7.9.6.2(1)(g) The Design-Builder will install sirens as needed for audible annunciation of intrusion detection events.

7.9.6.2(1)(h) The Design-Builder will train the Authority's Staff on how to maintain and use the intrusion detection system, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.6.3 Integration Requirements

7.9.6.3(1) Fixed Panic Duress

7.9.6.3(1)(a) The intrusion detection system will integrate with the fixed panic duress system to report the alarm location to a remote ULC-listed central alarm monitoring station chosen by the Authority using a duress system specific monitoring/control panel.

7.9.6.3(1)(b) Coordinate directly with the Authority’s service provider as required to configure and confirm this integration.

7.9.6.3(1)(c) Intrusion alarms will be displayed on a common graphical map with other ESS system alarms at security workstation(s).

7.9.6.3(1)(d) Alarm location will include the building, floor level, and room/zone where the alarm originated.

7.9.6.3(2) IPVS

7.9.6.3(2)(a) The intrusion detection system will integrate with the IPVS system such that when an alarm is activated the IPVS cameras located closest to the location of the intrusion alarm will be automatically displayed at the Security Centre.

7.9.7 Overdose Notification System

7.9.7.1 Basic Requirements

7.9.7.1(1) The Design-Builder will provide an overdose notification system consisting of door position contacts, motion sensors, audio/visual alerting devices, and integration with nurse call through the integration methods described in Section 7.8.25.1.

7.9.7.1(2) The system will achieve the following functionalities:

7.9.7.1(2)(a) When the door to the washroom is closed and motion inside the room is detected, the system will activate;

7.9.7.1(2)(b) Once activated, the system will continuously monitor motion within the washroom/stall;

7.9.7.1(2)(c) If motion is not detected for a predetermined length of time (as determined by the Authority) the system will alarm and initiate a priority call from the nurse call audio device within the washroom/stall. A strobe light outside the washroom will also activate upon alarm;

7.9.7.1(2)(d) Ten (10) seconds before the system alarms, a local audible and visual alert consisting of a buzzer and light will activate within the washroom or stall;

7.9.7.1(2)(e) If motion is detected, the timer will reset and begin the countdown process again, and this sequence will repeat until the system deactivates; and

7.9.7.1(2)(f) The system will deactivate when the door opens.

7.9.7.1(3) The time required to initiate the call will be customizable and will be programmed as determined in consultation with the Authority.

7.9.7.1(4) Provide a local key switch outside the room door to disable/enable the overdose notification system within the room.

7.9.7.1(5) The installation of the overdose notification system will be Tamper Resistant and Ligature Resistant.

7.9.7.1(6) The system will be installed in the following locations:

7.9.7.1(6)(a) Emergency Department public washrooms; and

7.9.7.1(6)(b) Main Entrance public washrooms.

7.9.7.1(7) The Design-Builder will train the Authority's Staff on how to maintain and use the overdose notification system, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.8 Intercommunications System (Intercom)

7.9.8.1 Basic Requirements

7.9.8.1(1) System Overview

7.9.8.1(1)(a) A combination of video, and audio-only, intercom stations strategically located throughout the Facility and interfaced to the access control system to provide remote access through specific portals.

7.9.8.1(2) Applicable Area

7.9.8.1(2)(a) The Design-Builder will provide IP audio-video master intercoms (VMI) in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff will have ready access to intercom master stations where they may reasonably be expected to verify access to secure spaces:

- 7.9.8.1.2.(a).1 Care Team Stations of all clinical departments;
- 7.9.8.1.2.(a).2 Anteroom, if not equipped with a nurse call Staff VoIP workflow station;
- 7.9.8.1.2.(a).3 Anteroom for Secure Room with integral two-way audio capabilities equipped with:
  - (a).3.1 Volume control;
  - (a).3.2 Two push-to-talk/call buttons; one to the Secure Room door station and one to the VMI at the Emergency CTS;
  - (a).3.3 Support DSP features, hands-free open duplex audio capability and switched duplex; and
  - (a).3.4 16 kHz voice speech quality.
- 7.9.8.1.2.(a).4 Office suite entrances;
- 7.9.8.1.2.(a).5 Shared offices;
- 7.9.8.1.2.(a).6 Areas identified within Appendix 1O [Security Operation Matrix]; and
- 7.9.8.1.2.(a).7 Areas identified within Appendix 1A [Clinical Specifications and Functional Space Requirements].

7.9.8.1(2)(b) The Design-Builder will provide IP audio-video door intercom (VDI) stations in the following locations, at a minimum, and in other locations as determined by the Authority in order that individuals will have ready access to video intercom stations where they may reasonably be expected to request access to secure spaces:

- 7.9.8.1.2.(b).1 Areas identified in Appendix 1O [Security Operation Matrix];
- 7.9.8.1.2.(b).2 Public entries to departments and Components;

(b).2.1 Calls from the VDI will be broadcast to each VMI within the department or Component simultaneously and may be answered from any of these locations.

7.9.8.1.2.(b).3 All entries to the Facility;

7.9.8.1.2.(b).4 Morgue Viewing Room;

7.9.8.1.2.(b).5 Areas where Line of Sight is not possible for the point of entry to the point of access;

7.9.8.1.2.(b).6 Secure Room including:

(b).6.1 Voice activated hands-free operation (no buttons);

(b).6.2 No video (audio only required); and

(b).6.3 Connectivity to the VMI in the Anteroom and VMI at Emergency CTS.

7.9.8.1.2.(b).7 Areas identified in Appendix 1A [Clinical Specifications and Functional Space Requirements].

7.9.8.1(3) System Responsibilities

7.9.8.1(3)(a) Refer to Appendix 1W [Systems Responsibility Matrix] for Authority and Design-Builder scope summaries.

7.9.8.1(3)(b) Authority will:

7.9.8.1.3.(b).1 Provide design feedback to the Design-Builder.

7.9.8.1(3)(c) The Design-Builder will:

7.9.8.1.3.(c).1 Provide all system infrastructure, equipment and software as determined in consultation with the Authority; and

7.9.8.1.3.(c).2 Integrate the system with the following systems:

(c).2.1 IM/IT VoIP;

(c).2.2 ACS; and

(c).2.3 Integration methods described in Section 7.8.25.1.

7.9.8.2 Performance Criteria

7.9.8.2(1) General

7.9.8.2(1)(a) The Design-Builder will undertake the Design and Construction of a fully digital IP based audio-video intercommunications system manufactured by

recognized industry leaders in the intercom business.

7.9.8.2(1)(b) The Design-Builder will provide all components of the intercommunications system including:

7.9.8.2.1.(b).1 all stations, expansion modules, mounting hardware, loudspeakers, microphones, wiring, servers, plug-in cards, software, licenses and other components required to provide a turn-key solution that meets or exceeds the Authority's requirements; and

7.9.8.2.1.(b).2 all server hardware, software and licensing required for the intercom control system and to complete the integration scope of work as defined in this section.

7.9.8.2(1)(c) The Design-Builder will provide operations, programming and maintenance training for the overall intercommunications system including the control system. Operating, programming and maintenance manuals and user guides will be provided at the time of training;

7.9.8.2(1)(d) The Design-Builder will train the Authority's Staff on how to maintain and use the intercommunications system, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.8.2(1)(e) The intercom system supplied and installed by the Design-Builder will:

7.9.8.2.1.(e).1 Meet the functional requirements described in Appendix 1A [Clinical Specifications and Functional Space Requirements];

7.9.8.2.1.(e).2 Provide full duplex hands-free and handset voice communication, allowing simultaneous talking and listening with echo cancellation;

7.9.8.2.1.(e).3 Support broadcast and multicast audio transmission;

7.9.8.2.1.(e).4 Provide one-way video between VDI / VMI and bi-directional video Transmission between VMIs;

7.9.8.2.1.(e).5 Be microprocessor controlled and incorporate modular components;

7.9.8.2.1.(e).6 Provide all interfaces and associated licensing for integration and or connection with other systems;

7.9.8.2.1.(e).7 Store and distribute pre-recorded music and audio messages to be played constantly or upon activation via event trigger or operator. Replay of pre-recorded content will be configurable to multiple groups or zones within the Facility;

7.9.8.2.1.(e).8 Allow direct dialing functions for each station individually as required by the Authority;

7.9.8.2.1.(e).9 Restrict features and dialing sequences for any station individually as required by the Authority; and

7.9.8.2.1.(e).10 Provide full autonomous supervision of all intercom systems components including servers, loudspeakers, microphones, stations and communications lines.

7.9.8.2(1)(f) Door stations located at locked perimeter doors will link to the master intercom station at the Control-Security office. Master intercom station at the Control-Security office will be capable of remotely unlocking perimeter entrance doors.

7.9.8.2(1)(g) The Design-Builder will supply and install hardware and mounting kits as required to place master stations either on the desktop or wall (flush or surface).

7.9.8.2(1)(h) The Design-Builder will supply and install stations that are detergent and disinfectant resistant where there is a heightened requirement for infection control or in environments where washing and disinfection occurs. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs.

7.9.8.2(2) Intercommunications Equipment and Software

7.9.8.2(2)(a) The door stations for the department doors and the entrances to the Facility will have the following minimum requirements:

7.9.8.2.2.(a).1 Digital pan/tilt and zoom with a wide-angle lens;

7.9.8.2.2.(a).2 Video quality – HDTV 1080P and H.264 or H.265;

7.9.8.2.2.(a).3 Support DSP features, hands-free open duplex audio capability, and switched duplex;

7.9.8.2.2.(a).4 Push-to-talk/call buttons;

7.9.8.2.2.(a).5 Protection classification IP65 Vandal Resistant and mechanical impact resistance, Tamper Resistant and Ligature Resistant where accessible by Patients; and

7.9.8.2.2.(a).6 Each video door intercom station will be able to provide a signal to the access control system for door release.

7.9.8.2(2)(b) Master intercom stations will have the following minimum requirements:

7.9.8.2.2.(b).1 Desk and wall mount capability;

7.9.8.2.2.(b).2 7” colour display;

7.9.8.2.2.(b).3 Support display of IP video streams from other intercom stations;

7.9.8.2.2.(b).4 IP65 protection classification;

7.9.8.2.2.(b).5 Support DSP features, hands-free open duplex audio capability, and switched duplex;

7.9.8.2.2.(b).6 16 kHz voice speech quality; and

7.9.8.2.2.(b).7 Support remote unlocking of doors;

7.9.8.2(3) Energy Centre

7.9.8.2(3)(a) Integrate the intercommunications system in the Facility with the intercommunication system in the Energy Centre to create one seamless intercommunications network which covers both. This integration will enable:

7.9.8.2.3.(a).1 bi-directional audio and one-way video communication between any master station located in the Facility and door stations in the Energy Centre (and vice versa) where required by the Authority; and

7.9.8.2.3.(a).2 The master stations in the Facility will not be used to release doors in the Energy Centre (and vice versa). Door release buttons for the Energy Centre will be located at predetermined locations in consultation with and where required by the Authority.

7.9.8.2(4) Integration Requirements

7.9.8.2(4)(a) The Design-Builder will physically and logically integrate the intercom system in the Facility with:

7.9.8.2.4.(a).1 IM/IT VoIP system

(a).1.1 The IM/IT VoIP system, such that the intercom network will function in a SIP environment and will be able to integrate to the Authority’s PBX using

SIP trunk lines for remote audio and dial-tone unlocking capabilities.

7.9.8.2.4.(a).2 ACS

(a).2.1 To allow remote access to specified areas where video intercom does not suffice.

7.9.9 IP Video Surveillance System (IPVS)

7.9.9.1 Basic Requirements

7.9.9.1(1) System Overview

7.9.9.1(1)(a) The IPVS will consist of high definition, IPVS cameras, storage devices, network video recorders (NVR), digital video management system (DVMS), licensing, and all associated hardware and software.

7.9.9.1(1)(b) The IPVS will provide:

7.9.9.1.1.(b).1 Recorded clear images of individuals to allow distinction of facial features, clothing and other identifiable details;

7.9.9.1.1.(b).2 License plate recognition; and

7.9.9.1.1.(b).3 Automatic recorded images of sufficient quality and zoom in functionality during an access control, duress, or other adverse event as determined by the Authority.

7.9.9.1(2) Applicable Area

7.9.9.1(2)(a) The Design-Builder will provide IPVS devices in areas in accordance with Appendix 1O [Security Operations Matrix] at a minimum, and in other locations as determined by the Authority where Staff, Patient and/or public safety may reasonably be at risk other than areas where there is a reasonably expectation of personal privacy:

7.9.9.1.2.(a).1 Fixed panic duress button locations;

7.9.9.1.2.(a).2 Bicycle lockers/storage;

7.9.9.1.2.(a).3 Publicly accessible fixed panic duress stations;

7.9.9.1.2.(a).4 Communications Rooms;

7.9.9.1.2.(a).5 Areas where cash is exchanged;

7.9.9.1.2.(a).6 Accessible roof areas;

7.9.9.1.2.(a).7 Steam Plant;

7.9.9.1.2.(a).8 Heating Plant;

7.9.9.1.2.(a).9 Main Chiller Plant;

7.9.9.1.2.(a).10 Locations of Major Mechanical Equipment with IPVS providing as many view angles as necessary for full visibility of the equipment as determined in consultation with the Authority;

7.9.9.1.2.(a).11 High-risk areas as designated by the Authority; and

7.9.9.1.2.(a).12 All Facility elevator cabs with full field of view within the cab.

7.9.9.1(3) System Responsibilities

7.9.9.1(3)(a) Refer to Appendix 1W [Systems Responsibility Matrix] for Authority and Design-Builder scope summaries.

7.9.9.1(3)(b) Authority will:

7.9.9.1.3.(b).1 Select the system IPVS: Avigilon; and

7.9.9.1.3.(b).2 Provide design feedback to the Design-Builder.

7.9.9.1(3)(c) The Design-Builder will:

7.9.9.1.3.(c).1 Provide all system infrastructure including licensing, hardware, equipment and software as determined in consultation with the Authority; and

7.9.9.1.3.(c).2 Integrate the IPVS with the following systems:

(c).2.1 Access control;

(c).2.2 Fixed duress;

(c).2.3 Integration methods described in Section 7.8.25.1.

(c).2.4 Intrusion detection; and

(c).2.5 Patient wandering.

7.9.9.2 Performance Criteria

7.9.9.2(1) General

7.9.9.2(1)(a) Provide new IPVS cameras, field devices, pathways, wiring, control panels, network equipment, licensing, software, mounting hardware, accessories, and all supporting infrastructure to support a fully functional IPVS system. Cabling for the system will meet the requirements as set out in Section 7.8.10 Structured Cabling.

7.9.9.2(1)(b) Each IPVS camera will be selected and configured with the appropriate lens to meet or exceed the resolution scene requirements of observation, identification, or recognition. Each IPVS camera will

have scene purpose stated. All cameras will be no less than 2MP image quality and utilize H.264 or better image compression technology.

7.9.9.2(1)(c) The Design-Builder will ensure that the IPVS network equipment follows industry best practices for cyber security hardening and consult with the Authority to ensure it meets the Authority's network security requirements.

7.9.9.2(1)(d) Provide video storage capacity for minimum of thirty (30) days at minimum 18 frames per second, recorded at each camera's intended resolution for all installed cameras, including clinical cameras. The IPVS system will have the option of recording each camera at various resolution levels and FPS depending on use and location, as well as by schedule or event. Provide file servers and optical storage devices and connect each to the IM/IT data network. The system will have activity detection and incorporate smart search capabilities. Playback speed will be supported at five (5) times the normal rate.

7.9.9.2(1)(e) The Design-Builder will provide and install a new standalone Avigilon DVMS for the Site. The DVMS will:

7.9.9.2.1.(e).1 Support the full range of functionality and integrations required by this Agreement; and

7.9.9.2.1.(e).2 Maintain this functionality locally in the Facility if the network connection to the regional server is lost.

7.9.9.2(1)(f) In the event of network disruption or loss of connectivity to the Authority's enterprise server, the IPVS system will continue to function in non-degraded mode of operation.

7.9.9.2(1)(g) The DVMS will be a network-based client application allowing for authorized users to remotely view, control and manage all aspects of the IPVS system across the network. The system will have network and web access for remote monitoring, using predefined user authentication.

7.9.9.2(1)(h) The Design-Builder will provide remote monitoring software and licensing for all Authority supplied workstations requiring remote monitoring of the IPVS system.

7.9.9.2(1)(i) The DVMS will reside on the Authority's IM/IT data network on a separate VLAN and be part of the Authority's Structured Cabling plan.

7.9.9.2(1)(j) All cameras will have FOV digital masking ability through software to allow sensitive areas within a scene to be hidden as required.

7.9.9.2(1)(k) Camera mounting will be appropriate for the environment and unobtrusive, with hidden cabling.

7.9.9.2(1)(l) Position cameras to minimize the possibility of reflection including glare created by bright light sources, both natural and artificial.

7.9.9.2(1)(m) Locate cameras such that their FOV is not impeded or obstructed by other ceiling mounted or nearby devices.

7.9.9.2(1)(n) The use of PTZ lens cameras will not be permitted unless approved by the Authority.

7.9.9.2(1)(o) Once the IPVS is installed and operational, the Design-Builder will provide screenshots of each camera for review by the Authority to ensure the correct field of view is captured. The Design-Builder will adjust any camera that the Authority identifies as not meeting the intent of the design.

7.9.9.2(1)(p) The IPVS will provide recorded images of sufficient quality to be used as court-admissible evidence in Canada. Designated objects within each camera's FOV require specific pixel densities in the following areas:

7.9.9.2.1.(p).1 Identification: 250 horizontal pixels/m for individuals at main entry and exit points to the Facility, department entry and exit points, emergency drop-off zones, elevator lobbies, drug storage and medication rooms, high risk areas and at each public emergency station location;

7.9.9.2.1.(p).2 Recognition: 250 horizontal pixels/m for individuals in public lobbies, waiting and gathering areas, areas where cash is exchanged, entrances to locker change rooms, equipment/server rooms and hallways/corridors;

7.9.9.2.1.(p).3 Observation: 125 horizontal pixels/m for exterior walkways, court yards and parking lots; and

7.9.9.2.1.(p).4 LPR: Licence plate recognition will be required for vehicles entering and exiting:

(p).4.1 Emergency drop-off zones;

(p).4.2 Entrances and exits to underground parking;

(p).4.3 Main entrance drop-off zone(s); and

(p).4.4 All after-hours entrance drop-off zone(s).

7.9.9.2(1)(q) Appendix 1O [Security Operation Matrix] provides additional details regarding the minimum required surveillance coverage of specific spaces and door types. The Design-Builder will ensure that the design of the IPVS system meets these requirements in addition to those set out in this Agreement.

7.9.9.2(1)(r) Provide IPVS cameras throughout the Site, underground parking and exterior areas for the purpose of viewing and recording video to enhance the level of security and assist the Authority's Staff in providing a safe environment for Patients, Staff, visitors and the general public while protecting the physical Assets of the Facility.

7.9.9.2(1)(s) The Design-Builder will post signage at entrances to the Facility and Energy Centre. The signage design and wording in accordance with Authority standards and provided by IPS will notify the public that this area is under video surveillance. IPVS processes will be governed by the Public Surveillance System Privacy Guidelines.

7.9.9.2(1)(t) Indoor cameras will be:

7.9.9.2.1.(t).1 Fixed type;

7.9.9.2.1.(t).2 Capable of a full analytic package including Avigilon Appearance Search;

7.9.9.2.1.(t).3 Colour;

7.9.9.2.1.(t).4 High resolution;

7.9.9.2.1.(t).5 Capable of HDR and auto white-balancing;

7.9.9.2.1.(t).6 High sensitivity (day/night);

7.9.9.2.1.(t).7 Smoke dome type;

7.9.9.2.1.(t).8 Equipped with an auto iris and zoom capability;

7.9.9.2.1.(t).9 Tamper Resistant and Vandal Resistant; and

7.9.9.2.1.(t).10 All cameras will be no less than 3MP image quality and utilize H.264 or better image compression technology.

7.9.9.2(1)(u) Outdoor cameras will be:

7.9.9.2.1.(u).1 Fixed type;

7.9.9.2.1.(u).2 Capable of a full analytic package including Avigilon Appearance Search;

7.9.9.2.1.(u).3 Colour;

7.9.9.2.1.(u).4 High resolution;

7.9.9.2.1.(u).5 Capable of HDR and auto white-balancing;

7.9.9.2.1.(u).6 High sensitivity (day/night);

7.9.9.2.1.(u).7 Equipped with an auto iris and zoom capability; and

7.9.9.2.1.(u).8 Tamper Resistant and Vandal Resistant.

7.9.9.2(1)(v) Outdoor cameras will be complete with weatherproof housing and internal heater/defroster/blower/wiper as required for suitable operation under varying environmental conditions.

7.9.9.2(1)(w) IPVS cameras will not be set up in private areas such as Patient Rooms, treatment rooms or areas where Patients are receiving care or treatment (unless specifically identified for use by clinical department Staff), locker rooms or washrooms. Cameras will not be placed or reviewed for the purpose of observing the work performance of employees.

7.9.9.2(1)(x) Provide IPVS equipment to monitor and record the identity of all persons entering and exiting the Facility’s entrances and corridors/links and utilizing elevators in strictly controlled high-risk departments and associated areas, as determined in consultation with the Authority.

7.9.9.2(1)(y) The Design-Builder will train the Authority's Staff on how to maintain and use the IPVS, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.9.3 Clinical Observation Camera Systems (CObCS)

7.9.9.3(1) The CObCS is comprised of cameras used by the Authority for:

7.9.9.3(1)(a) General observation (recordable and non-recordable)

7.9.9.3.1.(a).1 General observation areas are corridors, hallways, lounges, and waiting areas. Cameras in these locations are part of the IPVS system where there is a lower expectation of privacy and by default are set to not record. These cameras may serve a dual purpose as both IPVS and observation cameras with continuous supervision at the discretion of the Authority.

7.9.9.3.1.(a).2 The following are requirements for the Secure Room:

(a).2.1 IRT capability to view people in the room under low light conditions;

(a).2.2 Placed in room with full field of view; and

(a).2.3 Ability to blur out certain areas of a person during live viewing and recording for enhanced privacy ; refer to Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the B.C. Mental Health Act, Ministry of Health, Province of British Columbia.

7.9.9.3(1)(b) Clinical education (non-recordable)

7.9.9.3.1.(b).1 Clinical education cameras are not part of the IPVS. These cameras are used for training and education purposes where this is a lower expectation of privacy. Typically installed in Type 5 Multimedia Rooms. These cameras are not connected to any Network Video Recorder (NVR) and Digital Video Management system (DVMS).

7.9.9.3(1)(c) Clinical procedural (non-recordable)

7.9.9.3.1.(c).1 Clinical procedural cameras are not part of the IPVS. These cameras are used for remote monitoring of patients by clinical Staff only in areas that are located within clinical treatment rooms, operating rooms, autopsy rooms and other areas where there is a higher expectation of privacy and 1:1 Patient care occurs. Cameras in these areas require a separate Network Video Recorder (NVR) and

Digital Video Management system (DVMS) from that of the IPVS system.

7.9.9.3(2) The CObCS will be of the same manufacturer as the IPVS system.

7.9.9.3(3) The Design-Builder will:

7.9.9.3(3)(a) Coordinate location of viewing Patients in Patient Care Areas within clinical programs and the Millwork design to ensure ergonomic viewing and usage in conjunction with other systems as determined in consultation with the Authority;

7.9.9.3(3)(b) Provide a minimum of one viewing client, and license at each location identified as the designated remote monitoring location(s) as indicated in Appendix 1O for the areas requiring CObCS cameras as determined in consultation with the Authority; and

7.9.9.3(3)(c) Provide clinical observation remote monitoring in areas identified within Appendix 1O [Security Operation Matrix], at a minimum, and in other locations as determined by the Authority.

7.9.9.4 Integration Requirements

7.9.9.4(1) If supported by the DVMS manufacturer, when a system integrated with the IPVS triggers an alarm, all IPVS cameras associated with the alarm will increase their recorded framerate to a minimum of 30 FPS, with pre and post record.

7.9.9.4(1)(a) Access control

7.9.9.4.1.(a).1 The ACS will interface with the IPVS through manufacturer-supported API's such that when:

(a).1.1 An alarm is initiated at an access-controlled door, selected surveillance cameras associated with the door are displayed at the local and site security workstations.

(a).1.2 Access is requested at locations with IPVS cameras a second layer of security is included with facial recognition of Staff requesting access.

7.9.9.4(1)(b) Fixed duress

7.9.9.4.1.(b).1 The fixed duress system will integrate with the IPVS to provide video popups of cameras

located closest to the location of the alarm at security workstations.

7.9.9.4(1)(c) Intrusion detection

7.9.9.4.1.(c).1 The intrusion detection system will integrate with the IPVS to provide video popups of cameras located closest to the location of the alarm.

7.9.9.4(1)(d) Patient Wandering

7.9.9.4.1.(d).1 The intrusion detection system will integrate with the IPVS to provide video popups of cameras located closest to the location of the alarm.

7.9.9.4(1)(e) The Design-Builder will program each alert/alarm location of integrated systems to corresponding cameras near the location of the alert, as determined in consultation with the Authority.

7.9.10 Patient Wandering System

7.9.10.1 Basic Requirements

7.9.10.1(1) System Overview

7.9.10.1(1)(a) The Patient Wandering System is a tag-based system that prevents tagged, at risk, Patients from leaving pre-defined areas.

7.9.10.1(1)(b) The Patient Wandering System design will be developed in consultation with the Authority.

7.9.10.1(2) Applicable Area

7.9.10.1(2)(a) Applies to the Facility.

7.9.10.1(2)(b) The Design-Builder will provide Patient Wandering System devices in the following locations, at a minimum, and in other locations as determined by the Authority in order that Staff will readily receive notifications in any locations where Patients may reasonably be expected to be contained and are considered by Staff to be a risk for elopement due to cognitive impairment or similar conditions.

7.9.10.1.2.(b).1 Each of the following Components:

(b).1.1 Emergency Department; and

(b).1.2 Inpatient Units.

7.9.10.1(3) System Responsibilities

7.9.10.1(3)(a) Refer to Appendix 1W [Systems Responsibility Matrix] for Authority and Design-Builder scope summaries.

7.9.10.1(3)(b) Authority will:

7.9.10.1.3.(b).1 Provide design feedback to the Design-Builder.

7.9.10.1(3)(c) The Design-Builder will:

7.9.10.1.3.(c).1 Provide all system infrastructure including hardware, equipment and software as determined in consultation with the Authority;

7.9.10.1.3.(c).2 Integrate the system with the following systems:

(c).2.1 Access control;

(c).2.2 Nurse call;

(c).2.3 IPVS; and

(c).2.4 Integration methods described in Section 7.8.25.1.

7.9.10.2 Performance Criteria

7.9.10.2(1) General

7.9.10.2(1)(a) The Patient Wandering System will not be part of or use the same infrastructure as the RTLS.

7.9.10.2(1)(b) Patients will be provided with tags, ID bands, badges, or bracelets. The tracking system will be capable of continuous monitoring within departments as identified in this section.

7.9.10.2(1)(c) System will be water resistant and Tamper Resistant and will annunciate an alarm if any component of the system is tampered with.

7.9.10.2(1)(d) Each department and unit utilizing the Patient Wandering System will be provided with a wireless Patient wandering tag test device that audibly and visually indicates on a pass/fail basis the functionality and battery life of the Patient wandering tag. The testing device will be a closed loop device/station that allows for full Functional Testing without activating the Facility Patient Wandering Alarm System and will support audit function as required.

7.9.10.2(1)(e) The system will annunciate or alarm at or in the Care Team Station in the vicinity of the event and areas as determined in consultation with the

Authority if a Patient leaves the area to which they are assigned.

7.9.10.2(1)(f) The system will be designed such that if doors/devices on the system lose network connectivity, they will continue to function in stand-alone mode, complete with local manual override.

7.9.10.2(1)(g) The system will support the enabling and disabling of tags. Users will be able to quickly deactivate and reactivate tags.

7.9.10.2(1)(h) The Design-Builder will install the system, including all integrations, in one of the mock-up spaces and demonstrate that the system works reliably for the duration of the mock-up.

7.9.10.2(2) Performance Requirements

7.9.10.2(2)(a) At each designated perimeter door, provide a Patient wandering exciter array on each side of the door that will be interfaced with the ACS such that the restricted egress of a door can be initiated automatically upon local detection of Patient wandering tags.

7.9.10.2(2)(b) At each door equipped with a Patient wandering exciter array, a local strobe/sounder will activate when the associated door Patient Wandering System alarms.

7.9.10.2(2)(c) The system will alarm and send alerts when Patient tags approach, or pass through, a designated threshold as determined in consultation with the Authority.

7.9.10.2.2.(c).1 When a Patient tag enters the field near a department perimeter door, the door will lock and a visual indicator on each side of door will activate.

7.9.10.2.2.(c).2 If the Patient tag passes through the door, the system will alarm and send alerts to Staff.

7.9.10.2.2.(c).3 Proximity alert/alarm distance to the exit point will be adjustable to minimum of 2 m.

7.9.10.2(2)(d) Provide a local keypad at each Patient wandering exciter door for reset and override by authorized Staff members. Local override can also be accomplished by detection of a Staff/companion tag at the same exciter door location.

7.9.10.2(2)(e)	Provide a PC-based application that will provide a graphical presentation of Patient locations by superimposing positional data on a Facility floor plan and providing Patient tag-based information.
7.9.10.2(2)(f)	Provide dedicated workstations at each inpatient unit Care Team Station that can assign tags and annunciate alarm locations.
7.9.10.2(2)(g)	The Patient Wandering System will interface with the IPVS system such that when a tagged Patient exits through a department perimeter door, all local cameras associated with the door are displayed at the security workstations. The event will also be transmitted to the wireless Staff communications system as a secondary point of annunciation.
7.9.10.2(2)(h)	Upon the initiation of an alert, the system will identify the location of the event and the particular Patient and display the location on graphical mapping on the local clinical department workstations;
7.9.10.2(2)(i)	All tags will report on battery status in real-time and be rechargeable.
7.9.10.2(2)(j)	Patient tags will be non-Line of Sight and will work when covered with bed sheets and shirt sleeves.
7.9.10.2(2)(k)	Provide tags and battery types that will last 1 year minimum based on average usage scenarios.
7.9.10.2(2)(l)	Provide 500 Patient wandering tags and 500 Staff/companion tags.
7.9.10.2(2)(m)	The Design-Builder will consult with the Authority to develop standard operating procedures for the system and program the system as determined in consultation with the Authority.
7.9.10.2(2)(n)	The Design-Builder will train the Authority's Staff on how to maintain and use the Patient Wandering System, in accordance with Section 5.6.13.5(3), notwithstanding that the training schedule will be determined in consultation with the Authority and overall end-user Staff training schedules.

7.9.10.2(3) Integration Requirements

7.9.10.2(3)(a) Integrate to the ACS and IPVS such that upon the initiation of an alert:

7.9.10.2.3.(a).1 The ACS will lock the door where the alert is initiated.

7.9.10.2.3.(a).2 The system will identify the location of the event and the Patient on the local clinical department workstation(s) graphical mapping software.

7.9.10.2(3)(b) The Patient Wandering System will integrate via integration methods described in Section 7.8.25.1 allowing the Authority the capability to integrate system events to applicable Section 7.8 and Section 7.9 systems as determined by the Authority.

7.9.11 Structural Moat Wall and Future Underground Parking

7.9.11.1 For structural moat wall and future underground parking requirements refer to Appendix 1G [Campus Perimeter Pathway System Technical Specifications] and Appendix 1O [Security Operations Matrix].

PART 8. SITE AND INFRASTRUCTURE SUBGROUP SPECIFICATIONS

8.1 Earthworks (Division 31)

8.1.1 Site Grading

8.1.1.1 Basic Requirements

8.1.1.1(1) Excavate, backfill and grade to provide slopes and elevations to suit all Site improvements including Site and building access points, foundations, underground parking, roadways, walkways, and utilities.

8.1.1.1(2) Site grading will meet with the proposed grades of the adjacent road network.

8.1.1.1(3) Site grading will include waste removal, stripping, clearing, grubbing, common excavation, rock removal, trenching, backfilling, embankment, controlled density fill, dewatering, and compaction.

8.1.1.2 Performance Requirements

8.1.1.2(1) Site grading will meet the recommendation provided by Design-Builder’s geotechnical engineer.

8.1.1.2(2) Design-Builder will provide a geotechnical report to outline any Off-Site preparation requirements for the Off-Site servicing requirements.

8.1.2 Site Slopes and Retaining Walls

8.1.2.1 Basic Requirements

8.1.2.1(1) Site slopes and retaining walls will meet the recommendations provided by Design-Builder’s geotechnical engineer.

8.1.2.1(2) Site grading is to provide positive grading throughout. No surface ponding is permitted On-Site.

8.1.2.1(3) Site grading is to prevent over-steepened slopes that cause erosion, cause pedestrian instability and will not hold growing medium and plants.

8.1.2.1(4) All slopes and site grading will conform to accessibility requirements. Ensure accessibility to Persons with Disabilities at grade changes through sloped walkways and ramps and prevent the use of stairs.

8.1.2.1(5) Retaining walls will be designed by a Geotechnical Engineer.

8.1.2.2 Performance Requirements

8.1.2.2(1) Design of On-Site grading, including retaining walls, to be in accordance with the latest MMCD, the Surrey Building Bylaw 17850, and the City of Surrey Engineering Design Manual.

8.1.2.2(2) Soft slopes will be finished with growing medium and plant material. Rip-rap is prohibited on slopes.

8.1.2.2(3) Where slopes are steeper than the recommendations of the Design-Builder's Geotechnical Engineer, site grading is to be retained using structural, architecturally-finished retaining walls; refer to Section 03 33 00 – Architectural Concrete.

8.1.2.2(4) Retaining walls greater than 1.2 m in height will be 'green' retaining walls, such as terraced planters, planted with vegetation to cover the face of the retaining walls.

8.2 Landscape

8.2.1 Basic Requirements

8.2.1.1 Work and materials will meet or exceed requirements of the latest edition of the BC Landscape Standard.

8.2.2 Landscape Elements – All Areas

8.2.2.1 Provide landscape design that contributes to a liveable, healthy and responsive community.

8.2.2.2 Provide and coordinate the design of fixed exterior site furniture, including benches provided at regular intervals for ease of use, particularly for people with differing levels of mobility, physical and mental wellness. Select products based on safety, comfort, design and materials that relate to the Facility architecture and landscape design, durability and required maintenance.

8.2.2.3 Design landscape features and provide exterior site furniture that does not encourage the use of skateboards, the setting up of tents or other forms of shelter, public urination and defecation, and mitigates the risk of assault, self-harm, suicide, and intravenous drug use.

8.2.2.4 Locate trees, shrubs, lighting and seating elements to support, and not conflict with, Wayfinding on the Site.

8.2.2.5 Maximize the extent of landscape areas on the Site and minimize the extent of impervious surfaces to increase the natural absorption rate of storm water to meet City bylaw requirements for site soft landscape percentage, including trees, shrubs, groundcovers and grass.

8.2.2.6 Landscape furnishing materials will use colour and texture that is consistent with the Facility and, wherever possible make use of local or sustainably responsible materials.

8.2.2.7 Refer to Appendix 1S [Child Care Centre Requirements] for Child Care Centre landscape requirements.

8.2.2.8 The landscape design will accommodate locations where cranes and crane delivery vehicles carrying counterweights can access the Site and be staged for the Authority's use for future Equipment replacement.

8.2.2.9 Loading areas, garbage containers and passive recycling containers will be screened as per specified in CD-20418.

8.2.2.10 Provide landscape tree islands located in accordance with the City's OCP as follows:

8.2.2.10(1) Between, and at the end of parking rows;

8.2.2.10(2) One landscaped island along the side of a parking space, at the end of every six spaces in a single row; and

8.2.2.10(3) One landscaped island, at a minimum of 3.6 m in length, located along the end of each group of 6 paired spaces (e.g. 12 spaces in two adjoining rows of 6 spaces, each front to front).

8.2.2.11 Provide bike spaces for visitors outside in accordance with Section 4.16.14.

8.2.2.12 Unify the exterior ground plane treatment using common paving materials, tree grates, lighting and other landscape furniture items.

8.2.2.13 Provide a band of decorative concrete with contrasting finish at each vehicular entry point to the Site. Provide similar concrete treatment at pedestrian areas/crossings in parking/driving areas leading to public building entrances.

8.2.3 Plant Material - All Areas

8.2.3.1 Use large shade trees that provide seasonal interest in association with ground cover plants and low shrub plantings. Use a variety of plant material to reflect seasonal change. Maximum spacing for trees will be 10 m. Total number of On-Site trees will be 200 minimum and will be planted by the Design-Builder. Refer to Section 4.14 Municipal Off-Site Services Infrastructure for any Off-Site street tree requirements.

8.2.3.2 Limit the number of tree species where appropriate to help unify the Site character, create recognizable spaces, contribute to Facility orientation and create a strong sense of place.

8.2.3.3 Fruit producing trees will not be acceptable.

8.2.3.4 Use indigenous flora where appropriate to minimize maintenance and reduce water requirements. All plant selections will be suitable for the site plant hardiness zone and specific to the micro-climate conditions of the Site temperature and precipitation anticipated for future weather data. All tree selection will be climate-resilient and comply with Urban Tree List for Metro Vancouver in a Changing Climate.

8.2.3.5 Minimum caliper size for deciduous trees will be 50 mm for small trees and 75 mm for medium/large trees. Minimum height for coniferous trees planted onsite will be 2 m.

8.2.3.6 Group plants of similar habits and environmental requirements together to minimize the use of water, chemicals and fossil fuel use for routine maintenance and to promote a healthy and climate resilient local ecosystem using sustainable measures.

8.2.3.7 Shrubbery within 2 m of walkways will not exceed 500 mm in height.

8.2.3.8 Provide landscaped surfaces to entire Site, exclusive of hard-surfaced circulation and paved areas. Grassed areas are to be sodded.

8.2.3.9 The selection of outdoor plantings in all outdoor spaces will be low maintenance.

8.2.3.10 The selection and placement of outdoor plantings and furnishings will be safe for users and not allow opportunities for hiding or seclusion. Plants that are sharp, poisonous, climbable or otherwise dangerous, or that can potentially cause allergic reactions are not permitted.

8.2.3.11 All external foliage will not interfere with exterior IPVS camera views and any required external site lines.

8.2.3.12 Street trees will be consistent species and be suitable to Site conditions. Provide tree trench planting details where required in street boulevards and in hard surface courtyard conditions.

8.2.3.13 Provide street trees and plantings to create functioning sustainable and ecological systems. Linear tree planting will be made in connected below grade soil trenches or in clustered groupings of trees with a generous soil mass to allow for interconnected root systems that will promote tree health.

8.2.3.14 Street tree planting specifications and soil volume requirements will be in accordance with City standards and specifications.

8.2.3.15 Plantings will not have high-maintenance root systems or produce messy leaves that clog drains or make areas hard to clean.

8.2.3.16 Plant selection will be favourable to bee pollination where appropriate.

8.2.3.17 Use mulching, high efficiency irrigation, temporary watering for plant establishment, recycled or non-potable water strategies.

8.2.3.18 Planting will accommodate Utility and power lines on Site. Tree planting will be in accordance with applicable City bylaws, Appendix 1E [Civil Infrastructure Plans] and the Appendix 1G [Campus Perimeter Pathway System Technical Specifications].

8.2.3.19 Planting along environmental setbacks will be in accordance with the requirements of the AHJ and Qualified Environmental Professional.

8.2.3.20 Provide a Firesmart 1.5 m setback from the Facility with no combustible landscape materials allowed. Provide a Firesmart 10.0 m setback from the Facility; with no high-combustible landscape plantings allowed. These high-combustible plantings include all coniferous trees, coniferous shrubs and tall grasses.

8.2.3.21 Screen planting at least 3 metres wide will be provided along all lot lines abutting parking areas and will include trees.

8.2.3.22 Provide 10 m3 growing medium per tree, to a depth of 0.6 - 0.75 m. Any shortfall of topsoil will be made up with structural soil calculated at a 4:1 ratio.

8.2.3.23 Locate trees no closer than 2.5 m from a building face, or foundation. Use only small growing tree species between 2.5 m and 3.5 m from the building face. Medium growing trees will be at least 3.5 m from the building face and large growing trees at least 4 m.

8.2.3.24 Locate trees at least 1 m away from any hardscape including retaining walls, driveways, patios, and walkways.

8.2.3.25 Substantial shrub planting will accompany most tree planting areas, especially in screening parking areas from the street and in buffer screening from adjacent industrial lands. All parking areas to be screened from the road with a minimum zoning width of shrubs easily maintained at a height of 1.0 m.

8.2.3.26 Manicured grass areas will comprise no more than 25-50% of all soft landscaping area.

8.2.3.27 Provide trees in parking lot at 1 tree per 4 parking stall (1:4) ratio through planting in parking islands and diamond planters between parking stalls. Parking lot tree species will consist of the following: Fraxinus ornus, Ginkgo Biloba, Gleditsia triacanthos, Gymnocladus dioicus (Male only), Juniperus chinensis, Pinus nigra, Pinus banksiana, Quercus coccinea, Pistacia chinensis (Male only).

8.2.3.28 Pedestrian walkways connecting parking lot and the main building will to be covered by continuous row of shade trees.

8.2.4 Exterior Improvements (Division 32)

8.2.4.1 Section 32 14 00 – Unit Paving

8.2.4.1(1) Part 1 General

8.2.4.1(1)(a) Obtain each type of unit paver from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

8.2.4.1(1)(b) Provide solid interlocking paving units complying with ASTM C 936/C 936M and resistant to freezing and thawing when tested according to ASTM C67(or CSA A82:14), made from normal- weight aggregates.

8.2.4.1(2) Part 2 Materials

8.2.4.1(2)(a) Thickness: Concrete paver for pedestrian area will be 60mm minimum. Concrete pavers in vehicular traffic areas will not be permitted.

8.2.4.1(2)(b) Colour: min 50% of paver will have an SRI value of 29 or higher to reduce urban heat island effect.

8.2.4.1(2)(c) Acceptable Products: VS5 and Holland collection by Expocrete or equal as determined in consultation with the Authority.

8.2.4.1(3) Part 3 Execution

8.2.4.1(3)(a) Not applicable

8.2.4.2 Section 32 33 00 – Site Furnishings

8.2.4.2(1) Part 1 General

8.2.4.2(1)(a) Provide and coordinate design for exterior site furniture, at regular intervals for ease of use.

8.2.4.2(1)(b) Select products for their suitability and durability in the climatic conditions found at the Facility;

8.2.4.2(1)(c) Select products with Vandal Resistant and anti-theft design features;

8.2.4.2(1)(d) Utilize a variety of scales, locations and orientations of seating areas and site furnishings to cater to varied outdoor activities and varied experiences of the Staff and visitors; and

8.2.4.2(1)(e) Encourage temporary use while preventing sleeping and the setting up of tents or shelters.

8.2.4.2(2) Part 2 Materials

8.2.4.2(2)(a) Section 32 33 13 – Site Bicycle Racks

8.2.4.2.2.(a).1 Exterior bicycle racks at all public spaces and entrances to the Facility will:

(a).1.1 Be approved by the CSA, (or similar approving agency) and/or approved for use on City streets (subject to modification to satisfy space width requirements);

(a).1.2 Hold the bicycle securely by means of the frame. The frame must be able to be supported so that the bicycle cannot be pushed or fall to one side in a manner that will damage the wheels;

(a).1.3 The bicycle frame and one wheel can be locked to the rack with a high-security, U-shaped shackle lock if both wheels are left on the bicycle;

(a).1.4 Be securely anchored with theft resistant hardware;

(a).1.5 The bicycle spaces will be provided in racks which provide a minimum width of 0.6 metre for each bicycle; and

(a).1.6 Be accessible by means of an aisle with a minimum width of 1.2 metres which is separate from pedestrian access. There will be unrestricted access behind the space of a minimum length of 0.5 metre.

8.2.4.2.2.(a).2 Acceptable Products: Ring by Landscape Forms or equal as determined in consultation with the Authority.

8.2.4.2(2)(b) Section 32 33 23 – Site Trash and Litter Receptacles

8.2.4.2.2.(b).1 Exterior waste receptacles at all gathering spaces and entrances to the Facility will:

(b).1.1 Have half-open or closed top, fixed to the ground surface and located at easily accessible locations;

(b).1.2 Be approximately 100 cm in height, and the opening of the receptacle will be at least 25 cm wide and at most 90 cm above the ground to facilitate use by the disabled;

(b).1.3 Be between 30-40 gal in size; and

(b).1.4 Be wildlife-proof.

8.2.4.2.2.(b).2 Acceptable Products: Chase Park Litter side open by Landscape Forms or equal as determined in consultation with the Authority.

8.2.4.2(2)(c) Section 32 33 43.13 – Site Seating

8.2.4.2.2.(c).1 Seating in the Plaza, Secure Outdoor Space and along the Wellness Walkway will:

(c).1.1 Be designed to allow a wheelchair to sit alongside fixed seating or, where tables are provided, to allow a wheelchair to pull up to each table;

(c).1.2 Have 25% of seating provided with backrests, armrests and adequate heel space below the bench;

(c).1.3 Bench height will be not less than 450 mm and not more than 500 mm from the ground. Armrests will be mounted about 200 mm above the height of the seat pan;

(c).1.4 To accommodate a wheelchair, there will be a level and firm ground surface at least 850 mm x 1200 mm adjacent to the bench;

(c).1.5 Have a middle armrest on benches in public areas to prevent people sleeping on bench;

(c).1.6 Shed rainwater or be under shelter, either built or natural; and

(c).1.7 Be a durable material such as high-density polyethylene, wood will not be acceptable.

8.2.4.2.2.(c).2 Acceptable Products: 400 Backed/ Backless Benches with Centre Arm by Maglin with Wood Grain Texture High Density Polyethylene or equal as determined in consultation with the Authority.

8.2.4.2.2.(c).3 Seating areas with benches will be located within the landscape areas. Seating nodes along James Hill Drive to be coordinated with City. Seating nodes along Wellness Walkway will be no more than 40 m apart from each other.

8.2.4.2(3) Part 3 Execution

8.2.4.2(3)(a) Not applicable

8.2.4.3 Section 32 80 00 – Irrigation

8.2.4.3(1) Part 1 General

8.2.4.3(1)(a) References

8.2.4.3.1.(a).1 Conform to the latest editions of the following:

(a).1.1 ASTM A102-84 - Specification for Pipe, Steel Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.

(a).1.2 ASTM D1785-86 - Specification for Poly-Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR- Series).

(a).1.3 ASTM D2241-86a - Specification for Poly-Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR-Series).

(a).1.4 ASTM D2564-84 - Specification for Solvent Cements for Poly-Vinyl Chloride (PVC) Plastic Pipe and Fittings.

(a).1.5 Standards for Landscape Irrigation, Irrigation Association of British Columbia.

(a).1.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

(a).1.7 Material Safety Data Sheets (MSDS).

(a).1.8 Irrigation Best Management Practices, Water Management Committee of the Irrigation Association, December 2010.

8.2.4.3(1)(b) Quality Assurance

8.2.4.3.1.(b).1 The irrigation design will be supervised and approved by a BCSLA registered landscape architect.

8.2.4.3.1.(b).2 The irrigation system design will be prepared by a Certified Irrigation Designer and Certified Landscape Irrigation Auditor (CLIA).

8.2.4.3.1.(b).3 Installer qualifications: An experienced installer with certification (CID, CIC) and with a company specializing in landscape irrigation; and fully knowledgeable in standard plumbing procedures.

8.2.4.3.1.(b).4 Obtain any signoffs that may be required by local water district board or other AHJ.

8.2.4.3.1.(b).5 Determine static pressure in municipal water service lines at both high and low levels.

8.2.4.3.1.(b).6 Calculate meter capacity and available working pressure.

8.2.4.3.1.(b).7 Evaluate maintenance and potential vandalism considerations.

8.2.4.3(1)(c) Design and Performance Criteria

8.2.4.3.1.(c).1 Design system to provide efficient, low water-use, automatic, timed irrigation for all landscaped areas.

8.2.4.3.1.(c).2 Piping will be sized to keep water flow at less than 5 feet per second at the maximum flow rate.

8.2.4.3.1.(c).3 Calculate and account for pressure loss due to elevation.

8.2.4.3.1.(c).4 Select components to keep the sprinkler precipitation rate below the infiltration rate of the soil and use repeat cycles to allow the water to soak into the root zone.

8.2.4.3.1.(c).5 Controller location to be coordinated with the Authority.

8.2.4.3.1.(c).6 Grass areas will have a high-efficiency spray irrigation system that includes the following features: pressure-regulating sprinklers, check valve in sprinklers at low areas, matched precipitation rate nozzles, separate zones based on microclimate, wind resistant nozzles.

8.2.4.3.1.(c).7 Raised planters and pots, which will be located only in the Secure Outdoor Spaces, will have a drip system, as follows:

(c).7.1 Drip line will have pressure compensating emitters; and

(c).7.2 Each drip zone will have an inline filter, inline pressure-regulating valve and air-relief valve.

8.2.4.3.1.(c).8 The controller for the irrigation systems will be an electronic, programmable, multi-zone controller with a rain sensor or weather station meeting the EPA’s WaterSense Criteria.

8.2.4.3.1.(c).9 Green roofs will have a high-efficiency irrigation system that includes the following features: pressure regulating sprinklers, check valve in sprinklers at low areas, matched precipitation rate nozzles, separate zones based on microclimate, and wind resistant spray nozzles.

8.2.4.3.1.(c).10 Proprietary drip or capillary irrigation is acceptable where manufacturer-designed build-up green roof systems are employed.

8.2.4.3(1)(d) Project Conditions

8.2.4.3.1.(d).1 Design the irrigation system to minimize installation and maintenance difficulties. The selection and placement of sprinkler and drip/micro irrigation components will be guided by the expected size of larger specimen plants through a minimum three-year establishment period for shrubs and ten years for trees.

8.2.4.3.1.(d).2 Separate drip/micro irrigation from overhead irrigation zones; separate zones allows the irrigator to adjust water requirements given differing Site conditions.

8.2.4.3.1.(d).3 Design the layout of heads and other emission devices for zero overspray across or onto a street, public driveway or sidewalk, parking area, building, fence, or adjoining property.

8.2.4.3.1.(d).4 Protect equipment, sidewalks, landscape reference points, monuments, markers and other completed Work.

8.2.4.3(2) Part 2 Materials

8.2.4.3(2)(a) Pipe and Fittings

8.2.4.3.2.(a).1 HDPE Pipe: The material will comply with ASTM D1248 as a Type II Class C, Category 5, Grade P34 material and with ASTM D3350-14 as a 445474C cell material for PE4710 and 345464C cell material for PE3608. The material will have a design factor of 0.63 for water service at 23°C.

(a).1.1 On main lines, the pipe will be PE4710 PR6160 DR13.5 or PE3608 PR160 DR11.

(a).1.2 Lateral pipe 50 mm or larger will use PE4710 DR17.

(a).1.3 25 mm Lateral pipe may use CSA Series 100 MDPE.

8.2.4.3.2.(a).2 HDPE Fittings:

(a).2.1 Fittings for HDPE pipe will be butt fusion type or electrofusion type. Fittings will be molded or fabricated by the pipe manufacturer. Heat fusion joining of pipes and fittings will follow ASTM standards, AWWA Manual M55 PE Pipe – Design and Installation, and

the current Plastics Pipe Institute (PPI) Handbook of Polyethylene Pipe.

8.2.4.3.2.(a).3 Plastic Pipe: Pipe will be CSA B137.3-93 SDR 26 polyvinyl chloride (PVC). It will be extruded, virgin, high impact pipe conforming to Cell Class 12454-B and continually and permanently marked showing manufacturer's name or trademark, type of material, pipe size and pressure rating.

8.2.4.3.2.(a).4 Plastic Pipe Fittings:

(a).4.1 GSR Schedule 40 PVC conforming to ASTM D-2466-97 (and F438-97 for CPVC) standards and be of the same material as the pipe. Fittings will be designed for solvent welding to PVC pipe except where valves, risers, etc. require threaded joints.

(a).4.2 All threaded connections will be joined with minimum three (3) wraps Teflon Tape: no substitutions accepted.

(a).4.3 Threaded nipples will be Schedule 80 PVC and be manufactured from the same material specified for the pipe.

(a).4.4 Threaded connections of PVC to metal will have female threads on the PVC and male threads on the metal (Schedule 80 FMI adapter).

8.2.4.3.2.(a).5 Primers and Pipe Solvents: CSA approved type as recommended by pipe manufacturer for the temperature and conditions under which the work is being performed. Deliver in sealed containers clearly marked with name of manufacturer and lot number.

8.2.4.3.2.(a).6 Sleeves: Size a minimum of two (2) nominal pipe sizes larger than any irrigation pipe to be carried.

(a).6.1 Will be Schedule 40 PVC or PVC C900 under all paved surfaces, through walls, and through or underneath footing walls.

(a).6.2 Electrical conduit to be 50 mm diameter.

8.2.4.3(2)(b) Spray Heads

8.2.4.3.2.(b).1 New pristine quality heads manufactured by Rain Bird, Hunter or Toro.

8.2.4.3.2.(b).2 The body and cap of the sprinkler will be injection moulded from ABS, a non-corrosive,

impact-resistant, UV-resistant, heavy-duty plastic material. The sprinkler will have a plastic filter screen sized to prevent entry of foreign material to the nozzle.

8.2.4.3.2.(b).3 Spray nozzles will be the fixed spray type designed to provide matched precipitation rates from 1.5 m to 4.5 m radius.

8.2.4.3.2.(b).4 Swing joints will be three angle using galvanized steel or PVC elbows and nipples and brass saddles, sized in accordance with sprinkler head requirements.

8.2.4.3(2)(c) Drip Line

8.2.4.3.2.(c).1 Low volume 17-19 mm dia. dripline with pressure compensating emitters c/w check valve, welded to the inside of the tubing. Flexible pipe to have minimum inside diameter of 13.7 mm and minimum wall thickness of 1.1 mm with an operating pressure range of 15-60 psi.

8.2.4.3(2)(d) Automatic Controller

8.2.4.3.2.(d).1 Automatic controllers, CSA certified as Class II power limiting circuit, compatible with system design, capable of handling required zones.

8.2.4.3.2.(d).2 Compatible rain sensor to be connected to controller.

8.2.4.3(2)(e) Gate Valves

8.2.4.3.2.(e).1 Gate valves for drainage and flow control will be brass with screwed connections, low rising system, removable handle and a resilient rubber ring seal with a minimum pressure rating of 10 kg/cm2 (3.4 psi). Gate valves will be installed in an upright position for accessibility.

8.2.4.3(2)(f) Electric Control Valves

8.2.4.3.2.(f).1 Automatic Electric Solenoid Valve - 24 volt. Body of valve to be high impact weather resistant plastic, will be capable of operating manually without electricity, and will open and close slowly without hammer or chatter.

8.2.4.3.2.(f).2 Zone control valves will be electrically operated and self-cleaning, compatible with the designed system. Hand-operated valves will be installed on the upstream side of every electric valve.

8.2.4.3.2.(f).3 For flows below 5 gpm install 200 mesh filter upstream on valve.

8.2.4.3(2)(g) Wires

8.2.4.3.2.(g).1 Wiring to and from controller and valves will conform to applicable regulatory requirements.

8.2.4.3.2.(g).2 Wiring will follow irrigation lines. When this is not possible, wire will be put in conduit at a depth of not less than 500 mm.

8.2.4.3.2.(g).3 Splices will be made waterproof with the use of an acceptable outdoor waterproof wire connector. Field splices will be identified, looped and located in a 250 mm diameter lockable irrigation box.

8.2.4.3.2.(g).4 110 volt wiring will be colour coordinated to be different from 24 volt wire where used. Install all 110 volt wire in accordance with Canadian Electrical Code.

8.2.4.3.2.(g).5 House all valves in plastic valve box with lockable cover. Size valve box to allow minimum 50 mm working room around valve. Provide valve box extension as required.

8.2.4.3(2)(h) Irrigation Boxes

8.2.4.3.2.(h).1 Valve Boxes: Will be green plastic irrigation boxes complete with captive lock bolt cove complete with stainless steel bolts, sized to suit valves and other components with adequate room for operating and maintenance access.

8.2.4.3.2.(h).2 Gravel bed in boxes will consist of 300 mm of clear, washed 19 mm gravel with area marginally larger than box opening.

8.2.4.3.2.(h).3 No box will exert pressure on any piping below box.

8.2.4.3(2)(i) Backfill

8.2.4.3.2.(i).1 Backfill materials for pipe trenches within 150 mm of pipe will be clean approved sand fill, or gravel less than 12 mm diameter in size, free of organic matter, stones, and sharp objects capable of damaging pipe.

8.2.4.3(3) Part 3 Execution

8.2.4.3(3)(a) Not applicable

8.2.4.4 Section 07 72 73 – Vegetated Roof Systems

8.2.4.4(1) Part 1 General

8.2.4.4(1)(a) Basic Requirements

8.2.4.4.1.(a).1 Intensive Green Roofs: Provide a build-up system such as the Roof Garden system by ZinCo, or alternative as approved by the Authority. The system will accommodate a variety of plant types from lawns and perennials to shrubs and small trees.

8.2.4.4.1.(a).2 Extensive Green Roofs: Provide proprietary pre-grown tray system such as LiveRoof Maxx 8 system or alternative as approved by the Authority.

8.2.4.4.1.(a).3 Adequate measures will be provided to permit the irrigation necessary to initiate and sustain the vegetation during the Design Life of the green roof.

8.2.4.4(2) Materials

8.2.4.4(2)(a) Green roof assemblies will, as a minimum, consist of a root repellent membrane, a drainage system, a filtering layer, minimum 200 mm growing medium and plants, and will be installed on a waterproof membrane with moisture sensor grid underneath. Erosion control soil bags are not an acceptable green roof system design.

8.2.4.4(2)(b) Extensive green roof areas will have low maintenance requirements and be appropriate for the micro-climate of each roof area.

8.2.4.4(2)(c) Service access routes for roof maintenance will be located with Convenient Access to the Patient Service Elevators and will not pass through Front-of-House areas or where Patients are receiving care or treatment. Ladder and hatch access are not permitted.

8.2.4.4(2)(d) Provide trays for planting area so they can be removed in sections.

8.2.4.4(2)(e) Parapet Height and/or Overflow Scupper Locations

8.2.4.4.2.(e).1 Parapets heights and overflow scuppers will be specified in the Design, as required, to limit retained rainwater loads to within structural limits in the event of obstructed internal drains. Refer to Section 5.7.2.1(5).

8.2.4.4(2)(f) Waterproofing Protection

8.2.4.4.2.(f).1 Provide a root barrier and moisture sensor grid sub barrier monitored by the BMS to detect leaks and the location in all vegetated roofing systems.

8.2.4.4(2)(g) Drainage

8.2.4.4.2.(g).1 The design hydraulic load will be evaluated assuming that the green roof system is fully saturated prior to the maximum fifteen-minute rainfall.

8.2.4.4.2.(g).2 Positive slope to drain will be provided at the level of the waterproofing membrane.

8.2.4.4.2.(g).3 The system will permit effective drainage beneath the growth media.

8.2.4.4.2.(g).4 Vegetation-free zones will be provided around all drains.

8.2.4.4(2)(h) Water Retention

8.2.4.4.2.(h).1 Water retention mats or equivalent materials will be provided as required to promote vegetation growth.

8.2.4.4.2.(h).2 The drainage layer will be appropriate for storm water retention and will be selected to comply with ASTM E2398-05 Standard Test Method for Water Capture and Media Retention of Geo-Composite Drain Layers for Green Roof Systems.

8.2.4.4(2)(i) Plant Selection

8.2.4.4.2.(i).1 Plantings will be low maintenance, such as sedum species, and adaptive to the specific micro-climate of each roof area.

8.2.4.4.2.(i).2 Vegetation on a green roof will not include noxious weeds as defined in the latest revision of the British Columbia Noxious Weed Control Act.

8.2.4.4.2.(i).3 The plant selection and design on extensive green roofs will be such that plants will cover 100% of the vegetated roof area at the time of installation.

8.2.4.4.2.(i).4 All tree planting on intensive green roof will be low growing and wind resistant.

8.2.4.4.2.(i).5 Seasonal plantings that go dormant need to be avoided. Provide plantings that are attractive year-round.

8.2.4.4(2)(j) Wind Protection

8.2.4.4.2.(j).1 All green roof landscape materials and site furnishings will be designed and secured to prevent any disturbance or movement due to the impacts of wind.

8.2.4.4(3) Part 3 Execution

8.2.4.4(3)(a) Not applicable

8.2.5 Maintenance

8.2.5.1 Prepare a maintenance plan and schedule outlining the levels of maintenance required to establish the proposed landscapes. Refer to Section 2.5.11 for Submittal requirements.

8.2.5.2 Deer protection will be provided to all tree and shrub planting on the Site for two (2) years minimum or until plants establish.