This page and the next 6 pages redacted in their entirety

PART 1 - GENERAL

1.1 SUMMARY

A. Design concrete mix, supply necessary materials and install Type 1 concrete and Type 2 architectural concrete as indicated and specified on the Issued For Construction (IFC) drawings prepared by Project Co.

B. This Section is intended to augment cast-in-place concrete section (to be developed by Project Co).

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. AAMA 800, Specification 810.1, Expanded Cellular Glazing Tape.
2. ACI 117, Tolerances for Concrete Construction.
3. ACI 301, Specifications for Structural Concrete.
4. ACI 303.1, Specification for Cast-in-Place Architectural Concrete.
5. ACI 308.1, Guide to Curing Concrete.
6. ASTM C94, Ready Mixed Concrete.
7. ASTM C109, Compressive Strength of Hydraulic Cement Mortars.
8. ASTM C309, Liquid Membrane-Forming Compounds for Curing Concrete.
9. ASTM C827, Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
10. ASTM C920, Elastomeric Joint Sealants.
11. ASTM C989, Slag Cement for Use in Concrete & Mortars.
12. ASTM A1064, Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
13. CAN/CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
14. CAN/CSA A3000, Cementitious Materials Compendium
15. CAN/CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement
16. CAN/CSA S269.1, Falsework and Formwork.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
    a. Indicate amounts of mixing water to be withheld for later addition at Project Site.
2. Proposed form release agent.
3. Proposed surface retarder.
4. Proposed special admixtures to address specific issues.
5. Provide product data for equipment and provide process and methodology to be used for modification of concrete surfaces, as-cast (example: sand blasted concrete, etc.).

B. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts

and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.

C. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints including construction joints.

D. Survey: provide plan survey of Type 2/Section 03 33 00/1.4 C.2 Architectural Concrete horizontal surface at Propulsion Power Station (PPS) AC Switchgear only, as indicated on the IFC drawings, at 0.500m grid to confirm compliance with the requirements of this Section for floor finish tolerances.

1.4 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct pre-installation conference at Project Site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place architectural concrete to attend, including the following:

   a. Subcontractor's superintendent

   b. Independent testing agency responsible for concrete design mixtures

   c. Ready-mix concrete manufacturer

   d. Cast-in-place architectural concrete Subcontractor

2. Review concrete finishes and finishing, cold and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural concrete.

B. Tolerances for Type 1 concrete:

1. Horizontal concrete surfaces for all floor slabs shall comply with CAN/CSA A23.1/A23.2/Table 21/Class B.

2. Vertical surfaces shall comply with CAN/CSA A23.1/A23.2.

C. Tolerances for Type 2 - Architectural Concrete: Concrete surfaces shall meet the following tolerances:

1. Horizontal concrete surfaces for all floor slabs shall comply with CAN/CSA A23.1/A23.2/Table 21/Class B.

2. Horizontal concrete surface for PPS at AC Switchgear will require a survey to ensure compliance with Table 21/Class B requirements. See Section 03 33 00/1.3 D. for survey requirements.

3. Vertical surfaces shall comply with CAN/CSA A23.1/A23.2.

4. Curved or complex shaped surfaces shall not deviate from the specified shape as dimensioned by more than 5mm, as measured by a survey.

5. Where the Discrete Surface of the concrete element is 3 metres or less in one dimension or less than 9 square metres in area, tolerances shall be one-half of the above.

6. Conformance to tolerance limits shall be checked at any time after the curing period.

1.5 DEFINITIONS

A. General: The following definitions have been used in this Section:

B. As-cast surface – untreated surface in which the mortar is the principle visible constituent, and the texture is that which is imparted by the formwork surface.

1. Type 1 Concrete: not exposed to public view. Vertical surfaces shall be “Rough-Form Finish” in compliance with CAN/CSA A23.1/A23.2

2. Type 2 Architectural Concrete: Concrete exposed to public view in both interior and exterior areas of passenger Fixed Facilities and at the exterior surfaces of the tunnel portals. Vertical surfaces shall be “Smooth-Form Finish” in compliance with CAN/CSA A23.1/A23.2

C. Treated surface – surface which is treated in place by removal of the surface mortar, thus wholly or partially obscuring the form texture.

D. Non-structural surface defect – an imperfection, fin, projection, hole, honeycomb area, or discontinuity visible on the surface of a concrete element impairing the appearance but not the structural integrity of the concrete element.

1. Minor – having a surface area of less than 700mm^2, a maximum surface dimension of less than 50mm, and a maximum depth of 35mm from the adjacent surface.

2. Major – having a surface area of more than 700mm^2, a maximum surface dimension of more than 50mm, or a depth of more than 35mm from the adjacent surface.

E. Structural defect – a surface or internal defect impairing the structural capacity or durability of the concrete element.

F. Discrete surface – a concrete surface at least 1.0m^2 in area, bounded on all sides by corners each with an interior angle of less than 165 degrees. Where a discrete surface has an area of less than 1.0m^2 it shall be combined with one or more adjacent discrete surfaces to form a discrete surface for the purpose of this Section. Where a discrete surface has an area of more than 50m^2, the requirements of this Section shall apply to any portion of the surface not more than 50m^2 in area and not longer than 10m in any one dimension between corners.

G. Architectural Concrete – those concrete surfaces identified on IFC drawings that is required to meet the specifications set out in this Section 03 33 00 including any relevant technical requirements set out in Article 10 [Architecture] of Part 2 of Schedule 4 of the Project Agreement.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Unless noted otherwise on the IFC Drawings, concrete shall be designed to satisfy the requirements of Class C-1 as defined in CAN/CSA A23.1/A23.2

B. Station ancillary space floors requiring a steel trowel finish, concrete shall be designed to satisfy the requirements of Class N-CF as defined in CAN/CSA A23.1/23.2.

2.2 FORM-FACING MATERIALS

A. General:

1. Type 1 Concrete – Rough-Form Finish in compliance with CAN/CSA A23.1/A23.2

2. Type 2 Concrete – Smooth-Form Finish in compliance with CAN/CSA A23.1/A23.2

3. In addition to the requirements of this Section, comply with cast-in-place concrete section (to be developed and provided by Project Co) for formwork and other form-facing material requirements.

B. Form-Facing Panels for As-Cast Finishes: As appropriate, utilize either:

1. Smooth-faced steel, glass-fibre-reinforced plastic, or other approved non-absorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

2. Smooth-faced exterior-grade plywood panels, non-absorptive, that will provide continuous, true, and smooth architectural concrete surfaces complying with CAN/CSA A23.1/A23.2 and CAN/CSA S269.1.

    a. High-density overlay, Class 1, or better.

    b. Medium-density overlay, Class 1, or better, mill-applied release agent and edge sealed.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fibre-reinforced plastic, paper, or fibre tubes that will provide surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fibre-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Form Liners: Units of face design, texture, arrangement, and configuration to match design reference sample. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.

F. Rustication Strips: Metal, rigid plastic, or dressed wood with sides bevelled and back kerfed; non-staining; in longest practicable lengths.

G. Chamfer Strips if indicated: Metal, rigid plastic, elastomeric rubber, or dressed wood, 19 by 19 mm (3/4 by 3/4 inch), minimum; non-staining; in longest practicable lengths.

H. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 6 mm (1/4 inch) thick.

I. Form Joint Sealant: Elastomeric sealant complying with ASTM C920, Type M or S, Grade NS, that adheres to form joint substrates.

J. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.

K. Form-Release Agent: Commercially formulated colourless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.

    1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

L. Surface Retarder: Chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified on the IFC drawings.

M. Form Ties: Factory-fabricated, internally disconnecting ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

    1. Furnish ties with tapered tie cone spreaders that, when removed, will leave holes 25 mm (1 inch) diameter on concrete surface.

    2. Furnish internally disconnecting ties that will leave no metal closer than 38 mm (1-1/2 inches) from the architectural concrete surface.

    3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 MATERIALS

A. General:

1. Materials used to repair or patch surface defects: Use similar constituents of approximately the same proportions as used for concrete being patched, except adjust aggregate size and sand content if required to provide similar finish to adjacent surfaces as determined by trial repair or patch.
2. Substitute white Portland cement for part of grey Portland cement, for patching of Type 2 As-Cast or Treated Surfaces, to produce colour to matching colour of surrounding concrete, as determined by a trial repair or patch.
3. Concrete Materials:
    a. Cement: Type GU, conforming to CAN/CSA A3000. Cement shall originate from the same mill.
    b. Fine and Coarse Aggregate: Conforming to CAN/CSA A23.1/A23.2, normal density, natural clean stone. Free from alkali aggregate reaction.
    c. Fly ash: CAN/CSA A3000, Class C or F.
    d. Ground Granulated Blast Furnace Slag: ASTM C989, Grade 100 or 120.
    e. Water: Potable and complying to ASTM C94.
6. Admixtures:
    a. Air-entraining admixtures: conform to CAN/CSA A23.1/A23.2, Section 6.
    b. Use of accelerating or set retarding admixtures during cold or hot weather placing is subject to Professional Engineer approval. Do not use admixtures containing calcium chloride or thiocyanate. Chemical admixtures in Exposure Class C-1 concrete shall be free of chloride ions.
    c. Verify all admixture products are fully compatible with each other and will not adversely affect the approved finish quality of the concrete or approved specified finishes applied to the concrete where applicable.
7. Reinforcing:
    a. Reinforcing steel for applications where welded splices and connections are not required, shall be Grade 400W, conforming to CAN/CSA G30.18-09, Stirrups and ties of Grade 400W material shall meet the bending and elongation requirements of Grade 300W steel.
    b. Reinforcing steel for applications where welded splices and connections are required, shall be Grade 400W (weldable), conforming to CAN/CSA G30.18-09.
    c. Reinforcing steel for applications where welded wire fabric are required, shall be Grade 400 bars conforming to ASTM A1064M.
    d. Reinforcing steel for applications where fabricated bar mats are required, shall be Grade 400 bars conforming to CSA G30.5-M for smooth bars and to CSA G30.15-M for deformed bar mats.
    e. Plain steel wire reinforcement, if required, shall conform to CSA G30.3-M.

B. Patching Mortar: Mix in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached stiffest consistency that will permit placing.

1. Repair Mortar: Specially formulated repair mortar mix matching existing mortar, non-shrink with a twenty-eight (28) day strength matching the base concrete.

C. Pre-Approved Latex Type Admixture: May be added to bonding grout or patching material. Quantity and use of admixture shall be in accordance with manufacturer's instructions.

D. Concrete Bonding Adhesive: Epoxy adhesive subject to a compliance certificate. Handling, mixing, and application of adhesive shall be in accordance with manufacturer's specifications.

E. Bonding Grout: Prepare using a mix of approximately one part cement to one part fine sand passing a No. 30 mesh sieve, mixed to consistency of thick cream then brushed into surfaces.

F. Grout: Non-shrink, non-metallic, and shall develop a minimum compressive strength of 40 MPa in 3 Days. Testing:

1. Compressive Strength of Grout: In accordance with ASTM C109, Compressive Strength of Hydraulic Cement Mortars.

2. Non-shrink Properties of Grout: In accordance with ASTM C827, Early Volume Change of Cementitious Mixtures.

G. Water: Quantity of mixing water shall be no more than necessary to facilitate handling and placing.

2.4 ACCESSORIES

A. Other materials proposed for use shall be submitted to Project Co for approval and considered based on successful performance in prototype or similar construction.

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 19 by 25 mm (3/4 by 1 inch).

1. Colloid Environmental Technologies Company; Volclay Waterstop-RX-101T.

2. Greenstreak; Swellstop.

3. Henry Company, Sealants Division; Hydro-Flex.

4. TCMiraDRI; Mirastop.

5. Or approved alternative

A. Concrete Curing and Sealing Compound: To ASTM C309.

2.5 FINISHES

A. Hardener Sealer – ACER Room:

1. ACER Room slabs: Non-metallic material composed of a premixed blend of Portland cement and synthetic oxide with a Moh's hardness of not less than 8 and a minimum compressive strength of 55 MPa at 28 days.

2. Acceptable Product: Target Synthetic Floor Hardener or approved alternative.

B. Integral Concrete Hardener – Propulsion Power Substations (PPS):

1. PPS slabs: Hard-Cem™ Integral Concrete Hardener, by Cementec Industries Inc.

C. Concrete Sealer for All Slabs other than 2.5 A and B above: to ASTM C309

1. Acrylic based, clear compound Florseal WB 25, by Sika, or approved alternative.

D. Graffiti Resistant/Water Repellent Coatings: provide where indicated and as specified.

PART 3 - EXECUTION

3.1 FINISHES - GENERAL

A. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.

1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

B. Maintain uniformity of special finishes over construction joints, unless otherwise indicated.

3.2 FORMED FINISHES

A. Rough-Formed Finish: Type 1 Concrete: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding specified limits on formed-surface irregularities.

B. Smooth-Formed Finish: Type 2 Concrete: As-cast architectural concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects.

C. Painted Surfaces: Type 1 Concrete as indicated.

3.3 FINISHING FLOORS AND SLABS

A. See Section 03 33 00/1.4 B.1 for Type 1 - Concrete floors

B. See Section 03 33 00/1.4 C.1 and C.2 for Type 2 - Architectural Concrete floors

C. Finishing shall conform to CSA-A23.1/A23.2 Clause 6.

D. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, and as indicated.

E. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fibre-bristle broom perpendicular to main traffic route.

G. Floor Hardener and Sealer:

1. Apply in strict accordance with manufacturer’s instructions.

3.4 PROTECTION, CLEANING AND SEALING

A. Protection:

1. Protect architectural concrete from damage by the elements and defacement during construction operation.
2. Protect corners and surfaces subject to damage with boards or hoardings.
3. Keep exposed concrete free from laitance caused by spillage, leaking forms or other contaminants. Do not permit laitance to penetrate, stain or harden on surfaces which have been sandblasted.
4. Protect exposed reinforcing steel in architectural concrete to prevent staining of surfaces of concrete due to rust and corrosion. If rust or corrosion does occur, remove it immediately to avoid permanent staining.
5. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.
6. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

B. Cleaning:

1. Immediately prior to application of sealer, thoroughly clean surfaces and maintain free of foreign materials such as sand, chips and dust from sandblasting and bush hammering operations. Rinse surfaces which are cleaned with a sealant manufacturer recommended cleaning solution and allow to dry before sealer application.

C. Sealing:

1. Apply clear sealer to concrete surfaces where indicated in accordance with manufacturer's instructions. Use the same method of application throughout the entire job.
2. Provide graffiti resistant coating where indicated and as specified.
3. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
4. Wash and rinse surfaces according to concrete finish applicator's written recommendations. Protect other work from staining or damage due to cleaning operations.
5. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies finishing requirements for cast-in-place concrete surfaces for all concrete elements excluding Stations and Municipal Infrastructure, including:

1. As-cast and treated formed horizontal and vertical surfaces,
2. As-cast and treated unformed horizontal surfaces,
3. Sloped and irregular surfaces,
4. Repair of as-cast and treated surfaces
5. Patching of tie holes and post-tensioning block outs, grout inlets and vent holes.

B. For Stations concrete finishing requirements refer to Section 03 33 00 Architectural Concrete.

C. For Municipal Infrastructure concrete finishing requirements refer to the respective municipalities' standards.

D. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:
1. CAN/CSA A23.1/A23.2: Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practises for Concrete.

1.3 SUBMITTALS

A. In accordance with Part 3 of this Section 03 35 00, a Concrete Repair Procedure and Concrete Patching Procedure will be submitted by the Subcontractor responsible for concrete placement and finishing to Project Co for review and acceptance.

1.4 QUALITY MANAGEMENT

A. Procedures, personnel, products, methods, and submittals noted in this section shall be considered as minimum requirements. Additional submittals, checklists, procedures and methods may be required by Project Co.

B. Project Co shall identify with the Subcontractor a section or area of concrete finishing works that shall be used as a sample against which all other completed areas with the same specified concrete finishing will be referenced for uniformity in finishing. Project Co may require that the Subcontractor provide a temporary mock-up panel as sample that does not form part of the permanent works or may allow the sample area to be part of the permanent works. Upon completion of this sample reference area by the Subcontractor, the Designer shall inspect, and either approve or reject the concrete finishing works. If rejected, the Subcontractor shall repair until the concrete finishing meets the required specifications and approval of the Designer. The Subcontractor should not be allowed to proceed with other sections of concrete work specified on the IFC drawings with the same concrete finishing until the sample reference area has been approved by the Designer. Project Co shall ensure that the Subcontractor extends the request for inspection of the sample reference area by the Designer to include the Province and TransLink to allow the Province and TransLink to provide any objections or comments on the finished work. The mock-up panel if temporary shall only be removed once all the relevant concrete finishing works has been completed.

1.5 DEFINITIONS

A. Concrete Repair Procedure and Concrete Patch Procedure – written procedure developed by the Subcontractor and submitted to the Designer for approval to repair or patch any concrete finishing that do not comply with the finishing specifications set out in this Construction Specification.

B. Designer – Professional Engineer shown on Project Co's Issued For Construction drawings

C. Finish Classes

1. Class 1 Finish: The basic finish to be provided on formed surfaces not exposed to view unless a better finish is specified or required by IFC drawings.
2. Class 2 Finish: The finish to be provided on formed surfaces exposed to view from moderate distances, such as surfaces of abutments and piers, and to any surface for which a Class 2 Finish is specified or required by the IFC drawings. A Class 2 Finish shall provide surfaces of uniform colour and texture as viewed from a distance of 25 m.
3. Class 3 Finish: The finish to be provided on formed surfaces exposed to view from close distances, such as surfaces of curbs and parapets, and to any surface for which a Class 3 Finish is specified or required by the IFC drawings. A Class 3 Finish shall provide surfaces of uniform colour and texture when viewed from less than 15m.
4. Float Finish: The finish to be provided on unformed surfaces to remove imperfections and embed large aggregate but still provide an open texture.

D. Subcontractor – the contractor retained by Project Co for the concrete finishing works (where this work is performed by Project Co, the Subcontractor will be Project Co itself)

1. Trowel Finish: The finish to be provided on unformed surfaces, as specified on the drawings sasandiprovided by Project Co, or unformed surfaces that must meet close tolerance requirements, in order to obtain a dense, hard, smooth surface free of toolmarks.
2. Broomed Finish: The finish to be provided on unformed surfaces, as specified on the drawings provided by Project Co, with a brush or broom on a surface that has been trowelled in order to provide a non-slip surface texture.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products used to obtain specified finish or to repair surface defects shall conform to CAN/CSA A23.1/A23.2 except as specified otherwise in this Section.

2.2 PATCHING MORTAR

B. Patching mortar shall be proportioned as follows:

1. Cement shall be 60% normal Portland cement and 40% white normal Portland cement; however, proportions may be adjusted to provide a close match to the concrete colour.
2. Liquid shall be 70% water and 30% pre-approved latex bonding agent.
3. Aggregate shall be sand that passes through a 1.25 mm sieve.

C. Quantity of liquid shall be no more than necessary to facilitate handling and placing.

D. Patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached stiffest consistency that will permit placing.

2.2 NON-SHRINK GROUT

A. Non-shrink grout shall be non-metallic and shall develop a minimum compressive strength in 28 days that is greater than or equal to the concrete that the grout is being used to repair.

2.3 OTHER MATERIALS

A. Other materials proposed for use shall be subject to approval by the Designer and will be considered based on compliance with requirements and successful performance in prototype or similar construction.

PART 3 - EXECUTION

3.1 INSPECTION

A. Immediately after removal of formwork, concrete surfaces shall be inspected for defects. Repairable defects shall be repaired in accordance with the requirements as defined in this Part 3 of this Section.

B. Structural defects shall be identified and reported to the Designer immediately. Structural defects shall not be repaired until inspected by the Designer and until the repair methods and materials have been authorized by the Designer in writing and in accordance with the approved Concrete Repair Procedure relevant to the work.

3.2 FINISHING OF FORMED SURFACES

A. All Classes of Finish:

1. All concrete finishing work shall conform to the requirements of CAN/CSA-A23.1/A23.2 except as specified herein.

   All ties, bolts, nails, and other metal specifically required for construction purposes shall be removed or cut back to a depth of 50mm from the surfaces of the concrete and the resulting holes filled.

2. No dry ties shall be permitted; form time rods shall remain embedded and terminate not less than 50mm from the formed face of the concrete. Removable embedded fasteners on the ends of the rods shall be such as to leave holes of a regular shape for reaming and filling.

3. All ties, bolts, nails and other metal specifically required for construction purposes shall be removed or cut back to a depth of 50 mm from the surfaces of the concrete and the resulting holes filled. Removable embedded fasteners on the ends of the rods shall be such as to leave holes of a regular shape for reaming and filling.

B. Class 1 Finish

1. Formwork shall be mortar tight. Panel marks and texture are of no importance.

2. Honeycombs and voids over 500mm2 in area shall be filled.

C. Class 2 Finish

1. Formwork shall be mortar tight and shall render a true surface. Fins 3mm wide (maximum) shall be allowed at the panel joints; however, sheathing joints must be mortar tight. Irregularities of 3mm in height with areas of 50 mm x 75 mm shall be allowed to a maximum of four such areas per 3 m2 of formwork. Patches of dissimilar material will not be permitted. Horizontal and vertical joints shall be aligned.

2. All ties, bolts, nails, and other metal specifically required for construction purposes shall be removed or cut back to a depth of 50mm from the surfaces of the concrete and the resulting holes filled.

3. No dry ties shall be permitted; form time rods shall remain embedded and terminate not less than 50mm from the formed face of the concrete. Removable embedded fasteners on the ends of the rods shall be such as to leave holes of a regular shape for reaming and filling.
4. Honeycombs and voids 25 mm diameter shall be filled, and all bug holes over 5 mm diameter shall be pointed. All fins and projections shall be removed with a hand stone or power grinder. The use of a power grinder shall be kept to a minimum and confined to areas required.
5. When a rubbed finish is not called for, patches shall be textured with a mortar float or lightly brushed after trowelling smooth.
6. Where more than 50 voids or bug holes over 5 mm diameter occur per 1.0 m2, or if the surfaces are not acceptably uniform in colour or texture, the entire area affected shall be given a rubbed finish.

D. Class 3 Finish

1. Formwork shall render a true smooth surface, free from fins and projections. New plywood or steel is necessary to produce required finish. Re-use of plywood forms will be permitted only if in an “as-new” condition. Repairs to the forms shall be with full panels of sheathing only. Horizontal and vertical joints shall be aligned.
2. All ties, bolts, nails, and other metal specifically required for construction purposes shall be removed or cut back to a depth of 50mm from the surfaces of the concrete and the resulting holes filled.

   No dry ties shall be permitted; form time rods shall remain embedded and terminate not less than 50mm from the formed face of the concrete. Removable embedded fasteners on the ends of the rods shall be such as to leave holes of a regular shape for reaming and filling.
3. Honeycombs and voids 25 mm diameter shall be filled, and all bug holes over 5 mm diameter shall be pointed. All fins and projections shall be removed with a hand stone or power grinder. The use of a power grinder shall be kept to a minimum and confined to areas required.
4. When a rubbed finish is not called for, patches shall be textured with a mortar float or lightly brushed after trowelling smooth.
5. Where more than 50 voids or bug holes over 5 mm diameter occur per 1.0 m2, or if the surfaces are not acceptably uniform in colour or texture, the entire area affected shall be given a rubbed finish.

3.3 FINISHING OF UNFORMED HORIZONTAL SURFACES

A. Unless specified otherwise on the IFC drawings, all exposed horizontal surfaces that are not intended to receive any additional concrete shall receive a float finish.

B. Horizontal surfaces intended to carry additional concrete shall be thoroughly roughened to an amplitude of 5.0mm and cleaned of laitance and loose concrete. This shall be performed by roughening of wet concrete, wet sandblasting, cutting with air-water jet, pneumatic scabbling (inclusive a hydro-blast), or other suitable methods to ensure clean and sound aggregate.

C. Float Finish:

1. Shall conform accurately, within specified tolerance limits, to grades and elevations shown on the drawings provided by Project Co.

2. After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating.
3. Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
4. All high spots shall be cut down and all low spots filled during this procedure to produce a surface within the specified tolerance limits throughout.
5. The surface shall then be re-floated immediately to a uniform sandy texture.
6. Special care shall be taken in finishing areas between inserts, templates and other similar devices.
7. Finished surfaces shall be free from open texturing, plucked aggregate and local projections.
8. Further trowel, broom or special finishes shall be performed as specified and where shown or required

D. Trowel Finish:

1. Finishing concrete surfaces with a machine or hand trowel fitted with metal blades.
2. Trowelling shall only be performed on a surface that has previously been float finished. Two or more passes of the trowel shall be made within suitable time intervals to obtain a dense hard smooth surface.
3. Trowelling by hand shall be performed only if required to remove irregularities where machine trowelling cannot be executed to create a suitable smooth surface.
4. Tooled edges and joints shall be re-finished after trowelling to maintain uniformity and true lines.

Broom finish:

1. Fine, but slip-resistant, striated surface produced by brushing the newly troweled surface with a soft bristled broom. Brooming shall be performed when the concrete has been previously float finished and troweled and is sufficiently hard to retain the texture.

3.4 REPAIR OF SURFACE DEFECTS AND PATCHING

A. The Subcontractor shall submit to the Designer a Concrete Repair Procedure and a Concrete Patching Procedure for review and acceptance, which upon acceptance by the Designer shall be referred to as the ‘Approved Concrete Repair Procedure’ and ‘Approved Concrete Patching Procedure’.

B. Materials and methods used for all repair of defects and patching shall be accordance with the Approved Repair Procedure and Approved Patching Procedure.

3.5 SURFACE TOLERANCES

A. Unless otherwise shown on the IFC drawings or in other Sections, concrete surfaces shall meet the following tolerances:
Horizontal or sloped concrete surfaces shall comply with CSA A23.1/A23.2 /Table 21/Class B.

3.6 PROTECTION

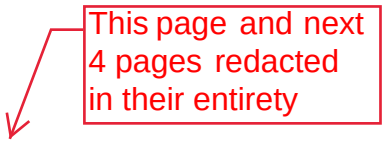
A. Take every precaution to prevent damage, abrasions and staining of surfaces and edges of concrete during the work.

B. Provide plywood or insulation protection and polyethylene wrappings or other means as required to concrete elements that may be damaged by subsequent construction activities.

C. Remove protective coverings at completion of construction.

D. Barricades shall be erected to prevent traffic on newly finished surfaces.

END OF SECTION


This page and next
4 pages redacted
in their entirety

PART 1 - GENERAL

1.1 SUMMARY

A. Provide labour, architectural concrete unit masonry and accessories for a complete installation as indicated and specified.

1. Build in and form openings for mechanical and electrical items in concrete unit masonry walls.
2. Build in door frames and grout as required.
3. Build in and grout inserts and attachment devices.
4. Build in access panels, miscellaneous metals, loose lintels, bearing plates, sleeves, anchor bolts, anchors and other similar items.
5. Clean architectural concrete unit masonry.
6. Apply a clear penetrating sealer and graffiti resistant coating.

B. Related Documents: IFC drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. Vancouver Building Bylaw (VBBL)
2. TransLink Building Code Criteria
3. ASTM C90, Standard Specification for Loadbearing Concrete Masonry Units
4. ASTM C404, Aggregates for Masonry Grout
5. ASTM A1064/A1064M, Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
6. CSA A165.1, Concrete Masonry Units.
7. CSA A179, Mortar and Grout for Unit Masonry.
8. CSA S304.1, Design of Masonry Structures
9. CSA A370, Connectors for Masonry
10. CSA A371, Masonry Construction for Buildings
11. CSA A3000, Cementitious Materials Compendium
12. CSA G30.18, Carbon Steel Bars for Concrete Reinforcement

1.3 SUBMITTALS

A. Certificates:

1. Provide certificate attesting to qualification of concrete masonry units, mortar and/or grout when requested.
2. Provide certificate indicating compliance with fire resistance ratings when requested.

B. Mill Certificates: For reinforcing steel.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled masons experienced in the installation of the products specified and the type of work to be undertaken.

B. Obtain architectural concrete unit masonry through one source from a single manufacturer.

C. Mock-up:

1. Provide a mock up panel of a minimum of 800 mm x 1200 mm constructed at a location determined by Project Co.

2. Mock-up panel, when accepted by Project Co may form a permanent part of the work and will be representative of masonry placement, jointing, alignment and overall quality of erection. Project Co shall include the Province and TransLink in the review of the mock-up panel. The mock-up panel if temporary shall only be removed once all architectural concrete unit masonry works has been completed.

D. Testing: Have masonry unit and mortar cube strength tests carried out at the plant by an independent testing agency engaged and paid for by the Subcontractor responsible for installing the unit masonry (the “Installer”).

E. The following will be considered as defects:

1. Shrinkage in individual units and erected work.

2. Spalling, chipping, and or cracking in individual units and erected work.

3. Poor colour or texture blending of units.

4. Failure of built in items to remain anchored.

5. Discolouration, crumbling, and similar deterioration of mortar.

6. Poor mortar and grout workmanship such as too little or excessive material, voids, poorly tooled joints, splatter and overspill left on concrete masonry unit exposed surfaces.

F. The Installer shall hold a preconstruction meeting with Project Co and the Designer to review the Installer’s work method for the installation of unit masonry walls.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver architectural concrete masonry units and cementitious material to the work site in manufacturer's original protective wrappings with labels intact, in a clean and dry condition. Protect units from moisture absorption due to rain, snow and other exposure.

B. Store material on pallets or platforms under waterproof cover, clear of ground contact.

C. Stack and handle architectural concrete masonry units to prevent chipping and cracking of units. Protect masonry materials from damage during construction phases including delivery, storage and handling.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Cold weather construction requirements shall be in accordance with CSA A371 and as follows:

1. Maintain materials and surrounding air temperature at a minimum of 10 degrees Celsius prior to, during, and 48 hours after completion of masonry work.

2. During freezing or near freezing weather, provide adequate equipment or cover to maintain a minimum temperature of 10 degrees Celsius, and to protect masonry work completed or in progress.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section, provided they meet the performance requirements established by the named products.

B. Architectural Concrete Unit Masonry:

1. Architectural concrete unit masonry components: In accordance with CSA A165.1 for manufacturing tolerances, mix content, appearance and format.
2. Type: H/15/A/M, unless specified otherwise on the design drawings for normal weight masonry in accordance with Table 1 of CSA A165.1 unless noted otherwise on the drawings.
3. Minimum Compressive Strength: 15 MPa, unless specified otherwise on the design drawings. Minimum compressive strength shall be calculated on the net area, based on an average of five units.
4. Size of Architectural concrete unit masonry: Actual face dimensions 190 mm high by 390 mm long by nominal widths scheduled.
5. Special Architectural concrete unit masonry: Provide special units required to complete the Work, including lintel, bond beam, finished end, intersection, control joint and end units.
6. Architectural concrete unit masonry items shall be from the same manufacturer to ensure uniformity of texture and colour.

C. Joint Reinforcement:

1. Joint Reinforcement: Horizontal ladder type reinforcing conforming to CSA A370 composed of two parallel 4.8 mm diameter steel side rods, joined together by 4.8 mm diameter steel cross rods, spaced at 400 mm on centre and welded in place.
2. Joint Reinforcement Material: Hot dipped galvanized after welding fabrication.
3. Widths of Joint Reinforcing: 50 mm less than width of masonry unit.
4. Cross Rods: Formed with drips where reinforcing is in exterior walls and without drips where in interior walls.

D. Ties and Anchors:

1. Galvanized steel rod or sheet steel configurations, adjustable to engage block coursing.
2. Suitable for attachment to structural back up and conform to CSA S304.1.

E. Lateral Partition Supports (Top of Wall Anchors)

1. Angle Support: fabricated from nominal 2.7mm core metal thickness angled steel plate having 75mm long legs fastened to deck structure to allow vertical movement of masonry assembly; mill galvanized; coordinate with Section 07 84 00 for firestopping insulation and smoke seals.

F. Reinforcing Steel: Conform to CSA G30.18 grade 400.

G. Grout Materials:

1. Portland Cement: Conforming to CSA A3000.
2. Aggregates for Masonry Grout: 10 mm maximum size and conforming to ASTM C404.

H. Water: Shall be potable.

I. Sand for Masonry Mortar: Fine granulated material composed of hard, strong, durable mineral particles, free of saline, alkaline, organic or other harmful materials conforming to CSA A179.

2.2 MIXES

A. Mortar: Type S conforming to CSA A179 unless specified otherwise on the design drawings. Masonry cement shall be used in preference to Portland cement and lime.

B. Concrete Grout:

1. Concrete Grout Strength: 15 MPa at 28 Days and conforming to CSA A179, unless specified otherwise on the design drawings.
2. Grout shall be of fluid consistency with a slump of 200 mm to 250 mm.
3. Colour to match architectural concrete unit masonry.

2.3 ACCESSORIES

A. Provide accessories as required and as follows:

1. Reinforcement, metal ties, anchors and dowels;
2. Membrane flashing;
3. Metal flashings;
4. Joint sealants;
5. Sealants and coatings;
6. Cellular plastic weep/vent inserts; and
7. Sealer and graffiti resistant coating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Erect architectural concrete unit masonry in accordance with CSA A370 and CSA A371.

3.2 TOLERANCES

A. Tolerances shall be in accordance with CSA A371 and as follows:

1. Variation from Mean Plane: 6 mm when measured with a 3 m straight edge.
2. Variation from Plumb: 3 mm on any vertical line up to 3 m high.
3. Variation in Sizes of Wall Openings: 6 mm maximum.
4. Variation from Grade Levels Stated: 6 mm.

3.3 BOND

A. Concrete unit masonry shall be running bond unless indicated otherwise.

3.4 JOINT SIZES AND PROFILES

A. Exposed Interior Masonry Joints: Uniform 10 mm width, struck flush.

B. Exposed Exterior Masonry Joints: Uniform 10 mm width, concave.

C. Concealed Masonry Joints: Uniform 10 mm width, struck flush.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Fabricate and install all galvanized steel and stainless steel, guardrails, handrails, and all required accessories for a complete and proper system.

B. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise indicated.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. Vancouver Building By-Law, VBBL
2. TransLink Building Code Criteria, TLBCC
3. ASTM A36/36M, Carbon Structural Steel
4. ASTM A53/A53M, Pipe, Steel, Black and Hot Dipped Zinc Coated, Welded and Seamless.
5. ASTM A123/A123M, Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
6. ASTM A153/A153M, Zinc Coating (Hot-Dip) on Iron and Steel Hardware
7. ASTM 276/A276M Stainless Steel Bars and Shapes.
8. ASTM A500, Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
9. ASTM A501, Hot Formed Welded and Seamless Carbon Steel Structural Tubing.
10. ASTM A554, Welded Stainless Steel Tubing
11. ASTM A666, Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
12. ASTM A743/A743M, Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant for General Application.
13. ASTM A780/A780M, Repair of Damaged and Uncoated Areas of Hot-Dip Galvanised Coatings.
14. ASTM A999/A999M General Requirements for Alloy and Stainless Steel Pipe.
15. ASTM A1016/A1016M General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes.
16. ASTM C1107/C1107M, Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
17. ASTM E488/E488M, Strength of Anchors in Concrete Elements
18. ASTM E935, Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
19. ASTM E985, Permanent Metal Railing Systems and Rails for Buildings.
20. ASTM F1267, Metal, Expanded, Steel.
21. AWS (American Welding Society) D1.1, Structural Welding Code - Steel.
22. CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
23. CSA W48.1, Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.
24. CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

25. CSA W59, Welded Steel Construction (Metal Arc Welding).
26. SSPC (The Society for Protective Coatings) (formerly SSPC - Steel Structures Painting Council), Steel Structures Painting Manual.
27. National Association of Architectural Metal Manufacturers, Metal Finishes Manual for Architectural and Metal Projects

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and loads as specified in the VBBL.

C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night-time sky heat loss.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Grout, anchoring cement.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by a structural Professional Engineer responsible for their preparation.

C. Samples for Initial Selection: Provide samples for approving colour, texture, or design, including mechanical finishes on stainless steel.

D. Letters of Assurance: Provide signed letters of assurance as required by any Relevant Authority.

E. Welding Certificates.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Steel fabrication shall be carried out by firms certified in accordance with CSA W47.1.

C. Welding shall be in accordance with the Canadian Welding Bureau (CWB) standards. Welding operators employed on the Work shall hold current CWB operator cards for the processes to be used in the work and be employed by an organization certified by CSA W47.1.

D. Mock-ups: Mock-up one segment of railing complete with specified finish with a minimum of two mounting locations. Approved mock-up may be incorporated into finished work upon Project Co's approval. Project Co shall include the Province in its inspection of the mock-up railing for acceptance to allow the Province to raise any objection or comment on the finished work.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on shop drawings.

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary coating before shipping.

PART 2 - PRODUCTS

2.1 METALS – GENERAL

A. Metal Surfaces - General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolourations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STAINLESS STEEL

A. Tubing: ASTM A554, Grade MT 304, railing component to be 42mm O.D.

B. Castings: ASTM A743/A 743M, Grade CF 3M for components requiring welding; Grade CF 8M for other components.

C. Stainless Steel Sheet, Strip, Plate and Flat Bar: ASTM A666, Type 304.

D. Stainless Steel Bars and Shapes: ASTM A276, Type 304.

2.3 STEEL AND IRON

A. Tubing: ASTM A500 (cold formed), railing component to be 42mm O.D.

B. Plates, Shapes, and Bars: ASTM A36/A36M.

C. Expanded Metal: ASTM F1267, Type as indicated on drawings provided by Project Co, Class 1 (uncoated).

2.4 FASTENERS

A. General: Provide the following:

1. Stainless Steel Railings: Type 304 stainless steel fasteners.
2. Galvanized Steel Railings: all fasteners to be hot-dip galvanized.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
2. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors: Provide cast-in-place anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.5 ACCESSORIES

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Non-shrink, Non-metallic Grout: to ASTM C1107 for exterior applications.

C. Water-Resistant Anchoring Cement: to ASTM C1107 for exterior applications.

2.6 STAINLESS STEEL HANDRAIL SUPPORTS

A. Glass Guard Handrail Brackets: Type 316 stainless steel.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1 mm (1/32 inch), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections, unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Close exposed ends of railing members with prefabricated end fittings.

K. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns.

L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

N. For railing posts set in concrete, provide steel sleeves not less than 150 mm (6 inches) long with inside dimensions not less than 13 mm (1/2 inch) greater than outside dimensions of post, with steel plate forming bottom closure.

O. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

P. Laminated/Tempered Glass Guards: Refer to Section 08 44 13 Glazed Aluminum Curtain Walls.

2.8 FINISHES – GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Provide exposed fasteners with finish matching appearance, including colour and texture of railings.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.9 STAINLESS STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Directional Satin Finish: No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.10 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot dip galvanize indicated steel railings, including hardware; fittings, brackets, fasteners and sleeves, after fabrication.
2. Comply with ASTM A123/A123M for hot dip galvanized railings.
3. Comply with ASTM A153/A153M for hot dip galvanized hardware.

B. Fill vent and drain holes that will be exposed in the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 2 mm in 1 m (1/16 inch in 3 feet).

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 5 mm in 3 m (1/4 in. in 10 feet).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 ADJUSTING AND CLEANING

A. Clean stainless steel in accordance with manufacturer's recommendation to leave clean and spotless surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

3.3 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings. Remove protective coverings at time of Substantial Completion. Restore finishes damaged during installation and construction period so no evidence remains of correction work.

END OF SECTION

This page and the next 3 pages redacted in their entirety

PART 1 - GENERAL

1.1 SUMMARY

A. Provide aluminum-faced composite panels as an exterior cladding system as specified and as shown on the drawings.

B. The work of this Section shall include the design, fabrication and installation of the following:

1. Aluminum-faced composite panels
2. Metal framing support system
3. All connections, flashing, trim and accessories integral to an aluminum composite panel cladding system

C. Related Documents: Drawings and general provisions of the Project Agreement apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition of the standard unless otherwise noted..

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. AA-C22-A41 - Clear Anodized - Class I.
2. AA-C22-A42 - Anodized Integral Color Coatings - Class II.
3. AA-C22-A44 - Electrolytically deposited color (2-step) - Class I.
4. AAMA 508 - Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.
5. AAMA 509 - Voluntary Test and Classification Method for Drained and Back Ventilated Rain Screen Wall Cladding Systems.
6. AAMA 620 - Voluntary Specification for High Performance Organic Coatings on Coil, Coated Architectural Aluminum.
7. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
8. AAMA "Metal Curtain Wall, Window, Storefront and Entrance Guide Specifications Manual".
9. ASTM B 117 - Method of Salt Spray (Fog) Testing.
10. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
11. ASTM D 822 - Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products.
12. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
13. ASTM D 1781 - Climbing Drum Peel Test for Adhesives.
14. ASTM D 1735 - Method for Water Fog Testing of Organic Coatings.
15. ASTM D 1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
16. ASTM D 2247 - Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity
17. ASTM D 2794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
18. ASTM D 3359 - Methods for Measuring Adhesion by Tape Test.
19. ASTM D 3363 - Method for Film Hardness by Pencil Test.
20. ASTM E 84 - Surface Burning Characteristics of Building Materials.
21. ASTM E 283 - Rate of Leakage through Exterior Windows, Curtain Walls, and Doors.
22. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads.
23. NFPA 285 - Intermediate Scale Multi Story Test

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Affidavit certifying material meets requirements specified.
2. Two copies of manufacturer's literature for panel material.
3. Preparation instructions and recommendations.
4. Storage and handling requirements and recommendations.
5. Installation methods.

B. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

C. Code Compliance: Documents showing product compliance with the applicable Building Code. Manufacturer shall have an ICC/ES Research Report and be in compliance with AC25 (Acceptance Criteria for Metal Composite Material).

D. Verification Samples:

1. Two samples of each type of assembly; 300 mm by 300 mm minimum.
2. Two samples of each color or finish selected; 75 mm by 100 mm minimum.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturer shall have a minimum of 10 years experience in the manufacturing of the panel product.
2. Manufacturer shall be solely responsible for panel manufacture and application of the finish.

B. Installer Qualifications:

1. Fabricator/installer shall be acceptable to the composite panel manufacturer.
2. Fabricator/installer shall have a minimum 5 years experience of metal panel work similar in scope and size to this Project.
3. Panel fabricator/installer shall assume sole responsibility for design and installation of the panel mounting components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

C. System Requirements:

1. Panel system includes the following components:

    a. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete watertight installation.
    b. Parapet coping, column covers, soffits, sills, border, and filler items indicated as integral components of the panel system or as designed.
    c. Interior panel system work that matches exterior panel system work.

2. Maximum deviation from vertical and horizontal alignment of erected panels: 6 mm in 6 m non-accumulative.

3. Shop drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331. Systems not utilizing a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated System) shall provide a means of concealed drainage with baffles and weeps for water which may accumulate in members of the system.

D. Mock-Up: Provide a mock-up of 10 sq.m for evaluation and acceptance of surface preparation techniques and application workmanship. Area of mock-up will be incorporated into the constructed system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finish and edges in accordance with panel manufacturer's recommendations.

B. Store material in accordance with panel manufacturer's recommendations.

1.6 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard form of warranty stating that manufacturer agrees to repair or replace components of composite panel system that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Ten (10) years from Substantial Performance Date.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with specifications, the following manufacturers are acceptable:

1. Alucobond; or
2. Approved equal alternative.

2.2 PANELS

A. Metal Wall Panels: aluminum-faced composite panels.

1. Panel Thickness and Weight: 6 mm thick, 7.8 kg/sq.m
2. Composition:

    a. Two sheets of aluminum sandwiching a solid core formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.
    b. Core Material: Extruded thermoplastic material.
    c. Aluminum Face Sheets:
        1) Thickness: 0.50 mm (nominal).
        2) Alloy: AA3000 Series (Painted material).
        3) Alloy: AA5000 Series (Anodized material).

3. Product Performance:

    a. Panel Tolerance:
        1) Length: -0 + 9.5 mm.
        2) Width: -0 + 4.8 mm.
        3) Thickness: +/- 0.20 mm for 3 mm to 6 mm thicknesses.

4) Bow (length and/or width): Maximum 0.8 percent.
5) Squareness: Maximum 6 mm.
6) Aluminum Sheet Thickness: 0.5 mm nominal.

b. Bond Integrity: in accordance with ASTM D 1781 (simulating resistance to panel delamination), there shall be no adhesive.
c. Temperature Resistance: Withstand environmental temperature changes from -50 degree C to 80 degree C
d. Fire Performance: in accordance with ASTM E84 and applicable Building Code requirements

2.3 FINISHES

A. Coil Coated Finishes:

1. in conformance with the following general requirements of AAMA 2605 and AAMA 620.
2. Color: as selected from manufacturer's color palette.
3. Coating Thickness:

a. Colors: 1.0 mil (+/-0.2 mil).
b. Clear: 0.50 mil (+/- 0.05 mil).

4. Hardness: ASTM D 3363;
5. Impact: ASTM D 2794
6. Adhesion: ASTM D 3359
7. Humidity Resistance: ASTM D 2247
8. Salt Spray Resistance:

a. ASTM B 117
b. Corrosion creepage from scribe line: 1.6 mm maximum.
c. Minimum blister rating of 8 within the test specimen field.

9. Weather Exposure:

a. Outdoor:
1) ASTM D 2244.
2) ASTM D 4214.

b. Chemical Resistance:
1) ASTM D 1308
2) AAMA 2605
3) ASTM D 2244.

B. Anodized Finish:

1. Finish: AA-C22-A41 Architectural Class I, clear.

C. Urethane Coating: For aluminum accent panels or custom color applications of limited quantity, provide a multi-coat urethane finish, applied in accordance with the paint manufacturer's requirements.

D. Natural Finish: High performance single coat clear finish over natural and brushed aluminum substrates.

2.4 PANEL SYSTEM FABRICATION

A. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.

B. The finish side of the panel shall have a removable plastic film applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection. Remove film as soon as possible after installation.

C. System Type:

1. Rear Ventilated Rain Screen:

a. System must provide a reveal joint as detailed on drawings. Provide moisture barrier and sheathing as shown on drawings.

D. System Performance:

1. Composite panels shall be capable of withstanding building movements, weather exposures, and wind loads, based on applicable Building Code requirements.

2.5 ACCESSORIES

A. Extrusions, formed members, sheet, and plate, sealants, gaskets, flashing, and fasteners shall be as per the manufacturer’s standards, written instructions, and recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared and meet manufacturer’s written instructions.

3.2 INSTALLATION

A. Erect panels in accordance with manufacturer's requirements and approved shop drawings, plumb, level, and true.

B. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -29 degree C to 82 degrees C.

3.3 ADJUSTING AND CLEANING

A. Remove and replace panels damaged beyond repair, and repair panels with minor damage as per manufacturer’s written instructions.

B. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

3.4 PROTECTION

A. Protect installed products until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide exterior stone veneer wall panel system (panels) as specified and as shown on the Issued For Construction (IFC) drawings prepared by Project Co.

B. The work of this section shall include the design, fabrication, and installation of the following:
   1. Stone veneer wall panel system;
   2. Metal framing support system; and
   3. All connections, flashing, trim and accessories integral to a stone veneer wall panel system

C. Related Documents: IFC drawings and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:
   1. ACI 530.1-92/ASCE 6-92/TMS 602-92 - Specifications for Masonry Structure.
   2. ACE 530.1-92/ASCE 6-92/TMS 602-92.
   3. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.
   4. ASTM D897 - Standard Test Method for Tensile Properties of Adhesive Bonds.
   5. ASTM D1761 - Standard Test Method for Mechanical Fasteners in Wood.
   6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   7. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.
   8. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
   9. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   10. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
   11. GB/T 9966.1 – Test Methods for Natural Facing Stones
   12. ISO 9001 - Quality Management Systems

1.3 PERFORMANCE REQUIREMENTS

A. Design Requirements; design exterior stone veneer panel system to withstand:
   1. Positive and negative design wind loads acting normal to wall plane in accordance with applicable ’Building Code’ (to be specified by Project Co in accordance with the BSP Project Agreement) and ASCE 7 with deflection of any member not to exceed L/175, as tested to ASTM E330.
   2. Movement caused by an ambient temperature range of 120 degrees F and a surface temperature range of 160 degrees F.

B. Performance Requirements:
   1. Air infiltration: Maximum 0.01 CFM per square foot, tested to ASTM E283 at pressure differential across assembly of 6.24 PSF.
   2. Water resistance: No leakage, tested to ASTM E331 at 12.0 PSF.
   3. Uniform load deflection:
      a. Two panel specimens: No damage, tested to ASTM E330 at 65 PSF positive and negative.
      b. Single panel specimen: No damage, tested to ASTM E330 at 260 PSF positive and negative.
   4. Uniform load structural:
      a. Two panel specimens: No damage and maximum 0.07 inch permanent set, tested to ASTM E330 at 97.5 PSF positive and negative.
      b. Single panel specimen: No damage and maximum 0.150 inch permanent set, tested to ASTM E330 at 390 PSF positive and negative.
   5. Impact resistance: No penetration, tested to ASTM E1996 at 50 FPS.
   6. Freeze/thaw resistance: No delamination, cracking, chipping, or visible distortion; tested to GB/T 9966.1 at 25 cycles.
   7. Adhesive bond: Average bond strength of 284 PSI, tested to ASTM D897.
   8. Tensile bond strength for adhesive: Average of 358 PSI, tested to ASTM D897 after 25 thermocycles.
   9. Shear load strength for riveted brackets: Average of 172 PSI, tested to ASTM D1761.
   10. Fire hazard classification: Maximum flame spread/smoke developed rating of 10/155, tested to ASTM E84.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Include plans, elevations, and details, size and layout of panels, trim, accessories, supports, and attachments.
   1. Show locations, mounting details and details of joints both within honeycomb-backed stone veneer assembly and between stone panel veneer assembly and other construction.
   2. Include details of all varying joints, anchorage, corners, direction changes and connection to other materials.
   3. Show locations and details of channel system.
   4. Show direction of veining, grain, or other directional pattern.
   5. Include large-scale elevations of each building elevation with each panel numbered and dimensioned

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two sets of samples, minimum size 152 mm square, representing actual product, color, and patterns and exhibiting the range of color and other visual characteristics to be expected for the project.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for cleaning and maintenance of veneer.

1.5 QUALITY ASSURANCE

A. Supplier/Fabricator Qualifications: Minimum of 5 years experience in the manufacturing of the panel product specified and meeting the following:
   1. Manufacturing facilities utilized in production ISO-9001 certified.

B. Installer Qualifications: Minimum 3 years documented experience in work of this Section and the type of panel products specified.

C. Mock-Up: Provide a 1220mm high by 2440mm wide mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas as shown on IFC drawings.
   2. Do not proceed with remaining work until color and workmanship is approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.
   4. Approved mockup may remain as part of the Work.

D. Pre-Installation Conference:
   1. Convene at site 2 weeks prior to beginning work of this Section.
   2. Attendance: Project Co, supplier, panel manufacturer's representative, panel installer, and related trades.
   3. Review and discuss: Project conditions, scheduling and related work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's properly labeled, unopened packaging, off ground to prevent deterioration or damage due to moisture, temperature changes, contaminates, corrosion, breaking, chipping, and other causes.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before stone wall panel fabrication.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
   1. Cold-Weather Requirements: Comply with cold-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE6/TMS 602-92. Remove and replace honeycomb-backed stone panels damaged by frost or freezing conditions.
   2. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602-92.

1.8 WARRANTY

A. Provide manufacturer's 10 year limited warranty against delamination and separation of panel components.

PART 2 PRODUCTS

2.1 EXTERIOR STONE VENEER PANELS

A. Stone Veneer Panels: aluminum backing, aluminum honeycomb substrate with a Fire Retardant Filler, fiberglass top sheet bonded to a natural thin stone veneer.
   1. Panel Size: Provide maximum lengths and widths available that will minimize joints in

each area that correspond with the support system indicated.
2. Panel Thickness: 25mm
3. Weight: including stone facing: 19.53 to 24.41 kg/sq.M.
4. Stone Type: Granite
5. Surface Finish: to be determined
6. Panel Edges: Apply FRF (Fire Retardant Filler) to all edges of the aluminum honeycomb (exposed or not) to fill voids in honeycomb. Edges to be smooth and filled. Use FRF with color similar to stone.
7. Corners and returns: Provide prefabricated panel units with mitered corners, bonded with epoxy and finished exposed surfaces.

B. Hanging Channels: Continuous extruded aluminum rails.
1. Channel Material: ASTM B221, 6063-T5ORT6 alloy and temper.
2. Finish: Flat black painted finish where exposed.
3. Water weepage: Allow water to pass between channel and substrate.
4. Connection and anchorage hardware, including interlocking channels, anchor plates, structural silicone and threaded inserts shall be of sufficient size, thickness and strength to properly support panels and applied loads. Panel fastening shall be completely concealed.

C. Accessories:
1. Fasteners: Concealed type except where unavoidable and suited to application, stainless or corrosion resistant coated steel.
2. Joint Sealers: Type recommended by panel manufacturer.

2.2 FABRICATION

A. Fabricate manufacturer's standard interlocking channel system to allow for free and noiseless vertical and horizontal thermal movement due to expansion and contraction.

B. Apply clear sealer to exposed stone surfaces at factory.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive stone panels and conditions under which they will be installed for compliance with installation tolerances and other conditions affecting performance of panels.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's written instructions and approved shop drawings.

3.4 ADJUSTING AND CLEANING

A. Remove and replace broken, chipped, stained, or otherwise damaged panels, defective joints, and panels that do not match approved samples, before Substantial Completion.

3.5 PROTECTION

A. Protect installed products until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide architectural porcelain enamel wall panels (panels) as specified and as shown on the Issued For Construction (IFC) drawings prepared by Project Co.

B. The work of this section shall include the design, fabrication, and installation of the following:
   1. Porcelain enamel wall panels;
   2. Metal framing support system; and
   3. All connections, flashing, trim and accessories integral to a porcelain enamel wall panel system

C. Related Documents: IFC drawings and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:
   1. Porcelain Enamel Institute (PEI S100)

1.3 SUBMITTALS

A. Shop drawings: Submit shop drawings indicating plans, elevations, sections and details for all work in this Section.

B. Submit duplicate samples of the specified finish for selection and approval of color and gloss.

C. No work shall be fabricated until shop drawings and samples have been reviewed and accepted.

1.4 QUALITY ASSURANCE

A. The supplier and installer must be able to demonstrate a minimum of 10 years experience and must have successfully completed at least 5 major projects in architectural porcelain enamel panels. The supplier must also be able to demonstrate that all fabrication, enameling and laminating are executed in one manufacturing location, no sub-contracting for all or part of the work is permitted.

1.5 MANUFACTURER WARRANTY

A. *Not used*.

B. The manufacturer shall provide a six year warranty commencing at Substantial Completion which covers the porcelain enamel finish under normal climatic conditions for Weather Resistance, Continuity of Coating, and Surface Appearance, in accordance with the Porcelain Enamel Institute Standard PEI:S100.

1.6 DELIVERY, STORAGE & HANDLING

A. Remove all panels which are damaged and replace with new.

B. Deliver panels packed on skids and shrink wrapped with plastic.

PART 2 - PRODUCTS

2.1 STEEL

A. Face steel shall be mild steel used for the manufacture of porcelain enamel panels. Steel shall be of low metalloid and copper content, ASTM A424 Type 1. Steel shall be stretcher levelled. Thickness of base metal shall be 18 ga (1.2 mm). Steel shall be stored in heated environment in order to prevent rusting/scaling.

B. Steel back sheet when a core material is included with the porcelain panel shall be galvanized steel ASTM A525-80A G90 designation. Base metal thickness to be recommended by the manufacturer, but shall not be less than 22 ga (0.8 mm).

C. Load bearing clips for attaching panels to the sub-structure shall be Type 302 stainless steel and shall be attached to the panel flanges after enameling with stainless steel pop rivets.

2.2 ENAMEL

A. Ground coat and cover coat frit shall be suitably selected material to achieve the finish and coverage of the panels, to the standards required in this specification. Frits selected shall be acid resistant type in order to achieve an A or AA acid resistance.

2.3 CORES

A. Core material shall be bonded to the back face of the porcelain panel when required to meet the flatness and structural requirements of the panel system.

B. Core material shall be 12 mm water resistant gypsum board.

2.4 ADHESIVES

A. Adhesives used to bond the core to the metal face shall be a high-performance neoprene-based cement. Adhesive shall be water resistant and heat resistant up to 100ºC.

2.5 SEALANTS

A. Sealant to be selected from available high-performance polyurethane or silicone based products. Color shall be selected from the standard color chart.

B. Joint backing to be compatible with sealant and shall be of type approved and recommended by sealant manufacturer. Diameter shall be 35% greater than joint width to prevent sagging.

2.6 FABRICATION

A. Sheet Metal Fabrication
   1. Panels shall be formed to shapes and sizes in accordance with the approved drawings. The tolerance for length and width shall be ±0.08 in (2 mm). The tolerance for squareness shall not exceed 0.24 in (6 mm) on diagonals of panel.
   2. Fabrication shall be completed before porcelain enameling. All welds shall be clean, sound and solid, free from defects and ground smooth. All necessary holes to be drilled or cut before application of porcelain enamel. All welding shall be done using base metal as described in 2.1.1. Flanges to be punched with a series of holes for the attachments of stainless steel clips.

2.7 CLEANING

A. All face panels shall be degreased by immersion in an approved degreasing fluid. The panels shall then be rinsed.

B. After the first rinse, panels shall be acid etched such that weight loss shall not be less than 0.115-0.131 oz/Ft.^{2} (35 - 190 gm/sm). Panels shall be then rinsed again.

C. After the second rinse, surface shall be treated with a nickel deposit of not less than 0.00085 oz/Ft.^{2} (0.26 g/sm). Panels shall then be dried rapidly.

2.8 ENAMELING

A. A porcelain enamel ground coat shall be applied to all areas of each panel including back and flanges. Ground coat thickness shall be approximately 0.13 mm.

B. At least one additional separately fired coating shall be applied to the face side of the panel. Thickness of the finish coat shall be approximately 0.23 mm. Final finish shall be a satisfactory color and texture to match the approved sample with 1 NBS unit. (1-2 NBS unit variation is barely perceptible to the human eye). Porcelain enamel surfaces shall be fired simultaneously with the finish coat.

C. For corrosion protection, one additional coating shall be applied to the back side of each panel and to be fired simultaneously with the finish coat.

D. Enamels shall be applied by methods recognized as good commercial practice. Panels shall be fired in a continuous furnace (not a batch type furnace) at temperature above 800ºC. After firing, every 10th panel is to be submitted to a computerized color meter with printed log output for proper color control.

E. This specification only applies to architectural porcelain enamel panels and shall conform to the applicable requirements of the "Specification for Architectural Porcelain Enamel on Steel PEI S-100" by The Porcelain Enamel Institute.

2.9 LAMINATION

A. The water resistant gypsum board core shall be glued to the back face of the porcelain panel with neoprene based cement.

B. The galvanized steel back sheet shall be glued to the back of the gypsum board with the neoprene based cement.

C. Immediately after assembling the core and the back sheet to the porcelain face panel, uniform pressure shall be applied.

D. After laminating, completely seal all joints on the back of the panel with an approved sealant to prevent moisture from entering the core.

2.10 INSPECTION

A. Prior to crating, finished panels shall be inspected for blemishes, chips and for flatness. Any panel not meeting the requirements of this specification shall be rejected.

B. A fully laminated panel up to 20 sf (1.9sm) shall meet the following flatness criteria:
   1. Convex - 0.24 in (6 mm) when measured perpendicular to the nominal plane of the panel face.
   2. Concave - .12 in (3 mm) from actual plane of panel face.

3. Deviations shall be measured with the aid of an accurate steel tape and straight edge.

PART 3 - EXECUTION

A. Install panels in accordance with manufacturers written instructions.

B. Erection: All work shall be performed by skilled workmen, especially trained and experienced in this trade. Work shall be carefully erected with proper provisions for thermal expansion and contraction, and installation tolerances.

C. Erection Tolerances: The wall cladding shall conform to the following tolerance:
1. Maximum offset from true alignment between two abutting panels shall be 2 mm.
2. Deviation from squareness shall not be greater than 6 mm.

D. Touch-Up:
1. Small chips, imperfections, blemishes or other minor defects shall be touched up in compliance with manufacturers written instructions.

E. Final Cleaning
1. Upon completion of the work of this section clean all smears, sealant, dirt and grime from the face of the porcelain panels using cleaning materials recommended by the manufacturer.

END OF SECTION

This page and next 3 pages redacted in their entirety

This page and next 6 pages redacted in their entirety

This page and next 4 pages redacted in their entirety

This page and next 5 pages redacted in their entirety

This page and next 4 pages redacted in their entirety

This page and next 6 pages redacted in their entirety

PART 1 - GENERAL

1.1 SUMMARY

A. Provide porcelain floor tile, wall tile and base cove tile with accessories, including all labour and equipment for a complete installation as indicated and specified.

B. Provide replaceable vitrified polymer composite tactile warning tile at top landing of public area stairs.

C. Provide thick set floor tile application at Station entry hall, concourse, and platform and as indicated.

D. Provide thin set floor tile application as indicated.

E. Provide waterproofing and anti-fracture/crack isolation membrane as specified.

F. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. Specification Guide 09 30 00 Tile Installation Manual 2012-2014, Terrazzo, Tile, and Marble Association of Canada (TTMAC).
2. Terrazzo, Tile, and Marble Association of Canada Maintenance Guide.
3. Specifications Guide 09 30 00 Tile Installation Manual.
4. ANSI A108/A118/A136.1 Specifications for the Installation of Ceramic Tile and ANSI A137.1 Specifications for Ceramic Tile.
5. Applicable ASTM International Standard Test Methods noted in these reference materials and this specification section.
6. ANSI A108/A118/A136.1 Installation of Ceramic Tile
7. ANSI A326.3 Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.
8. ASTM C627 Standard Method for Evaluating Ceramic Floor Tile Installation Systems
9. CAN/CGSB-75.1-M88: Tile, Ceramic.
10. Porcelain Tile Certification Agency (PTCA) for Porcelain Tile
11. CAN/CSA-A5: "Portland Cement".
12. ASTM C648-04 Standard Test Method for Breaking Strength of Ceramic Tile
13. ASTM C241-90 Abrasion Resistance
14. ASTM C501 Abrasion Resistance
15. ASTM 1597M-04 Standard Specification for Gypsum Wallboard (Hard Metric Sizes)
16. ASTM C1178/C1178M-04e1 Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
17. CSA B651 Accessible Design for the Built Environment Standard

1.3 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values per ANSI A326.3:

1. All Level Surfaces: 0.60 Minimum
2. Ramp Surfaces: 0.60 Minimum
3. Sloped Floors: 0.60 Minimum

B. The tile as well as the total assembly must be able to meet or surpass the testing requirements under conditions similar to actual transit station usage and environments.

C. Traffic Level Performance: Porcelain floor tiles to meet extra heavy traffic level performance passing ASTM C627 cycles 1 through 14 as described in TTMAC Tile Specification Guide 09 30 00. Polymer warning tile to meet abrasion resistance of ASTM C501.

D. All porcelain tiles provided for work in this Section to be frost resistant in accordance with CAN/CGSB 75.1 and shall have a moisture absorption rating of 0.4% or less.

1.4 SUBMITTALS

A. Product Data:

1. For each type of product indicated.
2. The supplier shall provide independent laboratory test results verifying slip resistance criteria for floor tiles. Products shall meet or exceed the performance requirements as indicated above.
3. Include installation and maintenance instructions.

B. Shop Drawings: Show locations of each type of tile and tile pattern, set-out point for installation of tiles, and coordination for alignment between differing tile types. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Samples for verification: Submit samples of each type of tile a minimum of six weeks before scheduled start of installation
2. Submit samples for each trim type and accessory a minimum of six weeks before scheduled start of installation

C. Qualification Data: For installer.

D. Maintenance Data: For products used for inclusion in the “Maintenance Manual”.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section, providing materials to meet or better the minimum performance requirements. Supplier to be a member in good standing with the Terrazzo, Tile and Marble Association of Canada, providing materials meeting the minimum standards of TTMAC.

B. All tile installation shall be designed and provided to meet the requirements for exterior applications and shall be compliant with all applicable standards for exterior applications.

C. Installer Qualifications: Company specializing in performing the work of this Section with documented evidence of previous similar installations. Employ skilled installers trained and experienced in the installation of tile work with minimum three (3) years documented

experience. Installer must be registered as member in good standing with the Terrazzo, Tile and Marble Association of Canada (TTMAC).

D. Source Limitations for Tile: Obtain tile of same type and colour or finish from one source or producer. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

E. Porcelain Tile Mock-ups:

1. Build mock-up of 10 square meters of each type of tile installation to verify selections and to demonstrate aesthetic effects and qualities of materials and execution.
2. Incorporate edge strips and sealants into mock ups.
3. Build mock-up of floor tile and base cove tile installations.
4. Build mock-up of wall tile installations.
5. Approved mock-ups will become part of the completed work upon Project Co's approval.
6. Project Co shall include the Province and TransLink in its inspection of the mock-up to allow the Province and TransLink to raise any objections or comments on the completed work.

F. Pre-Installation Conference: Conduct conference at Project Site two (2) weeks prior to start of installation. Attendees shall include the tile manufacturer representative, field Professional Engineer, Project Co, Architect and Subcontractor representative.

1.6 EXTRA MATERIALS

A. Supply additional material to a minimum of 4% for each type, colour and pattern of installed tile.

B. Neatly package in unopened containers, with protective covering for storage and identify with labels describing contents. Deliver to Province at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 TILE – GENERAL

A. Coordinate platform tile installation with platform edge tile.

B. Factory Blending: For tile exhibiting colour variations within ranges selected during sample submittals, blend tile in factory and package so tile units taken from one package show same range in colours as those taken from other packages and match approved samples.

C. All tile must be acid and/or chemical resistant.

D. All porcelain tile must be rectified and squared.

2.2 FLOOR TILE

A. Floor Tile: Unglazed porcelain tile with textured surface conforming to ANSI A326.3, CSA B651 where applicable, and to performance requirements as indicated in this Section 09 30 00.

B. Colour: Solid color through entire body of tile

C. Thickness: 8 mm minimum.

D. Colour: Selected from manufacturer's full range, or as noted.

E. Floor Tile 1: Field tile - Entry Hall, Concourse and Platform

1.	Manufacturer:	Atlas Concorde, Casalgrande, Caesar, or Sinola.
2.	Dimensions:	300mm x 300mm nominal; or 300mm x 600mm nominal
3.	Colour:	as selected from manufacturer's full range

F. Floor Tile 2: Designated Waiting Area (DWA)

1.	Manufacturer:	Atlas Concorde, Casalgrande, Caesar, or Sinola.
2.	Dimensions :	300mm x 300mm nominal; or 300mm x 600mm nominal
3.	Colour :	as selected from manufacturer's full range - must contrast with Floor Tile 1

G. Floor Tile 3: Tactile Warning Tile for Visually Impaired (at top landing of public area stairs)

1.	Manufacturer:	Kinesik Engineered Products Inc.
2.	Series:	Access Tile - Tactile Indicator Tile - vitrified polymer composite
3.	Dimensions:	750mm deep x width as indicated on drawings
4.	Finish:	Textured with truncated domes
5.	Colour:	Federal Yellow

H. Floor Tile 4: Wayfinding Tile for Visually Impaired (Platform Level: from elevators to DWA, Concourse Level: from elevator to elevator)

1.	Manufacturer:	Kinesik Engineered Products Inc.
2.	Series:	'Elan' Tactile Direction Indicator surface, porcelain tile.
3.	Dimensions:	300mm x 300mm nominal
4.	Finish:	Textured with raised guidance bars
5.	Colour:	Black

2.3 WALL TILE

A. Wall Tile: Glazed or unglazed porcelain tile. Solid colour through entire body of tile.

B. Thickness: 8 mm minimum.

C. Colour: as selected from manufacturers full range.

D. Manufacturers: Atlas Concorde, Caesar, Casalgrande or Sinola.

2.4 COVE BASE TILE

A. Cove base tile: Unglazed porcelain tile. Color to match floor tile color, cove, corner, and bullnose fittings as required to trim at walls, and other like terminations.

B. Thickness: 8mm minimum

C. Colour: as selected from manufacturer's full range.

2.5 SETTING AND GROUTING MATERIALS

A. Setting and grouting mixtures shall be provided in accordance with TTMAC Tile Installation Manual, for the particular system specified and in accordance with approved tile manufacturer's

latest printed directions unless otherwise shown. Colour shall be selected to match and compliment selected tile color as closely as possible by consideration of various approved available manufacturer's standard colours.

B. Setting bed for wall and floor porcelain tile shall be two component non-flammable, non-toxic, latex or acrylic reinforced thin-set mortar system undiluted and factory prepared. Companion joint grouting materials shall be used and colour shall be as selected from manufacturer's full range.

C. Use high quality tile accessories at major horizontal or vertical corner joints and expansion joints in lieu of grout or sealant, as well as other locations where there is high probability of grout joints cracking due to movement.

D. Grout release agent must be applied to tile surfaces prior to grouting.

1. Or equal alternative.

E. All water used for the preparation of all applicable tile assembly materials shall be potable, clean and free of chemicals and contaminants detrimental to mortar or grout mixes.

F. Polymer Composite Tactile Warning Tile: Tactile Bond and Seal dual purpose sealant/adhesive.

2.6 THICK SET APPLICATIONS

A. Thick set mortar bed sloped to floor drains as required

B. Slurry Thick Mortar Bed Bond Coat

C. Portland Cement Mortar (Thick Set) Installation Materials: Conforming to ANSI A108/A118/A136 as specified below:

1. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

2. Welded wire reinforcement mesh (if required): 51 mm x 51 mm mesh size, fabricated from 1.6 mm thick galvanized steel wire; welded fabric design

2.7 THIN SET APPLICATIONS

A. Floors: Chemical-Resistant, Water-Cleanable, Tile Setting and Grouting, conforming to ANSI A108/A118/A136.

B. Walls: Latex-Portland Cement Mortar (Thin Set): consisting of pre-packaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive. For wall applications, provide non-sagging mortar that complies with Paragraph F-4.6.1.

C. Metal window sill channels, structural steel angles and other miscellaneous metals elements to receive a bonded tile finish if applicable.

2.8 WATERPROOFING & ANTI-FRACTURE/CRACK ISOLATION MEMBRANE

A. Waterproofing and Anti-Fracture Membrane: conforming to ASTM C627 rated for extra heavy service.

2.9 SHOWER WATERPROOFING AND SHOWER DRAINS

A. Provide a manufactured shower waterproofing system including wall and floor membranes, flashing, sloping substrates, integral or compatible floor drains and other products and accessories as required to provide a complete waterproofing system for the entire shower assembly:

B. Follow all manufacturers instructions, requirements and recommendations for its installation and compatibility of associated materials used in conjunction with the system.

C. Slope finish shower floors to drain.

D. Extend waterproofing floor and wall base membrane to areas adjacent to the shower if they will be subjected to excess water from the shower areas sloped to a second floor drain to discharge water as required.

2.10 TILE GROUT, BACKER BOARDS AND ACCESSORIES

A. Floor and Wall Tile Premium Grout: Cement based chemical-resistant, water-cleanable, tile grout.

B. Floor & Wall Tile Epoxy Grout: For shower stalls/enclosures only.

C. Floor or Wall Tile Caulking/Sealant: Silicone or urethane sealant, frost proof and flexible. Ensure compatibility with all tile setting products used on site and make necessary adjustments to sealant products as required of equal quality and meeting all performance criteria.

1. Install appropriate bond breaker below the sealant to prevent bonding to the mortar surface.

D. Tile Backer Board:

1. Cementitious Backer Board: High density, cementitious, glass fiber reinforced, 12.7 mm thick.
2. Fiber-Cement Underlayment: 12.7 mm thick.

E. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, stainless steel; ASTM A 666, 300 Series exposed-edge material.

F. Prefabricated movement joints:

1. Control, expansion, and wall termination joints as per TTMAC, TCNA and manufacturers recommendations

G. Sealers: Compatible for use with unglazed tile and grout as recommended by the tile manufacturer for use in wet areas.

H. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.11 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

A. Comply with installation methods and details of TTMAC Specification Guide 09 30 00 tile Installation Manual and ANSI A108/A118/A136.1. Specifications for the Installation of Porcelain Tile.

B. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

C. TTMAC Specification Guide 09 30 00 Tile Installation Manual: Comply with installation methods and details.

D. Refer to notes on pages 10 – 14 and Detail 301 MJ-2-002 in TTMAC Manual.

E. Notwithstanding the Manufacturer's recommendations, no tiling work shall be done when the ambient temperature is lower than 10^{o} C. The Subcontractor shall provide heating, hoarding and ventilation to ensure that the temperature is maintained above 10^{o} C in the area of the Work during the setting time.

F. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

G. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

H. Apply tile to bond coat before bond coat skins over. Use sufficient bond to ensure 95% contact on surfaces. Ensure contact is evenly distributed. Slide tile firmly into position.

I. Allow bond coat to cure. Force grout into full depth of joint, remove excess grout, and clean.

J. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

K. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

   1. Locate joints in tile surfaces directly above joints in concrete substrates.

L. Crack Isolation: Use method 309 F-2002 from TTMAC Manual or crack isolation membrane where recommended by membrane manufacturer.

M. Tile Grout:

   1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108/A118/A136.1.

   2. For chemical-resistant grouts, comply with ANSI A108/A118/A136.1.

N. Metal Edge & Transition Strips: Exposed tile edges not permitted. Install at locations indicated, and where tile edges do not terminate at building elements. Install transition strips at butted floor transitions.

O. All tile edges shall terminate into another building element perpendicular to the tile edge or an appropriate tile accessory transition strip. Exposed tile edges are not acceptable. Tile accessory transition strips shall also be used at butted floor transitions so that the accessory strip will form a straight transition to the adjacent material and the tile can start with a grout joint between the transition strip and adjacent material to provide a clean installation, allow for dissimilar movement of materials and protect tile edges from chipping.

3.2 CLEANING AND PROTECTING

A. Clean all tile surfaces according to tile and grout manufacturer's written instructions.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. After tile installation is fully complete and cured, provide protective covering in traffic areas until Substantial Completion.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.3 FLOOR TILE INSTALLATION - GENERAL

A. General: Install tile to comply with requirements in the floor tile installation schedule, including those referencing Tile Installation Manual and ANSI A108 Series of tile installation standards.

1. Follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage for tile floors.

B. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit closely to electrical outlets, piping fixtures, and other penetrations so plates, collars, or covers overlap tile.

C. Jointing Pattern: Lay tile in grid pattern unless indicated otherwise. Align joints when adjoining tiles on floor, base, walls and trim are same size. Lay out tile work and centre tile fields in both directions in each space or on each wall area. Unless indicated otherwise. Provide uniform joint widths unless indicated otherwise.

D. Joint Widths - Paver Tile: not greater than 6.0 mm

3.4 TOLERANCES

A. Tolerances: Observe the following tolerances when laying tiles:

1. Joint variation: not be more than + 1.5 mm except as specified herein.
2. Where tile abuts columns and walls:
    a. Perimeter tiles: minimum of one-half (1/2) of full-size tile.
    b. Grout joint: not greater than 6.0 mm wide.
3. Tile top surfaces shall be within 1.5 mm of adjacent tiles.
4. Tiles shall be installed, unless otherwise shown on the drawings provided by Project Co, centered on areas to be covered. Tile joints shall be true to line and square

perpendicularly. Joints shall not vary more than 6.0 mm in 6.0 m over their length from establisher layout lines.

5. Check completed tile at every column bay for layout conformity.

3.5 WALL TILE INSTALLATION - GENERAL

A. Fill joints between cementitious tile backer boards with jointing mortar recommended by tile adhesive manufacturer. Embed 50 mm (2 inches) wide high-strength alkali-resistant glass tape and level off.

B. Install types of tile designated for wall installations to comply with requirements in the wall tile installation schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

C. Wall Tile Joint Widths: not greater than 6.0mm

3.6 FLOOR TILE INSTALLATION

A. Floor Tile 1 Installation – Station Platforms:

1. Floor tile installation on concrete; cement mortar bed (thickset) with waterproof/anti-fracture membrane thinset mortar; Tile Installation Manual and ANSI A108/A118/A136.1.
    a. Tile Type: Unglazed porcelain tile.
    b. Thick Set Mortar: Latex-portland cement mortar.
    c. Grout: Chemical-resistant, water-cleanable, tile-setting sanded grout.

B. Floor Tile 2 Installation – Station Concourses and Entry Halls:

1. Floor tile installation on concrete; waterproof/anti-fracture membrane, thick-set mortar;
    a. Tile Type: Unglazed porcelain tile.
    b. Thin Set Mortar: Latex-portland cement mortar.
    c. Grout: Chemical-resistant, water-cleanable, tile-setting sanded grout.

C. Floor Tile 3 Installation – Polymer Composite Tactile Warning Tile:

1. Vitrified Polymer Composite Tactile Warning Tile: tile to be custom cut by Kinesik Engineered Products Inc. to suit specific site conditions as indicated on drawings and to be in compliance with CSA B651. Install to manufacturer’s instructions.

D. Floor Tile 4 Installation

1. See 3.6 A. and 3.6 B.

3.7 WALL TILE INSTALLATION

A. Tile Installation – Concourse and Platform Walls:

1. Interior wall installation over cementitious backer units; thin-set mortar; Tile Installation Manual and ANSI A108/A118/A136.1.
    a. Tile Type: Wall porcelain tile.
    b. Thin Set Mortar: Latex-portland cement mortar.
    c. Grout: Chemical-resistant, water-cleanable, tile-setting sanded grout.

3.8 COVE BASE TILE INSTALLATION

A. Cove Base Tile Installation – Concourse and Platform:

1. Interior wall installation over cementitious backer units; thin-set mortar; Tile Installation Manual and ANSI A108/A118/A136.1.

    a. Tile Type: Base cove porcelain tile.

    b. Thin Set Mortar: Latex-portland cement mortar.

    c. Grout: Chemical-resistant, water-cleanable, tile-setting sanded grout. Grout to match adjacent floor tile grout.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for supply and installation of modular paver detectible/tactile warning surface tiles (platform edge tile), 600mm wide x 619mm long x 50mm thick nominal with high strength polymeric concrete core including integral stainless steel clip angles, levelling screws, and fastening bolts and washers, and all required accessories for a complete platform edge tile system**.**

B. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. CSA B651 Accessible Design for the Built Environment
2. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
3. ASTM C501, Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by Taber Abraser.
4. ASTM C1028, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
5. ASTM D543, Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
6. ASTM D570, Standard Test Method for Water Absorption of Plastics.
7. ASTM D638, Standard Test Method for Tensile Properties of Plastics.
8. ASTM D695, Standard Test Method for Compressive Properties of Rigid Plastics.
9. ASTM D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
10. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Approved submittals shall be retained and available on request. Submittals will include the following:

1. Product Data: Manufacturer’s literature describing products, installation and routine maintenance.
2. Samples for Review and Verification:

   a. One (1) sample c/w polymeric concrete fill in the required size, colour, truncated dome pattern, finish and tactile surface c/w stainless steel clip angles, levelling set screws, fastening bolts and washers shall be provided for approval and for verification prior to fabrication.

   b. Two (2) samples w/o polymeric concrete fill in the required size, colour, truncated dome pattern, finish and tactile surface c/w stainless steel clip angles, levelling set screws, fastening bolts and washers shall be provided.

3. Shop Drawings: Required for review showing truncated dome pattern, fabrication details; composite structural system; plan of tile placement including joint details; materials; accessories; and installation procedure.
4. Material Specifications: Submit manufacturer's specifications confirming compliance with specifications as listed under this Section's performance requirements.
5. Installation Procedures: Submit copies of manufacturer's specified installation procedures.
6. Maintenance Instructions: Submit copies of manufacturer's specified maintenance practices.

1.4 QUALITY ASSURANCE

A. Provide platform edge tile and accessories as produced by a single manufacturer.

B. Installer Qualifications: Installer shall be experienced and qualified for installation.

C. Provide tactile warning surfaces which comply with the tactile walking surface indicators section of CSA B651 Standards with truncated domes in a diagonal pattern.

D. Pre-Installation Conference: Two weeks prior to start of installation, convene pre-installation conference. Review the following:

1. Requirements for concrete substrate
2. Location of control joints
3. Installation of platform edge angle assembly and floor finish termination angle
4. Coordination with reviewed shop drawings

1.5 PERFORMANCE REQUIREMENTS

A. Water absorption of tile when tested to ASTM D570: not to exceed 0.35%

B. Slip resistance of tile when tested to ASTM C1028 for combined wet/dry static coefficient of friction values are not to be less than 0.80 on top of domes and field area.

C. Compressive strength of tile when tested to ASTM D695: not less than 186 MPa.

D. Tensile strength of tile when tested to ASTM D638: not less than 131 MPa.

E. Flexural strength of tile when tested to ASTM D790: not less than 172 MPa.

F. Gardner impact to geometry "GE" of the standard when tested to ASTM D5420 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. A failure is noted if a hairline fracture is visible in the specimen.

G. Chemical stain resistance of tile when tested to ASTM D543 to withstand without discoloration or staining: 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil.

H. Abrasive wear of tile when tested by BYK - Gardner Tester to ASTM-D 2486-00* (*ATX-G-U Standard) with reciprocating linear motion of 37 ± cycles per minute over a 250mm travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is 1.45kg. Average wear depth shall not

exceed 0.04 after 1000 abrasion cycles measured on the top surface of the dome representing the average of six measurement locations per sample.

I. Abrasive wear Index to ASTM C501 shall be not less than 500.

J. Fire Resistance: When tested to ASTM E84, flame spread shall be less than 25.

K. Accelerated weathering of tile when tested to ASTM G155 for 3000 hours shall exhibit the following result - $\Delta E < 4.5$as well as no deterioration, fading or chalking of surface of tile color No.33538/Federal Yellow.

L. Accelerated aging and freeze thaw test of tile and adhesive system when tested to ASTM D1037 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.

M. Salt spray performance of tile and adhesive system when tested to ASTM B117 not to show any deterioration or other defects after 200 hours of exposure.

N. Polymer concrete and/or epoxy resin properties shall meet or exceed the following criteria:

1. Tensile Strength of Resin: ASTM D638: greater than 48 MPa.

2. Modulus of Elasticity of Resin: ASTM D638: greater than 27 MPa.

3. Bond Strength of Polymer Concrete: ASTM C551: greater than 55 MPa.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver platform edge tiles and accessories to the site in original, unopened package, identified by part number, packaged or crated to prevent damage in shipping or handling, delivered to location as directed.

B. Unload platform edge tile and check for damage. Project Co to advise in writing within 24 hours of receipt of tile of any damaged platform edge tiles.

C. Store in a secured space where products will be protected against damage from moisture, temperature extremes, direct sunlight, surface contamination and other causes.

1.7 SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40°F (4.4°C) in spaces to receive platform edge tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store platform edge tiles in spaces where they will be installed for at least 48 hours prior to installation, and subsequently maintain minimum temperature as indicated above for such areas.

1.8 EXTRA MATERIALS

A. Deliver extra stock to location as designated by Province. Furnish materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification. Provide not less than 2 % of the standard dimension tile and two (2) of each tapered tile.

1.9 WARRANTY

A. Provide 10 year manufacturer’s warranty on the tile.

B. Platform edge tile installation shall be warrantied in writing for a period of two (2) years from date of Substantial Completion of the Project. The warranty includes defective workmanship including, but not limited to, loosening of tiles or platform edge angle assembly.

PART 2 - PRODUCTS

2.1 PLATFORM EDGE TILE

A. Basis of Design: Armor-Tile manufactured by Engineered Plastics Inc or approved equal.

B. Product: Vitrified Polymer Composite (VPC) modular platform edge tactile surface tile of epoxy polymer composition with an ultra-violet coating employing aluminum oxide particles in the truncated domes.

C. Truncated domes (tactile attention indicator surfaces) in compliance with requirements of CSA B651 Standards with truncated domes in a diagonal pattern.

D. Dimensions - Platform edge tiles shall conform to the following dimensions and tolerances:

1. Width and Length: 600mm x 619mm to suit typical station module, note typical requirement for tapered platform edge tile along last 2500mm at each end of platform.
2. Depth: 50mm (+/- 1mm)
3. Face Thickness: 3.2mm (+/- 5% max)
4. Warpage of Edge: 0.5% max
5. Insert locations: (+/-) 2mm from center of specified shop drawing dimension
6. Insert Angle: max. 2 degrees off axial centerline of hole (+1mm)

E. Colour: Yellow, conforming to Federal Colour No. 33538. Colour shall be homogeneous through the body / full thickness of the tile.

F. Core Materials: Platform edge tiles shall have a structural polymer concrete core and internal stainless steel fastening system as installed by the manufacturer.

G. Fasteners: stainless steel levelling screws and stainless steel M20 fastening bolts and washers.

H. Threaded Holes / Inserts: Ensure that threaded holes are sized and finished to accommodate fastening bolts and levelling screws.

I. Provide a continuous 10mm x 7mm drip groove to underside of front face of tile.

2.2 ACCESSORIES

A. Platform Edge Angle Assembly: 152 x 89 x 9.5mm x 2440mm steel angle with 40 x 9.5 x 2440 steel flat plate extension welded to bottom leg of platform edge angle and ground smooth c/w slotted holes for adjustable fastening to platform slab. Entire assembly to be hot-dip galvanized.

B. Platform Edge Angle Fastening Bolts:

1. Hilti KB3 19dia. x 203 LT HDG Galvanized Expansion Anchor, OR,
2. 19dia. X 203 galvanized threaded rod, drilled and epoxied insert

C. Floor Finish Termination Angle: 75 (varies dependent on depth of mortar bed) x 50 x 3mm x 2440mm continuous prime painted angle, positioned under edge tile adjustable set screws and secured to structural slab with a minimum of three (3) Hilti fasteners.

D. Sealants: Ensure that sealant is compatible with substrates. Use closed cell foam backer rod.

1. Between Platform Edge Tile and Platform Floor Tile: Polyurethane elastomeric sealant

   a. Acceptable Product: Sika SikaFlex 2c NS EZ Mix TG; or acceptable equal. Minimum Shore `A' Hardness 45 +/-5. Colour: pre-pigmented Limestone Grey.

2. Between Platform Edge Tiles: Polyurethane elastomeric sealant

   a. Acceptable Product: Sika SikaFlex 2c NS EZ Mix TG; or acceptable equal sealant. Minimum Shore `A' Hardness 45 +/-5. Colour: pre-pigmented Limestone Grey.

E. Neoprene Membrane Gasket: 3mm x 75mm Neo 60, continuous closed cell peel and stick neoprene gasket to top of platform edge angle

F. Washers: Provide galvanized plate, flat and lock washers and other accessories for a complete installation.

G. Thread Locking Fluid: Loctite 263, by Loctite.

PART 3 - EXECUTION

3.1 INSTALLATION – PLATFORM EDGE TILE

A. Platform edge to be installed after the guideway rails have been installed, surveyed and accepted by Project Co.

B. Install platform edge angle c/w fastening bolts, plate and lock washers and adjust height.

C. Install neoprene gasket on platform edge angle and cut holes for bolts.

D. Install floor finish termination angle.

E. Install platform edge tiles in accordance with manufacturer's written instructions, installation procedures and reviewed shop drawings.

F. Place and adjust platform edge tiles using stainless steel levelling screws and stainless steel fastening bolts c/w flat and lock washers.

G. For final tightening, apply thread locking fluid to threads of platform edge tile stainless steel levelling screws and fastening bolts, and galvanized platform edge angle fastening bolts..

H. Use an electronic level to check that required slope is achieved and tiles are positioned within allowable tolerances. Installed platform edge tiles must be true and square to platform edge in accordance with contract drawings.

I. Project Co to provide written survey confirmation that platform edge tile have been installed in compliance with specified tolerances as follows:

1. Vertical Tolerance: 751mm (-5, +0) top front edge of platform edge tile to top of rail

2. Horizontal Tolerance: 1300mm (+5, -0) face of platform edge tile to centreline of track

3.2 INSTALLATION – SEALANT

A. Apply joint sealant in compliance with manufacturer's written instructions.

3.3 CLEANING, PROTECTING AND MAINTENANCE

A. Protect platform edge tiles against damage during construction period.

B. Protect platform edge tiles against damage following installation by covering tile with plywood.

C. Perform final cleaning of platform edge tiles not more than four days prior to date scheduled for inspection intended to establish Substantial Completion in each area of Project.

D. Clean platform edge tile surfaces using method specified by platform edge tile manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide vinyl conductive resilient flooring with materials and accessories as specified for a complete installation to EER (Electrical Equipment Room), SCR (Switch Control Room), and RR (Radio Room) located at Stations or PPS (Propulsion Power Station) as indicated on drawings.

B. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials
2. ASTM F150, Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
3. ASTM E648, Test Method for Critical Radiant Flux of Floor Covering Utilizing Radiant Energy Source
4. ASTM E662, Test Method for Specific Optical Density of Smoke Generated by Solid Materials
5. ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
6. ASTM F970, Test Method for Static Loading
7. ASTM D2047, Standard Test Method for Evaluating the Standard Coefficient of Friction of Polish-Coated Flooring Surfaces
8. ASTM D1044, Test Method for Resistance of Transparent Plastic to Surface Abrasion
9. ASTM F1303, Standard Specifications for Vinyl Sheet Floor Covering with Backing
10. ASTM F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
11. ASTM F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes
12. UL 779, Standard for Electrically Conductive Floorings
13. NFPA 99, Health Care Facilities Code
14. NFPA 101, Safety to Life from Fire in Buildings and Structures
15. NFCA Floor Covering Reference Manual
16. CAN/ULC S102.2 Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

1.3 SUBMITTALS

A. Product Data: For sheet flooring and adhesive, and moisture control coating if required.

B. Shop Drawings: 8 1/2” x 11” floor plans indicating floor covering layout and approximate square footage for areas to receive sheet flooring.

C. Submit manufacturer’s requirements for grounding to achieve the specified electrical resistance.

D. Samples: Submit two 300 x 300mm samples of resilient flooring as specified.

E. Reports: Submit reports of moisture and alkalinity tests on substrate surfaces. Confirm that surfaces are properly cured within limits of moisture content specified by manufacturers of flooring and adhesives.

F. Maintenance Data: Johnsonite's Installation and Maintenance Instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in conductive resilient flooring application with a minimum of five (5) years proven experience with similar projects.

B. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor coverings.

C. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

D. Close spaces to traffic during flooring installation.

E. Close spaces to traffic for 48 hours after flooring installation.

F. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the requirements of this Section, the following manufacturers are acceptable:

1. Tarkett iQ Toro SC Static Conductive Vinyl Flooring
2. Or acceptable alternative equal to the product specified.

2.2 VINYL CONDUCTIVE RESILIENT FLOORING

A. Sheet Flooring: Homogenous, pure carbon backing, sheet vinyl flooring conforming to ASTM F1303, 2.0 mm (0.080 inch) minimum thickness.

1. Wearing Surface: Smooth, wear resistant, ASTM D1044.
2. Sheet Width: To manufacturer's standard dimensions.
3. Colour: #100 / Tundra, Welding Rod #1287322.
4. Standards: conform to NFPA 101, Class 1 interior floor finish and ASTM F1303 Type II, Grade 1, Class B performance sheet vinyl floorcovering with backing.
5. Load Limit: 17.5kg/cm2, ASTM F970.
6. NBS Smoke Developed: 450 maximum, ASTM E662.
7. Flame Spread: 75 maximum, ASTM E84.
8. Critical Radiant Flux: 0.45 watts/cm2 minimum, ASTM E648.
9. Electrical Resistance: 25,000 - 1,000,000 ohms between electrodes; 25,000 ohms minimum, floor to ground, ASTM F150.
10. Slip Resistance: Minimum wet and dry value to exceed 0.50 coefficient of friction, ASTM D2047.

2.3 ACCESSORIES

A. Select all materials, adhesives and accessories to meet manufacturer's requirements for a complete conductive resilient flooring installation.

1. Trowelable Levelling and Patching Compounds;
2. Adhesives: Water-resistant;
3. Copper Ground and Copper Ground Connector;
4. Edge Strip: Extruded aluminum or stainless steel; and
5. Moisture Control Coating: Ardex MC Rapid or acceptable equal alternate

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions.

B. Prepare concrete substrate according to ASTM F710 including the following:

1. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
   a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapour-emission rate of 2.27kg of water/92.9 sq. m (5 lb of water/1000 sq. ft.) in 24 hours.

      OR

   b. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates do not exceed 80% relative humidity level measurement.

C. **NOTE: if moisture vapour emissions or relative humidity requirements of 3.1 B.1 above cannot be achieved, the concrete floor surface is to receive a moisture control coating application prior to installation of finished floor covering.**

3.2 FLOOR COVERING INSTALLATION

A. Flooring Installation: Comply with manufacturer's written instructions.

B. Install copper grounding in accordance with manufacturer's recommendations to achieve electrical resistance specified and provide for positive connection to ground buss.

C. Extend floor coverings into recesses (specifically at columns), door reveals, and similar openings.

D. Terminate resilient flooring at centerline of door openings.

E. Install edge strips at unprotected and exposed edges where flooring terminates. Install where edge of flooring would otherwise be exposed.

3.3 FIELD QUALITY CONTROL

A. Conductive Flooring Tests: Test conductive flooring installation in accordance with NFPA 99 and ASTM F150, and in accordance with manufacturer's recommendations.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor covering.

B. Do not wax or seal conductive flooring.

C. Cover flooring until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide trowelled and sealed non-conductive seamless epoxy floor coating with accessories for a complete system as indicated and specified.

B. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise indicated.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. Standards as described in manufacturer’s printed literature;
2. ASTM C321, Standard Test Method for Bond Strength of Chemical-Resistant Mortars;
3. ASTM D1864/D1864M, Standard Test Method for Moisture in Mineral Aggregate Used on Built-Up Roofs

1.3 SUBMITTALS

A. Product Data: Submit copies of manufacturer's technical data, test reports, installation instructions, material safety data sheets and general recommendations.

B. Samples: Submit a 300 x 300 mm sample of epoxy floor coating system applied to a rigid backing, in colour and finish required.

C. Maintenance Data: Submit maintenance data for incorporation into maintenance manuals. Include manufacturer's printed data covering the care, cleaning and maintenance of epoxy floor finishes.

D. Test Reports for:

1. moisture content of substrate;
2. surface survey of finished installation; and
3. confirmation of 1 Megohm (minimum) electrical resistance

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of epoxy floor coatings and having manufactured such products for a minimum of ten (10) years. Use products and materials from same source for entire contract.

B. Manufacturer's Technical Representative:

1. Provide a manufacturer’s technical representative to inspect surfaces to which flooring is to be applied and confirm in writing that substrate is acceptable for application of flooring.
2. Technical representative shall carry out regular site inspections to ensure installation is performed in accordance with manufacturer's printed installation instructions and deficiencies are corrected.
3. Submit written inspection reports covering quality of installation and acceptance of completed work or corrections required.

C. Installer: Company acceptable to the manufacturer for installation of their products, specializing in epoxy flooring applications, having trained applicators with a minimum of five (5) years proven experience for projects of similar size and complexity.

D. Pre-Installation Conference: Convene a pre-installation conference. Attendees shall include: epoxy floor coating installer, epoxy floor coating manufacturer's technical representative, and Project Co.

E. Moisture:

1. Moisture Levels: Perform moisture testing in accordance with recommendations of coating manufacturer. Do not apply coatings until manufacturer acceptable moisture levels are achieved.
2. Moisture Content: Less than 3% when tested to ASTM D1864.
3. If the moisture content of <4% cannot be achieved, a cementitious, epoxy modified moisture barrier shall be installed to achieve moisture content acceptable to coating manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the specifications of this Section, the following manufacturers are acceptable:

1. Epoxy Flooring: Sikafloor Quartzite Trowel System or approved equal alternative
2. Moisture Barrier: Sikafloor 81 Epocem or acceptable alternative compatible with epoxy flooring product
3. Repair Mortar: SikaQuick 1000 or acceptable alternative compatible with epoxy flooring product

2.2 SEAMLESS QUARTZ EPOXY FLOORING SYSTEM

A. Non-Conductive Epoxy Flooring: 15mm thick (minimum 12mm) high-build, level finish, non-slip, durable, hard, impact resistant surface with a minimum 1 Megohm per square meter electrical resistance across topping thickness at normal temperature and humidity, compressive strength of 47.8 MPa minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Carefully inspect surfaces and materials to which work of this Section is to be applied. Ensure surfaces are sound, satisfactory and are prepared in compliance with manufacturer’s written instructions and meet approval of manufacturer's technical representative.

B. Remediate slab depressions that exceed 15mm slab depression for epoxy flooring installation as per manufacturer’s recommended procedure using a system compatible repair mortar.

C. Apply each component of epoxy floor coating system in compliance with manufacturer's written instructions to produce a uniform monolithic wearing surface of thickness indicated.

D. Coordinate installation of flooring system with installed switchgear ground plates.

E. Install epoxy floor coating system to slab depression thickness, flush with elevation of adjoining floor.

F. Prepare electrical grounding in accordance with manufacturers product requirements.

3.2 TOLERANCES

A. Finish surface shall be level and smooth to a tolerance not to exceed +/- 6mm in three meters.

B. Installer to provide survey of finished floor surface on 500 mm square grid to confirm above tolerances.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and application of high performance coating systems on the following substrates:

1. "Architectural Exposed Steel" - refer to definition contained herein.

B. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 REFERENCES

A. Referenced standards shall be the current edition unless otherwise noted.

B. Work of this Section shall conform to the following standards unless indicated otherwise:

1. NACE Industrial Maintenance Painting. National Association of Corrosion Engineers.
2. SSPC Steel Structures Painting Manual, The Society for Protective Coatings, formerly SSPC - Steel Structures Painting Council.
3. ASTM D522 Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
4. ASTM D523, Standard Test Method for Specular Gloss.
5. ASTM D610, Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces.
6. ASTM D660, Standard Test Method for Evaluating Degree of Checking of Exterior Paints.
7. ASTM D661, Standard Test Method for Evaluating Degree of Cracking of Exterior Paints.
8. ASTM D714, Standard Test Method for Evaluating Degree of Blistering of Paints.
9. ASTM D3359, Standard Test Methods for Measuring Adhesion by Tape Test.
10. ASTM D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
11. ASTM D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
12. ASTM D4414, Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
13. ASTM D4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
14. ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
15. ASTM D4585, Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
16. ASTM D5894 Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet.
17. ASTM D7091, Standard Practice for Non-destructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.

18. ISO 2409, Paints and varnishes – Cross-cut test.
19. ISO 2808, Paints and varnishes – Determination of film thickness.
20. ISO 8501-1, Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.
21. ISO 8503-2, Preparation of steel substrates before application of paints and related products – Surface roughness characteristics of blast-cleaned steel substrates – Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel – Comparator procedure.
22. ISO 8504, Preparation of steel substrates before application of paints and related products. Surface preparation methods.
23. ISO 9001-2000, Quality management systems – Requirements.
24. ISO 12944, Paints and varnishes – Corrosion protection of steel structures by protective paint systems.

1.3 DEFINITIONS

A. "Architectural Exposed Steel (AES)":

1. Structural steel members exposed to view in public areas of Stations.
2. Miscellaneous steel including but not restricted to; all furniture components (except stainless steel), non-stainless steel handrails and railings, and metal fabrications exposed to view in public areas of Stations and on the public area platform within 2m of the platform edge. **[Note to Proponents: Not applicable to hollow metal steel doors and frames, and glazed anodized aluminum platform end gates and frames.]**

B. "Supplier": supplier retained by Project Co to perform high performance coating works, including supply of coating material, preparation work of all surface (to receive the coating) and application and curing of all coatings.

1.4 PERFORMANCE REQUIREMENTS – STEEL COATINGS

A. Architectural Exposed Steel: To ISO 12944, C4 Environment / High Durability:

1. ASTM D5894 Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet
   a. Less than 2 mm scribe creep after 12 cycles or 4200 hours

B. Architectural Exposed Steel: finish coat requirements

1. ASTM D522 Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
   a. Pass 10 mm mandrel when applied at typical DFT to aluminium panel
2. ASTM D523, Standard Test Method for Specular Gloss
   a. 88-92% at 60 degree geometry for typical DFT applied to glass panel
3. ASTM D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

a. Average of 138 mg. loss when tested with CS17 wheel after 1000 cycles for typical DFT applied directly to abraded steel

b. Average of 68 mg. loss when tested with CS10 wheel after 1000 cycles for typical DFT applied directly to abraded steel.

1.5 SUBMITTALS

A. Product Data: Cross-reference products to coating system and locations of application areas. Use same designations indicated on drawings provided by Project Co and in schedules.

1. Manufacturer's product data sheet
2. MSDS Sheet
3. Performance test data

B. Samples for Initial Selection: For each type of coating product indicated.

C. Samples for Verification: For each type of coating system and in each colour and gloss of coat indicated.

1. Submit samples on rigid backing, 200 mm (8 inches) square;
2. Step coats on samples to show each coat required for coating system;
3. Label each coat of each sample; and
4. Label each sample for location and application area.

1.6 QUALITY ASSURANCE

A. Inspection Agency/Quality Control by Supplier: Provide quality control in accordance with Supplier's quality assurance management system through an independent NACE Level 1 inspector.

B. Coating materials shall be from one supplier only.

C. Qualifications – Applicators:

1. Applicators shall be skilled, trained, experienced and familiar with the specified requirements and methods necessary for proper performance of work, with a minimum of 3 years experience in projects that are similar in size and complexity.
2. Installer must be pre-qualified by coating manufacturer as qualified to work with high performance coating materials.

D. Manufacturer's Representative:

1. Ensure manufacturer's technical representative is present to review coating procedures during the initial coating application. In addition, the Supplier's technical representative shall make periodic inspections of the coating application throughout the remainder of the work and provide written reports on quality control of the results of the inspection.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store materials not in use with labels intact, in tightly covered containers, in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C.

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

B. Storage and Protection:

1. Provide suitable temporary weather tight storage facilities as may be required for materials that will otherwise be damaged by storage in the open.
2. Store materials between 5 deg C and 40 deg C in dry, shaded conditions away from sources of heat and ignitions. Protect from frost. Store and protect materials from damage.
3. Maintain MSDS reports on all stored materials at project site, accessible to employees.
4. Keep materials sealed until ready for use.
5. Do not use material which exceeds manufacturers stated shelf life limitation.

1.8 PROJECT CONDITIONS – GENERAL

A. Do not apply coatings in snow, rain, fog, or mist.

B. Do not apply coatings to surfaces which are dirty, dusty, rusty, damp or oily.

C. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 10 and 35°C.

D. Apply coatings only when relative humidity is between 40% and 85%.

E. Temperature of surfaces to be painted must always be a minimum of 3°C above dew point.

F. For elevated temperature, low temperature or humid curing: In accordance with manufacturer's written instructions.

1.9 SHOP APPLICATION CONDITIONS

A. Except for touch-ups and repairs, coatings to Architectural Exposed Steel are to be shop applied by conventional (air or airless) spray application.

B. All surfaces to be coated shall meet the specified requirements of 3.4 Surface Preparation immediately prior to coating.

C. Whenever work is being accomplished in an operating environment, or when preparation and painting are being carried out simultaneously, power wash primed surfaces prior to application of intermediate coat and finish coat to remove soluble salts and other foreign matter while maintaining a pH level of no less than 6 or no greater than 8.Should the pH level remain less than 6 or greater than 8, re-wash the entire area until the pH level can be brought back into the acceptable range.

D. In the event visible rusting occurs, relative humidity exceeds 85%, or temperature of surface to be painted falls within 3°C of dew point prior to application of prime coat, re-blast surface to be painted.

1.10 FIELD APPLICATION CONDITIONS

A. Except for touch-ups and repairs, coatings to Architectural Exposed Steel are to be applied by conventional (air or airless) spray application.

B. Apply and cure coatings at times when wind is less than 24.15 km/h (15 miles per hour), when a freshly painted test plate does not pick up visible dust upon two minute exposure.

C. If an item has received only a prime coat or prime and intermediate coats and has exceeded the overcoating window, do not apply final coat until last coat has been prepared by light sandblast, light wire brushing or other preparation as recommended by coating manufacturer.

1.11 WARRANTY

A. Provide coating manufacturer's written ten (10) year material warranty for the coating system installed.

B. Provide Supplier's written two (2) year labour warranty for the coating system installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide coating system by one of the following:

1. International Paint; or
2. approved alternative

2.2 HIGH PERFORMANCE COATINGS – GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Provide products of same manufacturer for each coat in a coating system.

B. Colours: As specified in this Section.

2.3 MATERIALS

A. Total Coating System Dry Film Thickness: 11 mils minimum

1. Primer coat – Two Component Metallic Epoxy Zinc-Rich Primer:
   a. Meet requirements of SSPC Paint 20
   b. Dry Film Thickness: 3 mils minimum
   c. Colour: Gray
   d. Products: Subject to compliance with requirements, provide one of the following:
      1) International Paint; Interzinc 52; or
      2) acceptable alternative
2. Stripe Coats - Two Component Epoxy Zinc Phosphate/Micaceous Iron Oxide:
   a. Dry Film Thickness: 3 mils minimum to ensure coverage
   b. Colour: Buff
   c. Products: Subject to compliance with requirements, provide one of the following:
      1) International Paint; Intergard 2575; or
      2) acceptable alternative

3. Intermediate Coat - Two Component Epoxy Zinc Phosphate/Micaceous Iron Oxide:
   a. Dry Film Thickness: 6 mils minimum
   b. Colour: Buff
   c. Products: Subject to compliance with requirements, provide one of the following:
      1) International Paint; Intergard 2575; or
      2) acceptable alternative
4. Finish Coat – Two Component Acrylic Polysiloxane, Pigmented, High Gloss:
   a. Dry Film Thickness: 2 mils minimum
   b. Colour: White – RAL 9010
   c. Products: Subject to compliance with requirements, provide one of the following:
      1) International Paint; Interfine 878; or
      2) acceptable alternative

PART 3 - EXECUTION

3.1 COORDINATION

A. Apply all coatings in compliance with manufacturer's written instructions.

B. Coordinate receiving of AES with steel fabricator to meet requirements of the Project Schedule. Provide 'Schedule of Coating Operations' which is in agreement with steel fabricator's schedule and the Project Schedule.

C. Provide adequate receiving, production and shipping areas to accommodate scheduled activities.

D. Schedule work to allow appropriate cure times before shipping coated steel to Project Site. Coordinate with the Project Schedule and steel fabricator.

3.2 EXAMINATION

A. Substrates to receive coatings must be sound, proper, and free of defects.
   1. Surface preparation and coating application facilities shall be inspected by Supplier and meet performance requirements of specification prior to proceeding.
   2. Submit on a daily basis, quality control records detailing the work completed, surface preparation methods, ambient air temperature, relative humidity, structure surface temperature and dew point, coatings used with batch numbers, coating thickness, and application method.
   3. Conditions that would interfere with performance of coating system must be reported in writing and corrected before continuing with specified work.

B. Examine substrates and conditions, with Supplier present, for compliance with requirements affecting performance of the work.
   1. Inspect substrates before shipment from fabricator's facilities to ensure that steel has been properly prepared to receive abrasive blast cleaning at the Supplier's facility.

C. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

E. Coating application indicates acceptance of surfaces and conditions.

3.3 PREPARATION – GENERAL

A. New Work: Comply with manufacturer's written instructions.

B. Touch-ups and Repairs: Comply with manufacturer's written instructions.

C. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

D. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.

3.4 SURFACE PREPARATION

A. Cleaning:

1. Comply with manufacturer's written instructions. Remove rust and loose mill scale. Surfaces must be clean, dry and free from contamination. Prior to paint application, assess and treat surfaces in accordance with ISO 8504. Remove oil and grease in accordance with SSPC-SP1 Solvent Cleaning.

B. Abrasive Blast Clean: To SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."

1. If oxidation has occurred before coating application, the surface must be re-blasted to the specified standard. Surface defects revealed by the blast cleaning process, should be ground, filled, or treated in the appropriate manner.

2. Surface Profile: 1.6 - 3 mils (40 - 75 microns).

C. Stripe Coats: Apply to welds, lap joints, plate edges, corners, sharp edges, and any other areas where spray application of overall coating system may prove difficult resulting in low dry film thickness.

D. Field Touch-up and Repairs:

1. Surfaces to be coated should be clean, dry and free from contamination. Prior to paint application, surfaces should be assessed and treated in accordance with ISO 8504, ensuring removal of slag, splatter, dirt, dust, cement, oil, salts and any other surface contamination.

2. Damaged Areas, Welds and Areas of Corrosion: Clean using hand or power tools to a minimum standard of SSPC-SP11. When using power tools care should be taken to avoid surface polishing.

3. Especially on surfaces prepared to SSPC-SP11, brush application will assist surface wetting and improve subsequent coating performance.

3.5 APPLICATION – SHOP APPLICATION

A. Shop apply high performance coatings in compliance with manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.

B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, colour, and appearance.

C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and colour breaks.

3.6 RESPONSIBILITY FOR TOUCH-UPS AND REPAIRS

A. Supplier is responsible for correcting any damage to the coatings if damaged during the following procedures:

1. Damage to coatings incurred at coating applicator’s facility, and during loading of coated steel to be shipped to Project Site.

2. Damage to coatings incurred during shipping from coating application facility to Project Site, and unloading at Project Site.

3. Damage to coatings during storage, handling and erection at Project Site.

4. Damage to coatings during period between erection and Substantial Completion.

3.7 TOUCH-UPS AND REPAIRS

A. Field Touch-up Coatings:

1. Primer: High build surface tolerant epoxy
   a. Dry Film Thickness: 4.0 to 7.0 mils
2. Intermediate: High build surface tolerant epoxy
   a. Dry Film Thickness: 4.0 to 7.0 mils
3. Finish: Acrylic Polysiloxane.
   a. Dry Film Thickness: 2.0 to 3.0 mils
4. Dry Film Thickness of three (3) coat system: 11 mils minimum

3.8 REPAIR / RESTORATION

A. Coats of paint that have peeled off, bubbled, cracked, failed an adhesion test conducted generally in accordance with ASTM D3359 or where visible (rust grade 10 per ASTM D610), shall be considered a failure of the paint system.

B. Repairs: Clean area back to bare clean substrate, and re-coat with coating system as specified.

C. Repairs shall be made at no cost to Project Co.

D. Repair of pitted surface & weld seams:

1. Shallow pits less than 3 mm deep, shall be filled flush with the plate surface with approved surfacer.
2. Clean repaired pit areas by power disc to SSPC-SP11. After power discing, the surface shall have a roughened profile and not be polished. Feather adjacent coated areas and roughen by power or hand sanding.
3. Welds and weld seams shall be mechanically ground flush, abrasive blast per specification and then stripe coated with specified primer.

3.9 RE-INSTALLATION

A. Areas of coating film defects such as skips, inclusion of foreign matter, fish eyes, runs, curtains, gassing, bubbling, or dry spray should be corrected immediately by re-installation of coating system in accordance with manufacturers' written instructions.

3.10 QUALITY CONTROL

A. Supplier's Responsibility:
   1. Cooperate with the independent inspection agency.
   2. Witness and certify inspection report.
   3. Project Co may direct Supplier to stop applying coatings if test results show materials being used do not comply with specified requirements. Remove non-complying coating materials from Project Site, pay for testing, and recoat surfaces coated with rejected materials. Supplier will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

B. Inspection agency's responsibility
   1. Establish hold point after surface preparation, and after application of each successive coat of paint. These points shall include but not be limited to the following:
      a. Pre-Surface Preparation Inspection
      b. Measurement of Environmental Conditions
      c. Evaluation of Compressor and Surface Preparation Equipment
      d. Determination of Surface Preparation Cleanliness and Profile
      e. Inspection of Application Equipment
      f. Witnessing Coating Mixing
      g. Determination of Wet Film Thickness
      h. Determination of Dry Film Thickness
      i. Evaluating Cleanliness between Coats
      j. Adhesion Testing on Spot Basis.
   2. Test Reports: Prepare and submit to Project Co on a daily basis; test reports listing test data required and work completed per this specification. Include documentation of testing procedures indicating:
      a. Film thickness gauge used
      b. Locations where tests were made
      c. Dry film thickness at each location

d. Name of person performing tests.

3. Supplier shall witness the testing and certify test reports.

3.11 CLEANING

A. Field Touch-ups and Repairs:

1. For work at site, prior to Substantial Completion, clean site and make it ready for utilization by Project Co. At the completion of the work, remove the following from the site; tools, appliances, construction equipment and machinery, and surplus materials. Restore to original condition property not designated for alteration by contract documents. This includes, but is not limited to, surfaces inadvertently painted such as glass, masonry, etc.
2. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from site.
3. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
4. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, and leave in an undamaged condition.
5. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide washrooms, locker rooms, accessible toilet stalls, janitor room accessories, and other accessories as required for a complete installation as indicated and specified.

B. Related Documents: Issued For Construction (IFC) drawings prepared by Project Co and any other relevant sections (developed and specified herein by Project Co), apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: Identify locations using room designations indicated on IFC drawings provided by Project Co.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with specifications the following manufacturers are acceptable:

1. Bobrick Washroom Equipment, Inc.
2. Shanahan's Building Specialities (Lockers and Benches)

2.2 CREW AND ACCESSIBLE WASHROOMS AND LOCKER ROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser:

1. Description: Surface mounted roll-in-reserve dispenser with hinged front secured with tumbler lockset.
2. Operation: Non-control delivery with theft-resistant spindle.
3. Capacity: Designed for 127 mm (5 inches) diameter tissue rolls.
4. Material & Finish: 18-8 S, Type 304 stainless steel, satin finish.
5. Lockset: Tumbler type.
6. Product: Bobrick, B-4288, Contura Series, Surface-Mounted Multi-Roll Toilet Tissue Dispenser.

B. Combination Towel Dispenser/Waste Receptacle:

1. Description: Surface mounted combination unit for dispensing C-fold or multi-fold paper towels with removable waste receptacle.
2. Towel-Dispenser: Minimum capacity 600 C-fold or 800 multi-fold paper towels.
3. Waste-Receptacle: Minimum capacity 56.8 L (15.0 gal.) stainless steel.
4. Material & Finish: 18-8, Type 304 stainless steel, satin finish.
5. Product: Bobrick, B-43949, Contura Series, Surface-Mounted Paper Towel Dispenser and Waste Receptacle.

C. Toilet Seat Cover Dispenser:

1. Description: Surface mounted for dispensing single or half-fold paper toilet seat covers.
2. Capacity: 500 toilet seat covers.
3. Material & Finish: 18-8, Type 304 stainless steel, satin finish.

	4.	Product:	Bobrick, B-4221, Contura Series, Surface-Mounted Seat-Cover Dispenser.
D.	Liquid-Soap Dispenser:		
	1.	Description:	Surface wall-mounted for dispensing soap in liquid or lotion form.
	2.	Capacity:	1.2 L (40 fl.oz.).
	3.	Components:	Push button dispenser with corrosion resistant valve components and locked, hinged, stainless steel lid for top filling.
	4.	Material & Finish:	18-8 S, Type 304 stainless steel, satin finish.
	5.	Lockset:	Lockable
	6.	Refill Indicator:	Window type.
	7.	Product:	Bobrick, B-2111, Classic Series, Surface-Mounted Soap Dispenser.
E.	Grab Bar 1:		(typical)
	1.	Mounting:	Flanges with concealed fasteners mounted horizontally beside toilet.
	2.	Material:	18-8 S, Type 304, 18 gauge stainless steel, peened grip, satin finish.
	3.	Configuration:	As indicated on drawings.
	4.	Product:	Bobrick, B-5806.99, Stainless Steel Grab Bar – 32 mm (1-1/4 inches) diameter x 1220 (48”) long.
F.	Grab Bar 2:		(typical)
	1.	Mounting:	Flanges with concealed fasteners mounted horizontally behind toilet.
	2.	Material:	18-8 S, Type 304, 18 gauge stainless steel, peened grip, satin finish.
	3.	Configuration:	As indicated on drawings.
		Product:	Bobrick, B-5806.99, Stainless Steel Grab Bar – 32 mm (1-1/4 inches) diameter x 610mm (24”) long.
G.	Grab Bar 3:		(shower stalls)
	1.	Mounting:	Two-wall horizontal shower compartment grab bar, flanges with concealed fasteners.
	2.	Material:	18-8 S, Type 304, 18 gauge stainless steel, peened grip, satin finish.
	3.	Configuration:	As indicated on drawings.
	4.	Product:	Bobrick, B-58616.99 Series, Shower Compartment Grab Bar – 32 mm (1-1/4 inches) diameter x 610 (24”) x 915mm (36”) long.
H.	Grab Bar 4:		(at urinal)
	1.	Mounting:	Vertical (x2).
	2.	Material:	18-8 S, Type 304, 18 gauge stainless steel, peened grip, satin finish.
	3.	Configuration:	As indicated on drawings.
	4.	Product:	Bobrick, B-5806.99, Stainless Steel Grab Bar - 32 mm (1-1/4 inches) diameter x 610 (24”) long.
I.	Shower Seat:		(shower stalls)
	1.	Frame:	18-8 S, Type 304, 18 gauge stainless steel frame

	2.	Seat:	One piece, 13mm thick solid phenolic, matte finish, ivory colour.
	3.	Configuration:	As indicated on IFC drawings.
	4.	Product:	Bobrick, B-5181, Reversible Solid Phenolic Folding Shower Seat.
J.	Sanitary Napkin Dispenser:		
	1.	Type:	Surface mounted sanitary napkin and tampon dispenser.
	2.	Capacity:	20 napkins and 30 tampons.
	3.	Operation:	Dispensing mechanism shall be pre-set at factory for 'Free' operation
	4.	Material & Finish:	18-8 S, stainless steel, No. 4 finish (satin)
	5.	Lockset:	Tumbler type.
	6.	Product:	Bobrick, B2706C, Classic Series Free Napkin/Tampon Vendor.
K.	Sanitary-Napkin Disposal Unit:		
	1.	Description:	Surface mounted napkin disposal unit with flip-up cover
	2.	Receptacle:	Disposable paper liners. See Item H. Below.
	3.	Material/Finish:	18-8 S, Type 304 stainless steel, satin finish.
	4.	Product:	Bobrick, B-270, Contura Series, Sanitary Napkin Disposal
L.	Sanitary-Napkin Disposal Unit – Paper Liners		
	1.	Description:	Disposable waxed paper liners. **[Note to Proponents: Provide one unit/station only.]**
	2.	Product:	Bobrick, 270-12 (1000 liners)
M.	Tilt Mirror:		
	1.	Type:	Surface mounted, tilt mirror with stainless steel frame
	2.	Frame:	18-8 S, Type 304 heavy-gauge stainless steel, satin finish.
	3.	Size:	410mm W x 760mm H
	4.	Product:	Bobrick, B-293 Series, Model 1630 Tilt Mirror with Stainless Steel Frame.
N.	Coat Hook:		
	1.	Type:	Surface Mounted Hat and Coat Hook
	2.	Material & Finish:	18-8 S, Type 304 stainless steel, satin finish
	3.	Product:	Bobrick, B-6827, Surface-Mounted Hat and Coat Hook
O.	Toilet Partitions:		
	1.	Type:	Accessible (min. 1500W x 1500D) and standard (900W x 1500D) partitions as indicated on drawings.
	2.	Material/Hardware:	25mm thick high pressure laminate (HPL), stainless steel door and mounting hardware.
	3.	Product:	Bobrick, HPL Metro Series 1551.64, Floor-Anchored.
	4.	Colour:	Burnt Strand 6307-58.
P.	Urinal Partitions:		
	1.	Type:	Wall mounted screens (x 2) as indicated on drawings.

2. Material/Hardware: 25mm thick high pressure laminate (HPL), stainless steel mounting brackets.
3. Product: Bobrick, Metro Series 1555.64, Wall-Hung, 1070H (42") x 460W (18").
4. Colour: Burnt Strand 6307-58

Q. Lockers:

1. Type/Product: SML Deluxe Series 20, single tier locker c/w metal base, sloped top 305mmW (12") x 381mmD (15") x 1829mmH (72")
2. Colour: Surf White

R. Benches:

1. Type/Product: SML Locker Room Bench, fixed pedestal, prefinished hardwood seat 290mmW (11 ½") x 1220mm (48") long

S. Shower Stall Soap Dish:

1. Type/Product: Bobrick B-6807 wall mounted (satin finish stainless steel)

T. Shower Curtain Rod: (shower stalls)

1. Type/Product: Bobrick B-6047 x 1067mm (42") satin finish stainless steel
2. Type/Product: Bobrick B-6047 x 1524mm (60") satin finish stainless steel

[Note to Proponents: Cut to length to suit site conditions.]

2.3 JANITOR ROOM ACCESSORIES

A. Subject to compliance with specifications, the following manufacturers are acceptable:

B. Mop - Service Sink: Stern Williams MTB-3624 (915mm x 610mm x 250mm)

C. Mop - Service Sink Accessories: Stern Williams

1. Faucet set: T-10-VB
2. Hose & wall hook: T-35
3. Splash Panels: BP (20 ga. Type 304 stainless steel)
4. Mop Hanger: T40 (610mm wide, stainless steel, 3 rubber spring-loaded grips)

2.4 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six keys to Province.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install washroom accessories in accordance with applicable 'Building Code' and manufacturers' written instructions using fasteners appropriate to substrate and suitable for load requirements as specified in the applicable 'Building Code'. **[Note to Proponents: To be specified by Project Co in accordance with the BSP Project Agreement.]**

B. Install units level, plumb, and firmly anchored in locations as indicated.

END OF SECTION

This page and next 26 pages redacted in their entirety

This page and next 27 pages redacted in their entirety

This page and next 2 pages redacted in their entirety

This page and next 3 pages redacted in their entirety

This page and next 4 pages redacted in their entirety