FACULTY OF MEDICINE

Design Guidelines for Learning Space AV Systems & Associated Infrastructure Small Seminar Rooms

SEPTEMBER 17, 2014

Version	Date	Author(s)	Description of Change
Draft-v3	August 30, 2012	Izaak Housden, Gabriel Rose, Jo-ann Chubb, Anthony Knezevic; with input from Marcel Shoenenberger and Dan Lyzun	Reformatted; initial draft
Draft-v3a	September 4, 2012	Izaak Housden, Jo-ann Chubb, Anthony Knezevic Izaak, Gabriel Rose	Content updates
Draft-v3b	September 11, 2012	Dan Lyzun and Marcel Shoenenberger	Content updates
Final-v4	September 28, 2012	Gabriel Rose	Finalized
Final-v5	October 19, 2012	Gabriel Rose	Removed reference to appendices
v6.31	September 17, 2014	Izaak Housden	Updated power to align with new infrastructure

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1 INTRODUCTION

1.1 FACULTY OF MEDICINE DISTRIBUTED MEDICAL PROGRAM

In 2004, the University of British Columbia (UBC) Faculty of Medicine (FOM) initiated its Distributed Medical Program (DMP), the purpose of which is to provide equal access to medical teaching and training for students, residents, and practicing physicians across BC. The DMP is made possible by technology-enabled learning spaces located at university sites (UNBC, UBCO, UVic, and UBC) as well as Clinical Academic Campuses and Affiliated Regional Centres located across the province. Many of these spaces are also videoconference (VC)-enabled and are connected to each other via the central VC Bridge, all of which rests on a dedicated network called the Distributed Medical Program Audiovisual (DMP-AV) network.

1.2 DOCUMENT PURPOSE

This document is part of a collection of documents referred to as the **UBC FOM Design Guidelines for Learning Space AV Systems and Associated Infrastructure** (henceforth referred to as AV Design Guidelines). They provide guidelines for technology-enabled learning spaces based on best practices and extensive organizational experience developed since 2004. Each learning space type has (or will have) an associated AV Design Guideline document with high-level information about that space type. If additional, more detailed information is required, it can be provided by the UBC FOM project team. Please see section 4 for contact information.

The AV Design Guidelines are generally used in the early stages of a facilities project, along with the Functional Program and/or Project Plan, to align various stakeholders around a common, high-level vision of a given space. Where a functional plan includes technology-enabled rooms, the corresponding AV Design Guideline document(s) should accompany it. If a project is approved, the applicable AV Design Guidelines will be provided to all project team members and contractors.

This document in particular presents high-level guidelines for VC-enabled Small Seminar Rooms (SSRs) with 4-20 seats.

The AV Design Guidelines are intended to encourage and facilitate conversation between designers and the UBC FOM project team to confirm that all designs match the intended use of the space. Information contained in this document (and all UBC FOM AV Design Guidelines) should be considered guidelines[1]. In every case, the project design team must consult with the UBC FOM's project team to clarify requirements and develop and approve designs specific to the space. The contents of this document will never supersede UBC project team decisions, a specification document, detailed design, or any other source that is considered by UBC to be more directly relevant to the project at hand. Furthermore, the contents of these documents must not be used as contract language

[1] A guideline is a general rule, principle, or piece of advice. As used in this project, guidelines are not considered mandatory. They are to be used to determine a course of action and are intended to enable alignment towards common designs. (Oxford Dictionaries Online: http://oxforddictionaries.com/definition/english/guideline?q=guideline)

1.3 ROOM USAGE DESCRIPTIONS

SSRs are VC-enabled teaching, learning, and meeting spaces for between 4 and 20 local participants. They are used to connect a small group of people in a meeting-style room with other groups of people in other VC enabled rooms. All participants (both in the same physical space as the presenter or in a remote space) must have equivalent ability to interact with the other participants. SSRs are located at University Sites, Clinical Academic Campuses, and Affiliated Regional Centres, and Community Education Facilities. SSRs are used by students, instructors, and staff for core curriculum delivery, administration, and FOM management and development meetings.

1.4 FUNCTIONAL REQUIREMENTS

SSRs must enable all participants (located at all connected sites) to see, hear, and speak to the other participants, regardless of which site the participants are physically located. All participants must also be able to see (and hear, where applicable) other participants' presentation material.

Participants must be able to display content for all participants (at all connected sites) from a laptop. A lectern PC and/or DVD player and/or document camera may be provided in some cases.

2 OVERVIEW OF TECHNICAL SOLUTION

In order to meet the functional requirements described above, SSRs are generally equipped with a permanently installed VC system which includes:

- A VC codec that sends and receives the audio and video signals to/from the other sites via the VC bridge.
- Two side-by-side HD flat-panel displays at the front of the room for simultaneous display of images.
- One high resolution VC camera at the front of the room, between the displays, to send video feeds of the participants to remote locations.
- One to four table-top microphones, depending on room size, to capture local participants' speech.
- Speakers mounted at the room front wall (with the displays and camera) for sound amplification purposes.
- An infra-red remote control to control the codec, camera zoom and angle, volume, and content projection.

At UBC's discretion, an alternate, cart-based solution may be specified for some SSRs. In this case, the manufacturer's installation recommendations will apply. Other infrastructure, such as power and data ports may be required to accommodate this type of solution.

The room should have VC-appropriate architecture, acoustical treatments, wall and furniture colours, lighting, cooling, power and data ports, and cable pathways. The following sections describe guidelines for additional aspects of room and VC system design.

UBC FOM technology-enabled learning spaces have active AV equipment 24 hours per day, 7 days per week. Spaces are primarily used during business hours (6am-6pm Monday-Friday), but can be used at any time.

The AV equipment in this space has a life cycle. The best practices included herein consider renewal as part of this cycle.

3 TECHNICAL SOLUTION DESCRIPTION

The following content is divided into trade specific sub-sections related to specific infrastructure needed in order for the VC system to function as intended. The sections are as follows:

1. Architecture & Interior Design
2. Mechanical
3. Electrical
4. Data & Telephone
5. Acoustics
6. AV System

The information contained in this AV Design Guideline is relatively high-level and intended to be used for early project planning (e.g.: budget estimates) and to create a common understanding of what is necessary for a SSR to be fit for intended use. Once a project has been approved, this AV Design Guideline document can be used to guide design of the spaces.

All information in this document should be considered as in support of the AV system. There may be additional infrastructure requirements unrelated to the AV system, and thus not contained herein, but that are still necessary for the space to be fit for intended use. For example, power outlets not required for AV components, door sizes, handicapped access, etc. These should be included in the space design developed by the architect.

3.1 ARCHITECTURE & INTERIOR DESIGN

3.1.1 GENERAL DESCRIPTION

- SSRs seat between 4 and 20 people.
- The space for a 16-seat SSR should be approximately 44 net square meters. The space for an 8-seat SSR should be approximately 26 net square meters. In the event that an existing space is being converted to an SSR, design should attempt to accommodate physical constraints.
- The space should be rectangular with an aspect ratio of side walls to front/back walls of 1:1.13.
- Site lines to the main screens at the front of the room should be unobstructed from all seats.
- The floor should be flat and seating should be around either a rectangular table or a U-shaped table.
- The minimum distance from the front wall to the participant table should be 1600mm.
- The ratio of distance from displays to the most distant viewer (MDV), to image height, should not exceed a factor of 6.7 (distance from display to MDV divided by image height) for all seats.
- The horizontal viewing angle for all seats should not exceed 60 degrees for both displays.

- The entire front wall should be reinforced to permit secure mounting of approximately 600 pounds of equipment (exact weight load depends on display size).
- The entrance should be at the back of the room (opposite the wall with the displays and camera). A single door is generally sufficient for an SSR.

3.1.2 WINDOWS

- Exterior windows should generally be avoided in videoconferencing spaces because exterior light creates problems for videoconferencing and video presentation.
- If exterior windows exist, blackout blinds will be needed for these windows to make it possible to display video or use video cameras.

3.1.3 CAMERA POSITION

- The camera requires positioning for appropriate image angles and complete visual coverage of all participant seats.
- The cameras require appropriate protection from theft and damage, where applicable.
- The camera should be positioned such that when the audience is looking at the screens, they appear to be looking in the direction of the camera.
- Adjoining spaces should be carefully selected to avoid structural borne vibration. High Definition cameras have a low tolerance for structure borne vibration, and magnify the problem when using zoom function. Spaces that have a detectable vibration should use dampening material to stabilize the image.

3.1.4 FURNITURE

- SSRs use wall mounted equipment behind the displays. VC specific millwork is not required in this type of space.
- The participant table should be either rectangular or U-shaped.
    - In a room with 4-10 seats, a rectangular table should generally be used, with one table or a ganged set of tables.
    - If the room is for 10-20 participants, a U-shaped table opening towards the camera should be provided for best viewing angles. In general, for a U-shaped configuration, it is better to have the majority of people sitting at the base of the U, facing the display wall directly.
    - UBC will inform the project team on what tables will be required to form the seating arrangement that best suits the seating capacity and geometry of the space. Floor box placement will be validated by UBC to ensure the infrastructure supports the seating arrangement.
- The requirement for gromets in tables (to facilitate microphone and and video cable pass through) will be decided on a case by case basis.

3.1.5 COLOURS

- The colour of the walls, carpeting, and chairs should be either grey or solid blue to provide visual definition to the participants relative to the background. The purpose of the solid colour is to avoid adding

unnecessary bandwidth to the video conferencing signal, and to avoid the reflected light from the background affecting colour quality of the images.

- The colour of the table surface should be either antique white, light grey, or light maple to allow the 45-degrees light to bounce off the surface and reflect light upward helping to illuminate the faces of the participants and eliminate the dark shadows under the chin/nose. This also minimizes changes in light quality when the participants place paper in front of themselves on the desk.

3.2 MECHANICAL

3.2.1 HVAC AND HEAT LOAD

- SSR space HVAC designs should account for all AV equipment and maximum occupancy to maintain temperatures comfortable for occupants and safe for AV equipment.
    - Long-term ambient room temperature target for these rooms to operate in is 21 degrees Celsius with a humidity level of 30-50%.
    - Maximum short-term (1 hour) sustainable ambient temperature for these rooms is 24 degrees Celsius with a humidity level of 30-50%.
- SSRs AV equipment may require up to 6000 Btu/hour of cooling capacity, depending on equipment. Sometimes, a room's HVAC system can handle this load, but this should be confirmed. Maximum occupancy must be factored in for all heating calculations.
- Consideration should be given to the location of the compressor such that it does not interfere with the acoustical requirements and does not introduce vibration into any wall or bulkhead that supports a camera.

3.2.2 PROTECTION FROM WATER DAMAGE

- All VC rooms should be designed and constructed to protect the AV equipment from damage caused by plumbing failures and excessive condensation.

3.3 ELECTRICAL

3.3.1 LIGHTING

- Lighting is a key factor in a properly functional VC room. It should be designed to:
    - Allow the participants to be well-illuminated for the VC cameras;
    - Avoid light reflecting off screens and video display surfaces;
    - Avoid an overly illuminated or glaring participant area;
    - Avoid hot spots or shadows on participants;
    - Allow the participants to easily control the lighting conditions;
    - Illuminate the entire participant area.
- Light reflecting off the table surface should be at an approximate 15-20 degree angle.

- Colour temperature should be 3500 degrees Kelvin in a VC room. Different lights/colour temperature should not be mixed.
- Lighting should provide a minimum brightness of 80 foot-candles.

3.3.2 POWER OUTLETS

- The AC load from AV equipment located in the SSR is approximately 1800 watts in operation and 200 watts at idle.
- Power receptacles should be provided for the following AV equipment locations:
    - Each display on the front wall:
        - For rooms using displays smaller than 80", one 20 Amp duplex is required behind the left display, and one 20Amp quad behind the right display. These two outlests can share a common dedicated circuit;
        - For rooms using 80" displays or larger, one 20 Amp duplex is required behind the left display, and one 20Amp quad behind the right display. These outlets should have independent dedicated 20Amp circuits;
    - The participant table:
        - One floor mount, recessed quad under a rectangular table (10 or fewer seats);
        - Three floor mount, recessed duplexes, one approximately at the centre of the bottom of the U-shaped table, and one at each midpoint of the side tables (12 or more seats).

3.3.3 CONDUITS AND CABLE PATHWAYS

- The SSR should be equipped with a conduit/cable-tray and back-box infrastructure to support the low-voltage AV system connectivity requirements.
- Appropriate quantity and size of conduits will be needed to facilitate AV, IT, and power cable runs between:
    - The AV pull box and the opposite display (for video and speaker audio)
    - With a U-shaped table:
        - One conduit from the electrical panel to each of the three floor boxes, one in the centre and one at either midpoint of the side tables (for power)
        - One conduit from the Communications closet to each of the three floor boxes, one in the center and one at the midpoint of the side tables (for data)
        - Two 27mm conduits From the AV pull box to each of the three floor boxes, one in the center and one at the midpoint of the side tables (for AV terminations)
    - With a square or rectangular table:
        - One conduit from the electrical panel to the centre of the table (power)
        - One conduit from the Communications closet to the centre of the table (data)
        - Two 27mm conduits from the AV pull box to the centre of the table (AV terminations)
- Conduit runs with more than 90 degree turns require cable pull boxes to be inserted in the proper locations.
- For any location that requires a power outlet (as described in section 3.3.2), appropriate conduits should be installed.

3.4 DATA & TELEPHONE

- Room design should account for Wi-Fi coverage with sufficient density for the number of occupants and multiple devices per occupant.
- The following should be placed behind the left display in the top right corner
    - Two RJ45 Data outlets (one must be assigned on the video conferencing vlan)
- The following should be placed where appropriate within the room (UBC facilities rep to determine)
    - One VoIP phone outlet
    - One Analog Phone outlet to accommodate a conference speakerphone
- Floor box Data Outlets Minimum Requirements:
    - One RJ45 data outlet per floor box

3.5 ACOUSTICS

- Room acoustics play a key role in ensuring presenter and audience speech intelligibility.
- Design characteristics intended to support the acoustical requirements must be validated by a qualified and UBC approved acoustical consultant. The acoustical report generated will address acoustical requirements for the HVAC system, ambient noise levels, lighting ballasts, reflective surfaces, treatments, reverberation, and other noise mitigation methodologies.
- At UBC's discression, an acoustical performance validation test by the acoustical consultant will be performed.
- There are three primary factors for consideration:
    - Background noise which considers ambient noise from HVAC and other systems that may create continuous/intermittent noise in the space,
    - Sound isolation which considers noise transfer from outside the space to inside the space, and
    - Interior acoustics which considers the movement and reflection of sound waves within the room.

3.5.1 BACKGROUND NOISE

- In order to provide good speech intelligibility for local and remote listeners:
    - The background noise target should be Noise Criteria (NC) 25-30 with no pure tones.
- Achieving these low NC levels means very tight control of fan noise and air flow conditions.
- Noise-producing HVAC equipment including mixing boxes, fan-powered mixing boxes, and fan coil units should not be located inside VC rooms or within the ceiling plenum space.

3.5.2 NOISE ISOLATION

- It is critical to the proper functioning of the VC room to achieve adequate sound isolation between the rooms and adjacent spaces. The adjacent spaces may include, but are not limited to, the booth, other VC rooms, regular meeting rooms, lecture rooms, washrooms, and corridors.
- The following targets are applicable to all SSRs. In renovation situations, these may require review.
    - All perimeter walls should achieve a Sound Transmission Class (STC) rating of STC 55. The door should be targeted for a purpose built STC 45.

- Noise isolation to rooms above and below are set at minimum STC 50.
- A target Impact Isolation Class (IIC) 65 rating should be set for the floor/ceiling system.

3.5.3 INTERIOR ACOUSTICS

- SSRs should have appropriate acoustical conditions to optimize the rooms for presentations, VC, and/or monitoring. Appropriate acoustical treatment should be installed to control reverberation, minimize reflections, flutter echo and other acoustical issues that may adversely affect the microphone pickup.
- The design target for reverberation time should be 0.45 to 0.55 seconds in the mid and high frequencies, with controllable low frequency energy.

3.6 AV SYSTEM

3.6.1 AUDIO

- The audio systems for the lecture theatre perform two key functions:
  - Playback of multimedia material from various sources,
  - Processing and playback of the incoming audio from remote sites.
- The SSR should have one to four table-top microphones.
- The AV playback system will use two display side-mount loudspeakers from the display manufacturer.

3.6.2 DISPLAYS

- There should be two displays on the front wall to accommodate dual 16x9 displays. The size of the screens will depend on room size and distance to the most distant viewer.
- Displays need to be of adequate size to enable all participants to clearly see the content on the screen. Screen size is a function of room size and dimensions.
  - Ratio of the distance from the displays to the most distant viewer (MDV) to image height will not exceed a factor of 6.7 (distance to most distant viewer, MDV, divided by a single image height) for all seats.

3.6.3 CONTROL

- The SSR should be controlled using the infra-red codec remote. This allows control of speaker volume and mute, microphone mute, presentation activation, VC call dialling, and camera zoom.

3.6.4 VIDEO CONFERENCING

- For the purpose of connecting to remote sites, the SSR should be equipped with one videoconferencing codec, allowing simultaneous transmission of up to two high resolution graphics channels. The control of the codec and source assignment will be managed by the remote control.

3.6.5 CAPITAL RENEWAL

AV designs and associated infrastructure consider life cycle management and equipment renewal.

4 CONTACT

If you have questions or require additional information, please contact Izaak Housden, Sr. Technology Analyst, Island Medical Program at ihousden@uvic.ca or 250-472-5506.