1.0 **GENERAL**

1.1 Related UBC Guidelines

.1 **UBC Learning Space Design Guidelines**
.3 Division 27 Section 27 05 05 Communication Rooms Design Guidelines.
.4 **Division 14, Section 14 20 00 Elevator Machine Room and Closet Design Guidelines.**
.5 **Division 26, Section 26 05 00 Electrical Service Rooms and Closet Design Guidelines.**

1.2 Coordination Requirements

.1 UBC Building Operations - Technical Services.
.2 Acoustic Consultant.
.3 UBC Information Technology (IT)
.4 **UBC Building Operations – Electrical Technical Support**

1.3 Reference Standards:

.1 American Association of College Facilities Management.
.2 **Interior Wayfinding Signage Guidelines.**

1.4 **Main Entrances**

.1 **Hand Sanitizing Units** to be provided for all main entrances free standing within 6 feet of entranceway
.1 Required product (PURELL® LTX™ or TFX™ Dispenser Floor Stand SKU:2424DX) or wall mounted (PURELL® FMX-12™ Dispenser Push-Style Dispenser for PURELL® Hand Sanitizer SKU:5120-06).

1.5 Classrooms

.1 Refer to **UBC Learning Space Design Guidelines**.
.2 Demonstrate adaptability to technology changes.
.3 Refer to Audio Visual Services, UBC IT, for sound, video and control systems guidelines.
.4 Acoustic Consultant to be UBC approved.
.5 Demonstrate active acoustic strategy.
.6 Demonstrate passive acoustic strategy.
.7 Refer to **Acoustical Design Standard for UBC Classrooms** in paragraph 1.16 below.

1.6 Washrooms

.1 “Airport style” washroom design without the use of doors is preferable and promotes the use of hand dryers over paper towels.
.2 Hardwiring is required in washrooms for hand dryers. UBC is in the process of phasing out paper towel use in washrooms.
.3 For floor drains, see Division 22 Section 22 05 00 Plumbing - General Requirements.
.4 For plumbing fixtures, see Division 22 Section 22 40 00 Plumbing Fixtures, Section 2.0.
1.7 Electrical Rooms

.1 The preferred location for Main Electrical Rooms is on North or East exterior building wall (for cooling and to allow for direct ventilation). Main Electrical Rooms, Local Electrical Rooms and Electrical Closets are considered Restricted Access Service Rooms/Closets. These rooms/closets are to be designed for housing electrical distribution equipment, electrical metering equipment, life safety equipment, lighting control equipment only.

.2 Main Electrical Rooms, Local Electrical Rooms and Electrical Closets are not to be used as conduits (pass through/feed through) for other building systems serving other areas such system include HVAC, communications and security.

.3 All electrical distribution equipment, electrical metering equipment, life safety control equipment, Transfer Switches, lighting control equipment including panelboards are to be located in Main Electrical Rooms, Local Electrical Rooms and Electrical Closets. Electrical distribution equipment, electrical metering equipment, life safety equipment, lighting control equipment including panelboards shall not be installed in any other room including Communication Rooms, Custodial Rooms, Laboratories, Audio Visual Service Rooms, Classrooms, Lecture Theatres, Offices or Corridors. Mechanical Rooms may contain Motor Control Centres, Variable Speed Drives, Distribution Centres and Panelboards for mechanical loads.

.4 All Electrical Rooms and Closets shall be designed and located in the building so that direct access is from a common or non-secure area such as a public corridor. Electrical Rooms and Closets shall not be located behind other rooms that might have specialized or secure locks installed; for example, a custodial room, server room, machine shops, etc.

.5 All Electrical Rooms and Closets shall be designed so that no equipment will be installed above a door or behind an inward opening door swing.

.6 All Electrical Rooms and Closets shall have 1.2 m horizontal by floor to ceiling vertical, of open wall space to allow for installation of future equipment.

.7 All Electrical Rooms shall be located and constructed to allow for replacement of installed equipment. All possible challenges must be considered such as structural loading, size of doorways and access corridors and exterior access.

.8 All Electrical Rooms and Closets housing transformers shall be insulated to prevent sound transmission to adjoining spaces.

1.8 Elevator Machine Rooms

.1 Elevator Machine Rooms shall contain: elevator controllers, elevator power disconnects, elevator cab lighting disconnects, communication demarcation, fire alarm system interface relays and any other equipment directly related to elevator operation. Elevator Machine Rooms are required when a machine is hoistway mounted.

.2 Systems or equipment not directly related to elevator operation shall not be installed within Elevator Machine Rooms.

.3 Elevator Machine Rooms shall be constructed so that ceiling mounted lighting, smoke detectors and other equipment can be safely accessed for maintenance and replacement.
.4 Minimum size of Elevator Machine Rooms shall allow for replacement of controllers from at least 3 non-proprietary manufacturers. At no time shall the Elevator Machine Room be smaller than 1.5 m deep by 2.2 m wide by 2.4 m high.

1.9 Communications Rooms

.1 A Communications Room is a service room designed to safely house telecommunications equipment. It is also used to mount and terminate voice, data, RF, and when approved by UBC IT – security cables security cables and their associated terminating and distribution systems.

.2 Communications room construction shall meet all applicable building, fire, electrical and safety codes and regulations as stated by UBC. No fire separation or resistance rating is required on the walls or ceilings provided the walls are constructed of 16mm Type X GWB on both sides of stud walls. Hub Rooms shall be constructed to meet a 1 hour fire separation. A smoke detector, connected to the fire alarm system, shall be installed in all communications rooms.

.3 Each campus building will contain a Main Communications Room and possibly many Local Communications Rooms. The Main Communications Room may be used as a floor serving facility in addition to a Local Communications Room serving facility. No other building systems are to be installed in the Main Communications Room.

.4 Local Communications Rooms or Closets are used as a floor serving facility for mounting and terminating approved communications cabling and hardware only. No other building systems are to be installed in the Local Communications Room.

.5 Details of communications systems function and installation are handled by Division 27.

.6 False ceilings are not permitted in communication rooms.

.7 Communications Rooms and Closets have special requirements addressed in Division 27 of the Technical Guidelines, Section 27 05 05 Communication Rooms Design Guidelines. They shall only contain approved equipment and systems as indicated in Division 27.

.8 All Communications Rooms shall be designed and located in the building so that direct access is from a common or non-secure area. Communications Rooms are not to be located behind other rooms that might have specialized or secure locks installed; for example, a custodial room.

1.10 AV and Equipment Rooms

.1 AV rooms used as theatre projection rooms have special requirements and UBC shall be consulted in these situations.

1.11 Mechanical Rooms

.1 Floor to be concrete with 2 coat elastic membrane that will block concrete cracks when built over occupied space. For Mechanical Room floors over occupied spaces see Section 09 67 00 Fluid Applied Flooring Paragraph 2.1.1.2.

1.12 Showers

.1 Shower stalls shall be white durable plastic tub/shower surround and substrate shall be cementitious board, mineral fiber board or masonry. Floors to have waterproof membrane
and slope to drain. Shower stall to have 100mm curb, except in accessible shower stalls. Where possible make single stalls accessible.

1.13 Custodial Rooms

.1 General Requirements:

.1 Custodial rooms must be designed for ONLY custodial staff use. These spaces CANNOT be shared or be made to do double duty with any other operation in the building, because the already minimal space is then reduced to a dysfunctional level and their security access becomes compromised by other trades.

.2 Motion detector or similar energy saving on/off light switches shall be installed in all custodial rooms.

.3 Splash guards must be at least 2 feet above the janitor sink and 1 foot from the edge of the janitor sink laterally. Splash guard must be non-permeable and rust resistant.

.4 All custodial rooms shall be designed for detergent mixing stations and require 3/4” hot and cold backflow preventers installed above the mop sink. Refer to Section 22 11 18 for more information.

.5 Door to custodial room to swing out.

.2 Main Floor Custodial Room near Loading Bay – Space Allocation

.1 400 square feet per major building is required. Room is to be located very close to a loading bay.

.2 Dimensions: 20 feet by 20 feet

.3 Door width: 48 inches; in-swinging. Double door hollow metal body construction to allow for pallet delivery and mitigate damage.

.4 Electrical: two – one rated at 15 amps, one rated at 20 amps with 110 volt duplex receptacle outlets. 500 lux maintained lighting levels.

.5 Plumbing: Floor drain in centre; floor mounted custodial mop sink c/w 150mm curb with notched front for easy tilting to empty mop bucket, with stainless steel splash guard shield on wall.

.6 Shelving: 16 inches deep; adjustable height; two rows at 36 inches, 48 inches on the longest wall.

.7 Mop hanger: Continental # 515; steel with rubber cam, grips 7/8” to 1 ¼” diameter handles; three mop hangers to be located 70 inches over the floor mounted custodial sink.

.8 Typical supplies and equipment to be stored would consist of: paper supplies, 20 + gallons of chemicals, pails, brooms, mop & bucket, floor pads and scrubbing brushes, safety signs, wet/dry vacuums, extension cords, chalk, small liners, large liners, dust mops, vacuums, buffing machines, burnisher, stripping/finishing supplies, custodial cart, carpet cleaning, autoscrubber, and miscellaneous cleaning items.
.3 **Standard Custodial Room (Typical for all other floors)**

.1 120 square feet required per floor. It will serve the needs of the assigned area for each custodian (approximately 25,000 to 30,000 square feet of building area).

.2 Dimensions: 10 feet by 12 feet

.3 Door width: 36 inches; in-swinging

.4 Electrical: one – rated 15 amps, 110 volt duplex receptacle outlet.

.5 Plumbing: Floor drain in centre; floor mounted custodial mop sink c/w 150mm curb with notched front for easy tilting to empty mop bucket, with stainless steel splash guard shield on wall.

.6 Mop hanger: Continental # 515; steel with rubber cam, grips 7/8 to 1 ¼” diameter handles; three mop hangers to be located 70 inches over the floor mounted custodial sink.


.8 Typical supplies and equipment to be stored would consist of: paper supplies, wet/dry vacuums, buffing machine, autoscrubber, canister vacuum, pacer 30” vacuum, custodial cart, mop & bucket, up to 20 gallons of chemicals in 1 gallon containers, brooms, wet mops, and cleaning supplies.

1.14 **Biohazard Labs**

.1 Please contact UBC Building Operations - Technical Services Manager to alert him/her that special facilities will be designed and to ask for any coordinator assistance; phone: 604-822-6002, plus UBC Risk Management Services, Biosafety Advisor, phone: 604-822-9527.

.2 For floor drains, see Division 22 Section 22 05 00 Plumbing - General Requirements.

1.15 **Radioisotope Labs**

.1 Please contact UBC Building Operations - Technical Services Manager to alert him/her that special facilities will be designed and to ask for any coordinator assistance; phone: 604-822-6002, plus phone UBC Risk Management Services, Radiation Safety Advisor, phone: 604-822-7052.

.2 For floor drains, see Division 22 Section 22 05 00 Plumbing - General Requirements.

1.16 **Animal Care Facilities**

.1 Design and construction is to be completed in accordance with the latest CCAC guidelines.

1.17 **Kitchen and Lounges**

.1 Provide space between the countertop and over counter cabinets to mount paper towel dispenser and soap dispenser.

.2 All kitchens and lounges to have paper towel dispensers installed to conform to the UBC standard:
Kimberley Clarke Professional
Type: 09990
Color: Black/Smoke
Unit Size: 12.63” x 16.13” x 10.2”

This allows for the use of generic paper refills and universal keys so all paper towel dispensers use the same key. The top of the dispenser height is not to exceed 5.5 feet for access to the key on top of the lid.

.3 All kitchens and lounges to have hand soap dispensers installed to conform to the UBC standard:

   Purell FMX 20 (SKU 5234-06)
   2000 ml Purell Healthy Soap SKU 5572-02
   Color: Graphite/Metallic

This allows for the use of universal keys so all soap dispensers at UBC use the same key.
1.18 Acoustical Design Standard for UBC Classrooms

Acoustical Design Standard for UBC Classrooms

1. Context

This standard was developed by the following individuals, who met and deliberated between January 2004 and April 2005 as members of the UBC Classroom Acoustics Standards Committee:

- Barbara Gordon, Architect, Design Office, UBC
- Murray Hodgson, Professor of Acoustics, UBC
- Dan Lyžun, Acoustical consultant, Daniel Lyžun & Associates
- Justin Marples, Director, UBC Classroom Services
- Barry McKinnon, Acoustical consultant, McSquared System Design Group
- Tony Voon, Director, The Media Group, UBC

2. Scope

This standard pertains to the design of acoustical environments in spaces for teaching and learning (‘classrooms’) at UBC, and to related non-acoustical issues. It is relevant to the design of the geometry of the spaces, their bounding surfaces, their internal surface finishes, their contents, their mechanical, electrical and other systems, and their audio-visual systems. This standard specifies acoustical performance criteria that must be met to ensure high quality acoustical environments. The rationale for such criteria is discussed in Appendix A.

3. Classroom Categories

This standard considers three categories of classrooms, as follows:

- Small Standard Classrooms (up to 100 seats, rectangular geometry, no speech-reinforcement system);
- Large Standard Classrooms (more than 100 seats, non-rectangular geometry, with a speech-reinforcement system);
- Critical Classrooms (e.g., for distance learning).

4. Objectives

This standard presents acoustical performance criteria that will ensure that the acoustical environments in UBC classrooms are of high quality for the majority of instructors and students. In particular, it ensures that excellent verbal communication is possible between students and teachers. This is achieved by ensuring, at all seats, sufficiently high speech levels and sufficiently low noise levels, as well as appropriate reverberation. Spaces with acoustical environments that do not meet these criteria would be expected to present barriers to teaching and learning.

5. Design Constraints

The development of these acoustical standards was based on the following assumptions, and took into account the following constraints, in part imposed by current UBC policy:

- classrooms are approximately 60% occupied when used for teaching and learning;
- new UBC classrooms will not normally (this issue can be revisited for special rooms) have carpets, upholstered seating or sound-absorptive wall treatments;
many UBC classrooms have ceiling absorption – often form all or part of a suspended acoustical ceiling – to control the classroom reverberation, in-class student-activity noise and impact noise from spaces above the classroom;

- Given the above, the main source of sound absorption is the occupants of the classroom. Classrooms with much less than a 60% occupancy will be excessively reverberant and of inadequate acoustical quality. Classrooms with much more than 60% occupancy will have insufficient reverberation and non-optimal quality.

Other issues to be considered during the acoustical design process are discussed in Appendix B.

6. Acoustical Criteria

- Small Standard Classrooms: Reverberation Time (s) in the range 0.55 to 0.65 s; Maximum noise level = NC 35;
- Large Standard Classrooms: Reverberation Time (s) in the range 0.75 to 0.85 s; Maximum noise level = NC 35;
- Critical Classrooms: Reverberation Time (s) in the range 0.45 to 0.55 s; Maximum noise level = NC 25.

Reverberation-time criteria refer to the occupied, ‘in-use’ values at all frequencies. Noise levels refer to the unoccupied classroom (i.e., excluding student-activity noise) with mechanical services (e.g., the ventilation system) in typical operation, with normal activity occurring outside the classroom, and the classroom doors and windows closed.

Classroom equipment (projectors, computers) should be chosen to meet these criteria.

Additional criteria may apply to the design of electro-acoustical (e.g. speech-reinforcement, video-teleconferencing and assistive-listening) systems. Refer to the UBC Technical Guidelines for details.

Appendix C contains an overview of methods available for controlling classroom sound by acoustical design to meet the above performance criteria.

Appendix A: Rationale for Acoustical Standards

University classrooms are acoustically critical spaces in which verbal communication is crucial for teaching and learning. Non-optimal acoustical conditions in classrooms result in impaired verbal communication between teachers and students, impaired teaching and learning, and teacher voice problems. Students and instructors experience broken concentration, frustration and fatigue. Students have difficulty hearing other students ask questions. The problems are particularly acute for hearing-impaired people, and those using a second language.

Classrooms vary from small seminar rooms for a few occupants, to classrooms for several tens of students, to larger university lecture rooms and auditoria, accommodating hundreds of listeners. Smaller classrooms are usually of rectangular geometry. Larger lecture rooms can have fan plan-shape, inclined seating, non-flat ceiling profiles, etc. In smaller classrooms, talkers and listeners can be anywhere in the classroom, and source/receiver distances can vary from less than a meter to several meters. In lecture rooms and auditoria, the talker is usually at one end of the room, with the listeners spread out in front; source/receiver distances can vary from several meters to several tens of meters. For hygiene or maintenance reasons, classrooms may have hard, non-absorptive surfaces, though carpets and wall and ceiling absorption are not uncommon. Lecture and conference rooms can have non-absorptive or padded, sound-absorptive seating. The
occupants themselves contribute significant absorption to the classroom. This, and the fact that classroom occupancy can vary considerably, must be considered in the acoustical design.

In classrooms, as in other rooms for speech, quality and ease of verbal communication, free of distractions, are prime concerns. Verbal communication is considered to be affected by two main acoustical factors – the classroom reverberation, and the relative decibel levels of the speech signal and the background noise, at the listener’s ears. The classroom speech sources are the teachers’ and the students’ voices. Classroom noise sources include mechanical services (e.g. ventilation outlets), classroom equipment (projectors, computers), and the teachers’ or students’ voices when the other is generating the signal to be heard. Noise breaking into the classroom from outside can be significant when the classroom is located near transportation corridors (such as highways, airports, etc.), or in cases when children are active in nearby corridors or play areas. Intermittent noises, which cause distraction and break concentration, are considered more problematic than continuous noises. Finally, classroom activity itself generates significant noise, including speech babble, cell-phone ringing and impact noise from footsteps, etc.

It is generally considered that, for excellent verbal communication with instructors talking in a comfortable voice level, background-noise levels should not exceed about NC 35 for normal-hearing, first-language listeners, and NC 25 for hard-of-hearing or second-language listeners. Regarding the optimal reverberation for speech intelligibility, either too little or too much reverberation is detrimental. Excessive reverberation impairs verbal communication. With too little reverberation, voices do not readily reach listeners farther away. Hard-of-hearing and second-language listeners have more difficulty hearing in reverberation.

Appendix B: Non-Acoustical Considerations Affecting Acoustical Design

Modern building trends increasingly involve sustainable or ‘green’ design principles. Acoustical designers should be aware that university buildings containing classrooms, designed according these principles, present particular challenges with respect to meeting the acoustical criteria in this standard. ‘Green’ and acoustical performances are often in conflict. Examples of such conflicts are as follows:

- excessive noise levels resulting from inadequate external to internal sound insulation resulting from the promotion of natural building ventilation;
- excessive reverberation resulting from the absence of sound-absorbing materials left out of the building design in order to promote the use of hygienic materials;
- excessive impact noise or reverberation resulting from the absence of carpets and suspended acoustical ceilings not included in the design of a building incorporating thermal slabs for heating and cooling.

Designers should be aware of issues associated with the use of synthetic, fibrous materials for sound absorption in rooms, and of potential conflicts between the use of fibrous materials for noise control and ensuring high indoor-air quality. Refer to the UBC Technical Guidelines for further information.

Appendix C: Controlling Classroom Sound

Acoustical design is a complex inter-disciplinary task to be considered in the design or renovation of all classrooms. An acoustical consultant must be involved at the inception of all projects. The acoustical consultant should work closely with UBC Campus Planning, the project architect and other members of the team designing all building systems.
Controlling and optimizing the acoustical conditions in a classroom, or other rooms for speech, involves three fundamental considerations:

- **Promoting high speech levels**: Avoid excessive classroom volume due, for example, to high and vaulted ceilings. Use classroom geometries that direct sound to the back of the room. In large lecture rooms, this can include angled reflectors around teaching areas, and profiled ceilings. Given that classrooms must have minimum heights to meet requirements for lighting, visual aids, ceiling profiling, etc., an appropriate amount of surface absorption, usually located on the ceiling. Keep at least the central part of the ceiling sound reflective to promote the reflection of speech sounds to the back of the classroom. Use approximately square floor plans, avoiding long and wide rooms. Amplification by a speech-reinforcement system will likely be involved in larger rooms. One important issue to consider at the classroom design stage is that the optimal acoustical conditions for unaided speech may not be the same as when a speech-reinforcement system is in use;

- **Controlling background noise**: Avoid open-plan design. Control the noise and vibration of mechanical services. Avoid high terminal velocities of supply air-terminal devices, and place volume-control devices at distances of 0.5 m or more upstream to minimize noise generated by turbulent flow. Choose quiet equipment for use in the classroom, or enclose them in properly designed enclosures (e.g. projection booths). Impact noise due to student activity can be reduced by the use of carpets and cushioning materials in the classroom under consideration, as well as in the classroom above. The partitions bounding the classroom must provide adequate sound isolation; in critical cases, this might require the use of non-openable windows, entrance vestibules and quality door seals;

- **Optimizing reverberation**: Apply appropriate sound-absorptive materials to the room surfaces. Avoid applying sound absorption to the central part of the ceiling, which provides useful reflections between talkers and listeners. Using sound-absorptive seating allows the ceiling to be left reflective, and reduces the sensitivity of the classroom’s acoustical conditions to the number of occupants.

***END OF SECTION***