



ARTS AND CULTURE STUDIOS TECHNICAL GUIDELINES

REAL ESTATE, ENVIRONMENT AND FACILITIES MANAGEMENT

Facility Planning and Development

Including Artist, Production/Rehearsal
and Live-Work Artist Studios

JULY 2024

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1. GENERAL

1.1 INTENT

1. The technical guidelines are supplementary technical requirements to the Facility Standard Manual (FSM) and are to be read in conjunction with the FSM and other city-wide guidelines and requirements.
2. The intent of these guidelines is to encourage functional, accessible, affordable and safe Arts and Culture Studios and Production and Rehearsal studios.
3. Wherever guideline provisions refer to Arts and Culture Studio(s):
 - They refer to artist studio classifications – Artist Studio (Class A and Class B), and Production and Rehearsal Studios unless otherwise noted; and
 - If applicable, they refer to the residential development associated with the artist studio(s).
4. Wherever guideline provisions refer to **Live-Work Artist Studio(s)**:
 - The intent of these guidelines is to encourage functional, livable, accessible, affordable and safe City-owned or leased Live-Work Artist Studios and to outline the basic technical requirements.
 - The intent of this document is to outline the basic technical requirements for work area spaces accommodated in Live-Work Artist Studios, inclusive of both Class A and Class B artist studio designations, secured by the City of Vancouver as a capital asset.
 - Living spaces associated with Live-Work Artist Studios must adhere to the City of Vancouver's BC Housing Design Guidelines and Construction Standards unless otherwise specified in this document.
5. These technical guidelines are:
 - To be applied to the design and construction or renovation of City-owned or leased Arts and Culture Studio spaces, and Live-Work Artist Studio spaces. The Live-Work Artist Studio may be included as part of the Artist Studio Award Program, where they are awarded to Vancouver-based artists of various disciplines.
 - While recognizing that there is a wide variety of Arts and Culture Studio classes and subcategories, each with their own unique needs, the intent of this document is to outline the basic technical requirements for the range of spaces falling into the Artist Studio (Class A and Class B), Production and Rehearsal, and Live-Work Artist studio designations secured by the City of Vancouver as a capital asset.
 - To clarify the minimum standard required by the City of Vancouver for materials, finishes, equipment and other aspects.

- To be used as a tool by consultants in developing their designs and specifications.
- To be used as a tool at Facility occupancy stage to gauge whether these minimum standards have been met.
- To be used as a tool for Facility cost estimates early in the design process.

Variations from these guidelines may be considered but are not to proceed without prior discussion and acceptance by the City of Vancouver.

Note: areas referenced within the Guidelines relate to clear, functional space amounts and are therefore calculated as net square footage.

1.2 EXPLANATORY NOTE

1. In accordance with Vancouver Zoning and Development Bylaw, definitions are provided in Appendix 2.
2. General Vancouver Building By-Law (VBBL) Requirements.
3. Refer to listing of all applicable regulations and standards in Section 1.3.

1.3 REGULATIONS AND STANDARDS

Consultants and developers are to ensure that all applicable building codes, government acts and health regulations are met, including the current Vancouver Building Bylaw, Fire By-law (FBL), and British Columbia Fire Code (BCFC) and where relevant the NFPA (the National Fire Protection Association) standards. These include, but are not limited to:

1. The City of Vancouver Building Bylaw (VBBL).

The following requirements specific to artist studios are highlighted:

1. Production or Rehearsal Studio

- As defined in the VBBL, production/rehearsal studios are not classified as Artist Studios – Class or Class B, nor are they classified as standard theaters.
- Buildings intended for such use will classify as either a major/subsidiary Group A Division 2 occupancy (i.e., containing dance, music or drama studios), or a subsidiary/major Group F Division 2 or 3 major occupancy (i.e., containing rooms for the production of motion pictures, videos, television/radio programs, or sound recordings).

2. Live-Work Artist Studio – Class A

Refer to the current VBBL, where a building contains the integration of Artist Studios – Class A with residential quarters, regarding Multi-Occupancy Group requirements relating to:

- NFPA sprinkler conformance, and
- structural floor loads requirements

3. Live-Work Artist Studio – Class B

Refer to the current VBBL, where a building contains the integration of Artist Studios – Class B with residential quarters, regarding Multi-Occupancy Group requirements relating to:

- The construction requirements,
- The spatial separation requirements of the building,
- The fire alarm requirements, and where a fire alarm is required, smoke detectors, smoke alarms in individual suites as required,
- Building sprinklers in conformance with the current NFPA,
- Standpipe requirements,
- Accessible design requirements, and
- Structural floor loads requirements.

Refer to the current VBBL requirements for light and ventilation borrowed from the working studio area.

In addition, refer to the VBBL regarding exit travel distance requirements, when a portion of the studio such as a dinette or sleeping loft is used solely as living space.

2. Occupational Health and Safety Regulation (Work Safe BC)
3. The following standards and guidelines must be referenced and met where applicable:
 - Universal design is required.

Beyond the requirements of the VBBL, include Universal Design Principles in the design. Refer to the BC Housing Design Guidelines and Construction Standards for Universal Design Principles.

- Refer to the Public Washroom Design and Technical Guidelines.
- Refer to Reducing Barriers for Trans* & Gender Variant Community Members.
- City of Vancouver Bird Friendly Design Guidelines.

These guidelines are intended to support the design and implementation of bird friendly development throughout the City. <http://vancouver.ca/files/cov/vancouver-bird-strategy.pdf>

- Acoustical performance
 - Note that there are many variables to consider and specific guidance from an acoustical specialist should be sought for project specific details. In critical applications, lab testing of the intended envelope should be required.

4. Related Design and Technical Guidelines

The following related Design and Technical Guidelines are available to help provide clarity to partners involved in developing in-kind amenities. These design and technical guidelines outline City standards for functional requirements, materials, finishes, equipment, and technical specifications. These guidelines are available on the City's website, and where applicable found in the links below:

- City of Vancouver's Facility Standards Manual
- BC Housing Design Guidelines and Construction Standards
- Social Facility Technical Guidelines
- Public Washroom Design and Technical Guidelines
- Workspace Strategy and Office Accommodation Guidelines
- DDC Technical Guidelines
- Electronic Security Systems Specification CPS
- Bike Mobility Amenity Guidelines
- City of Vancouver Graphic Design Standards for Signage

The Consultant is responsible for ensuring all applicable updates or revisions to the relevant codes and regulations are addressed and included in the work.

The Consultant is responsible for ensuring any additional relevant guidelines are referenced and included in the work. Refer to the City of Vancouver Zoning and Land Use document library:

<https://vancouver.ca/home-property-development/zoning-and-land-use-policiesdocument-library.aspx>

New and renovated Arts and Culture Studios and Live-Work Artist Studios to be held as capital assets by the City are expected to follow the City's normal permitting and regulatory processes. Development, Building and Occupancy Permits are required for all new Arts and Culture Studio facilities. For detailed information concerning these permits and other relevant codes and requirements, contact the City of Vancouver Enquiry Centre, Development Services Department.

1.4 SUSTAINABILITY

Refer to Facilities Standards Manual for details.

1.5 DISCLAIMERS

Some items that have been noted throughout this document are Operator preferences and the selection should be confirmed with the City of Vancouver regarding their appropriateness for each Facility.

Any specific products named in this document are not to be taken as the City of Vancouver's endorsement of that product, but rather as an example of a standard of quality that has proven successful in the past. Any other products that meet this level of quality will be considered for use, but their use is not to proceed without prior discussion and acceptance by the City of Vancouver.

2. PLANNING

2.1 INTENT

1. The following information supplements the functional programming documents for each Arts and Culture Studio or group of Studios if applicable.

2.2 PARKING and LOADING

1. Loading access is required.
2. Loading bays should be adjacent to a direct stair-free route to an elevator and be covered (can be inside or outside).
3. Class/Type of loading stall should be driven by engineering requirements and artist discipline.
4. Loading, vehicle and bicycle parking provided must meet the minimum requirements of the Parking By-Law.
5. A reduction of or additional vehicle and/or bicycle parking may be required. Consult with the City and Facility Operator to confirm.
6. Location of bicycle and vehicle parking should be within easy access of the Development's entrance.

2.3 MAIL

- Mailbox accessible from interior at main entrance (confirm requirements for each Development).

2.4 STORAGE

1. Storage is a critical design consideration to ensure the flexibility of the arts facilities by the widest possible range of users. Ensure that sufficient, appropriate storage that is clearly labelled, and flexible in configuration is provided. In particular note any need for:
 - Large/oversized items,
 - Toxic/hazardous materials
 - Other specialized items.
2. In addition to the required work area for each studio type, a minimum of 5m² (50sf) of storage per artist is required.
3. Theatre and Dance Rehearsal studios require a minimum of 37m² (400sf) storage adjacent to rehearsal area.
4. Music Rehearsal and Production studios require Performance storage with a minimum of 7.5m² (80sf) and Instrument and Equipment storage with a minimum of 8m² (90sf).
5. Storage may be configured for individual studios and/or as shared amenity and should allow for custom configuration.
6. For Live-Work Artist Studios:
 - Storage should be located within the unit, adjacent to work area and allow for custom configuration. A minimum of 5m² (50sf) of storage per artist is required.
 - Provide additional storage (outside of the unit if required) to support the living area of the Live-Work Artist Studio unit per (Zoning) requirements.
7. Allow for proper ventilation of enclosed storage spaces.
8. Any toxic/hazardous material storage should adhere to applicable safety regulations including the current VBBL and Fire By-law.

2.5 GARBAGE AND RECYCLING

- Refer to the Facility Standards Manual for details.

2.6 ANCILLARY AND SERVICE SPACES

1. Janitor Room
 - Refer to Facility Standards Manual for details.
2. Multipurpose Area

- A separate multipurpose area with a minimum area of 37m² (400sf) should be provided in developments with overall/combined studio areas of 185m² (2,000sf) or larger. This space would include sufficient infrastructure to function as a common workshop, amenity space and presentation area.

3. Workshop

- The common workshop area is a facility separated from individual artist studios and associated residential units, and includes shared tools, equipment, etc.
- Workshop should provide:
- A mechanical ventilation unit with associated ducting sufficient for the safe use of noxious or toxic materials.
- A 120/208V, 3P, 4W dedicated electrical panel complete with surge protection device for workshop machinery and loads.
- Plumbing sufficient to accommodate a utility sink complete with sediment trap.
- Wall protection or corner guards in high traffic areas.
- A minimum 3,600mm (12 ft) clear ceiling height.
- Acoustic considerations regarding sound isolation must be considered. Work closely with the acoustical engineer, where applicable, to determine the appropriate assembly and ensure that floor to ceiling heights are not compromised. Acoustic considerations regarding sound isolation and acoustical comfort should be fully considered and, in some cases, will require the assistance of a suitably qualified acoustical engineer to determine the adequacy of separating assemblies and interior finishes for acoustical requirements.
- Fire separation to be determined based on the workshop's use and its contents.
- Refer to technical section for finish and plumbing guidelines.

4. Amenity area should include:

- A flexible space that can be used for (among other functions): meeting space or presentation area for artwork.

5. Presentation Area could be included as part of the Amenity area. It should provide:

- A minimum 3,600mm (12 ft) clear ceiling height.
- Infrastructure to support changing art installations and displays:
 - Suitable lighting.
 - Electrical and data outlets.
 - Display walls that include plywood backing reinforcement for hanging artwork subject to achieving suitable acoustic conditions.

- Capability for ceiling to accommodate suspension grid for hanging artwork subject to achieving suitable acoustic conditions.;
- Infrastructure must be compatible with achieving suitable acoustic conditions.
- See technical section for lighting and ceiling guidelines.

6. Utility Sink Access

- Studio facilities with dance and theatre rehearsal spaces must include roughed-in plumbing to permit the future installation of utility sinks. The rough-in should be located to permit easy shared access from multiple studios ideally within 45m (150ft) of studio spaces.
- All other studio types must include the installation of double utility sinks complete with sediment trap. Number of sinks to be determined in consultation with Studio Operator.
- See technical section for plumbing guidelines.

7. Office Area

- A separate office area is required in developments with overall/combined studio areas of 185m² (2,000sf) or larger. Consult with City and Facility Operator.
- Refer to Workspace Strategy and Office Accommodation Guidelines.

8. Kitchenette

- A separate kitchenette area should be provided in developments with overall/combined studio areas of 185m² (2,000sf) or larger. It should accommodate the following:
- Minimum length of 2.4 m (8'-0") of upper and base cabinet, microwave outlet and shelf, and double bowl stainless steel sink.

9. Refrigerator, microwave, dishwasher.

- Above counter outlets.
- Amenity kitchenettes are not intended for commercial cooking purposes.
- See technical section for millwork and plumbing guidelines.

10. Washroom Facilities

- Washrooms should be provided on the same floor as the studio spaces.
- Washroom count to be based on occupancy and code requirements.
- Refer to City of Vancouver Facility Standards Manual.
- Refer to City of Vancouver Public Washroom Design and Technical Guidelines.
- See technical section for mechanical and plumbing guidelines.

11. Change Rooms and Shower Facilities

- In developments with dance and theatre studio spaces or with overall/combined studio areas of 185m² (2,000sf) or larger, change rooms complete with shower facilities to be provided. At least 1 changeroom and shower must be fully accessible.
- Change room(s) and shower(s) can be grouped and located on 1 floor.
- Change rooms shall have lights, mirrors, shelves and wardrobe hooks for the Performers' make-up and personal clothing and table space for each Performer.
- Provide a sink with hot and cold running water.
- Refer to City of Vancouver Facility Standards Manual for Universal Access requirements.
- Refer to City of Vancouver Public Washroom Design and Technical Guidelines.
- Refer also to Canadian Theatre Agreement standards.

12. Laundry Facilities

- All studio facilities with dance and theatre studio spaces or with overall/combined studio areas of 185m² (2,000sf) or larger must include the installation of laundry facilities (minimum of one washer and one dryer).
- All other studio types must have roughed-in plumbing to permit the future installation of laundry facilities. The rough-in should be located to permit easy shared access from multiple studios, ideally within 45m (150ft) of studio spaces.
- See technical section for mechanical and plumbing guidelines.

2.7 LIVE-WORK ARTIST STUDIOS: IN-SUITE SERVICES

1. In-suite services associated with Live-Work Artist Studios must adhere to the City of Vancouver's BC Housing Design Guidelines and Construction Standards unless otherwise specified in this document.
2. Utility Sink
 - All live-work artist studios must include the installation of an industrial grade stainless steel double utility sink with hot and cold water and integral stainless-steel countertop, complete with floor mounted sediment trap, ideally located in the workspace area.
 - In smaller live-work artist studio units, this may be integrated within the kitchen.
 - See technical section for plumbing guidelines.
3. Kitchen
 - Kitchen in-suite should accommodate universal access and include:
 - Fridge, microwave, oven/stove, dishwasher, millwork cabinets/counter, sink

- Above counter outlets.
- See technical section for millwork and plumbing guidelines.

4. Washroom

- 3-piece washrooms should be provided within the premises.
- Washroom must be accessible.
- technical section for mechanical and plumbing guidelines.

5. Laundry

- All live-work artist studios to include in-suite laundry facilities.
- See technical section for mechanical and plumbing guidelines.

2.8 CIRCULATION AND ACCESS

1. Wayfinding

- As there may be multiple studios of varying sizes in the building, signage indicating use must be visually prominent to make easily navigable.
- Provide a building directory.
- Provide a *Community Notice Board* that will be visually prominent, informing artists and visitors of future events, cultural programs, and opportunities (for example provide rough in for electronic hook up in the future).
- If applicable, the Office/Administration Area should be easily findable within the building.
- If applicable, Rehearsal Spaces must be easily accessed by visitors from the Main Entrance for occasional performances. The rehearsal spaces are not required to be located at the main entrance level, but they are required to be accessible from the main entrance level, in accordance with the current VBBL.
- Signage should be barrier-free and universal. Refer to City of Vancouver Graphic Design Standards for signage.
- See technical section for signage guidelines.

2. Circulation

- Access and corridors between the loading bay and the elevator should be designed to permit the moving of large works of art, materials and / or equipment. Garbage and recycling also require direct access.
- Hallways are required to be:

- Arts and Culture Studios: a minimum of 1800mm (6 ft) in width to accommodate movement.
- Live-Work Artist Studios: a minimum of 1200mm (4 ft) in width.
- To conform to requirements for persons with disabilities and moving large artwork:
 - Recess all sprinkler heads,
 - Wherever possible recess fixtures, storage, fire extinguishers etc.
- Provide wall protection or corner guards in high traffic areas.
- Public exits shall be planned in such a way that the public does not have to cross through a secure Arts and Culture Studio space for exiting.

3. Doors:

- Exterior building entrance double doors with an overall opening of 1800mm (6ft) and a minimum height of 1800mm (6ft) are required.

4. Arts and Culture Studios:

- Interior double doors with a minimum overall opening of 1800mm (6ft) and a minimum height of 2100mm (6'-8") at the entrance to studio area are required. Remainder of interior doors within the studio area are not required to exceed code requirements.
- Door height to a minimum of 2100mm (6'-8").

5. Live-Work Artist Studios:

- Interior doors to live-work artist studios with minimum overall opening of 1200 mm (4ft) wide are required.
- Door height to a minimum of 2100mm (6'-8").

6. See technical section for hardware guidelines.

7. Elevator:

- Over-sized elevators that can carry heavy loads are required to facilitate moving larger works of art and/or equipment.
- See technical section for elevator guidelines.

2.9 SAFETY AND SECURITY

1. Safety and security provisions in the development can present some challenges, particularly because occupants, employees, and clients are likely to share underground parking, lobbies, elevators, hallways, etc.
2. The development should take into consideration the principles of Crime Prevention Through Environmental Design (CPTED). In addition, the safety sections of guidelines related to a District Schedule or Official Development Plan should be supplemented with the following considerations:
 - Public access to floors above the ground level should be limited to established business hours and restricted by intercom and passcode systems or equivalent security solutions as required for Universal Access.
 - Each studio, including ground level studios, should have secure internal access through a corridor to parking, garbage, and mailbox areas. For ground level studios, additional security features such as electronic security systems should also be considered. Standard window security grill bars would not be supported on building elevations that flank the street; and
 - Live-Work Artist Studio parking should be separate and secure, similar to security provisions for separating residential parking from commercial parking.
3. All rooms will feature locks. Refer to “Doors and Hardware” guidelines in technical section.
 - Entry door to the facility must fail to lock from the exterior.
 - See technical section for security guidelines.
 - Refer to City’s Electronic Security Systems Specification.

2.10 WORK AREA

1. Visual and Media Arts:
 - Artist Studios Class A
 - Minimum work area of 14m² (150sf) per artist is required. A range of work area sizes is preferred.
 - A mixture of studio sizes is preferred, for example:
 - 40% at 46.5 m² (500sf),
 - 40% at 93m² (1000sf),
 - 20% 140m² (1500 sf) or larger.

- Refer also to modular layout recommendations.
- Square/rectangular area is preferred.
- Artist Studios Class B
 - Minimum studio work area of 14m² (150sf) is required. A range of work area sizes is preferred.
 - Mixture of studio sizes is required, for example:
 - 40% at 46.5 m² (500sf),
 - 40% at 93m² (1000sf),
 - 20% 140m² (1500 sf) or larger.
 - Refer also to modular layout recommendations.
 - Square/rectangular area is preferred.

2. Music Studio (Production and Rehearsal) Space:

- To achieve sound excellence, the Production/Rehearsal studio space:
 - Should not be completely square in shape.
 - It should include some irregularity in the plan walls for a better quality of sound, and should avoid any right angles at wall joins, if possible, to avoid acoustic reflection and dead zones.
 - Room configuration must be reviewed by an acoustic consultant. Refer to Section 3.4 Acoustic Technical Guidelines for further information.
- Typical music production/rehearsal spaces:
 - For individuals a minimum area of 9.3m² (100sf) is required. A range of sizes should be provided.
 - For collectives a minimum area of between 18.6m² (200sf) is required.
 - A large production/rehearsal room with a minimum area 32.5m² (350sf) is required.

3. Recording Studio and Control Room

- Provision is optional. Consult with the City and/or Facility Operator.
- Control room is where lighting, sound mixing, and other recording equipment is operated and will be adjacent to the Performance Space with visual access to stage area.
- Room configuration must be reviewed by an acoustic consultant.

4. Electrical outlets to be provided in ceiling, in addition to outlets located at walls.
5. Refer to Section 3.4 Acoustic Technical Guidelines for further information.
6. Refer to Appendix 1: "City of Vancouver Music Production Space – Preliminary Criteria for Acoustic Design."
7. Dance Studio (Rehearsal and Production)
 - Dance studio (rehearsal spaces)
 - Spaces should be open and unobstructed.
 - Functional area should be 9m x 12m (30' x 40').
 - Electrical outlets to be provided in ceiling, in addition to outlets located at walls.
 - Sprung floor to be provided. Refer to Technical Section for details.
 - Mirrors to be provided. Confirm with Operator preference for wall-mounted vs. movable mirrors. Refer to Technical Section for details.
8. Theatre Studio (Rehearsal and Production)
9. Theatre studio (Rehearsal spaces)
 - Spaces should be open and unobstructed.
 - Functional area should be 18m x 14m (60' x 45'). If required, a smaller area of equivalent proportion could be considered in consultation with Operator.
10. Electrical outlets to be provided in ceiling, in addition to outlets located at walls.
11. Live-Work Artist Studio work areas
 - Minimum, unobstructed work area of 150 SF is required (not including storage space requirements).
 - Square/rectangular shape is preferred, and unobstructed.
 - Locate adjacent to windows.
 - Layout with work area open to living area is preferred.

2.11 CEILING HEIGHT

1. Visual Arts Studios

Artist Studio Class A and Class B spaces – open ceilings with exposed structure are preferred:

- A minimum clear ceiling height of 3.7m (12 ft) is preferred.
- A clear ceiling height of 3m (10ft) high is required.

2. Music Studio (Production and Rehearsal)

- All (finished) ceiling heights listed are to the interior acoustic treatment and fixtures. Refer to Appendix 1 "City of Vancouver Music Production Space - Preliminary Criteria for Acoustical Design" for additional recommendations and requirements.
- Music Production Studio spaces
 - A minimum clear ceiling height of 3.7m (12 ft) to the interior acoustic treatments and fixtures where possible with a minimum of 0.6m (2ft) of resiliently attached drywall ceiling with batt insulation in the cavity.

3. Rehearsal Space

A minimum clear ceiling height of 3.7m (12'-0") with a minimum of 0.8 - 1m of resiliently attached drywall ceiling with batt insulation in the cavity.

4. Control Room

- A lowered clear ceiling height to minimize sound reflection of 3m (9.5ft) with a minimum of 0.6m (2ft) of resiliently attached drywall ceiling with batt insulation in the cavity.
- A clear ceiling height of 3.5m (11.5ft) is acceptable.
- In all other cases, a clear ceiling height of 3.7m (12ft) is preferred.

5. Dance Studios – open ceilings with exposed structure are preferred:

Dance Studio (Rehearsal and Production spaces)

- A minimum clear ceiling height of 3.5m (11.5ft) is required. (b) A 4500mm (15ft) clear ceiling height is recommended.

6. Theatre Studio (Rehearsal and Production spaces)

A minimum clear ceiling height of 6m (20ft) is required.

7. Live-Work Artist Studio work areas

- A clear ceiling height of 2.7m (9ft) high is required at work area.
- A minimum clear ceiling height of 3m (10ft) at the work area is preferred.

2.12 STRUCTURAL LOADING

- Floor and suspension loading must be designed in accordance with VBBL requirements.

- For anticipated loads exceeding this amount, an independent review and /or confirmation from base building engineer is required.

2.13 VENTILATION

1. Mechanical ventilation of live-work space should be exhausted at a location having the least impact on residential livability. This should ideally be at the roof in a location that does not affect air quality for open space or air intake units.
2. Point of Use Filtration System is recommended for exhaust uses that result in the production of potentially harmful or odorous airstreams. For more details, please refer to Facilities Standards Manual
 - Each individual unit will have an exhaust duct connection, and an intake connection, directly connected to the exterior of the building. These connections to the exterior will be local to each individual live-work artist studio unit, and not connected to large vertical exhaust stacks. Provide a point of use capture filtration system based on their specific filtration needs. Filtration needs are very specific to the type of work being performed and cannot be generalized.
 - The point of use system will be engineered to address the specific hazards or odours present as a result of the unique use case of the space.
 - Filtration system will need to be engineered to exact process being undertaken.
 - Point of use filtration systems will need to be maintained properly. Filter media, and general maintenance to ensure proper operation of filtration system will need to occur on a regular schedule.
3. High Plume Commercial Ventilation is recommended for particularly hazardous exhaust airstream applications. These exhaust airstreams shall be directed to the roof in exhaust duct risers and discharged via a suitable high plume system.

Standard industrial solutions for properly ventilating spaces using hazardous materials include ventilating spaces with sufficient air changes and exhausting any hazardous exhaust away from the building to a distance that would not negatively impact the adjacent environment. This is typically achieved by the provision of exhaust stacks with sufficient height and exhaust velocity to provide an exhaust plume height that clears adjacent spaces and buildings.

4. Refer to Facilities Standard Manual.

2.14 DAYLIGHT ACCESS AND CONTROL

1. Daylight access:
 - Locate artist studios, or live-work artist studio work areas, to maximize daylight penetration. North light is preferred for visual arts studios.
 - Daylight access to be adjacent to work area.
 - Glazing to be of consistent colour and density. Coloured glass that affects the colour of light transmission is not acceptable.
 - Blinds with glare control and blackout capability are required.
2. Spaces to prioritize for natural light are:
 - Visual arts studio work areas
 - Office areas
3. Ideally, every studio will have access to natural light. Where not possible, natural light should be prioritized per above.
4. The allocation of windows in studio and rehearsal/production spaces may make acoustic isolation more challenging. It is recommended that an acoustic specialist should review the inclusion of windows. Refer to Section 3.5 for further information.
5. Provision of sufficient daylight access for work areas in Live-Work Artist Studios may be difficult especially in existing buildings originally constructed for non-residential purposes. The use of “borrowed light” may be necessary.
 - Where direct access to daylight cannot be provided to a work area, when located at the rear of a unit, daylight may be borrowed from exterior wall windows through a living adjacent to these windows.
 - Where it is proposed to enclose work area that does not have direct access to daylight, at least one wall of the enclosed area with primary exposure to the building’s exterior wall windows should be located no more than 7.6 m (25 ft.) back of the building’s exterior wall windows and of no less than 60% transparent or translucent glazing.
6. Refer to Technical section for glazing guidelines.

2.15 SPECIALIZED NEEDS

1. For all references indicated in this section refer to the current Vancouver Building By-law (VBBL), FBL and NFPA. The following represent some of the possible specialized uses that may need to be accommodated and that will have requirements exceeding the baseline studio provisions.
2. Smudging

- Confirm details and requirements with City of Vancouver’s Facility Standards Manual and in consultation with Indigenous stakeholders and space Operators.

3. Welding and Cutting

- Where welding and cutting operations present a fire or explosion hazard to adjacent areas, they are to be carried out in a room that meets the VBBL requirements for fire separation and automatic fire extinguishing systems.
- Exhaust ventilation and explosion venting are to be provided. That is, an exhaust ventilation system and an explosion relief device, vent, or other protective measure designed in conformance with applicable codes and by-laws.
- Hot works involving open flames or the production of heat/sparks (including cutting, welding, soldering, grinding etc.), will be subject to the requirements of the current FBL.

4. Woodshop

- A woodshop is to be designed to the requirements of the FBL.
- In accordance with the VBBL, exhaust ventilation and explosion venting are to be provided. That is, an exhaust ventilation system and an explosion relief device, vent, or other protective measure designed in conformance with the applicable codes and VBBL requirements.

5. Fired Ceramics/Kilns

- Where flammable vapours are given off by products that are being baked or dried, refer to the FBL for applicable requirements. That is, the design, operation and maintenance requirements relating to baking and drying processes is to conform to NFPA 86-2011, “Ovens and Furnaces.”
- In accordance with the VBBL, exhaust ventilation and explosion venting are to be provided. That is, an exhaust ventilation system and an explosion relief device, vent, or other protective measure designed in conformance with the applicable codes and VBBL requirements.

6. Spray Booth

- Where combustible dry powders, flammable liquids, or combustible liquids are used in spray coating processes, the requirements of the FBL will be applicable. That is, the design, operation, and maintenance requirements relating to spray coating processes is to conform to NFPA 33-2011, “Spray
- Application Using Flammable or Combustible Materials.”

- In accordance with the VBBL, exhaust ventilation and explosion venting are to be provided. That is, an exhaust ventilation system and an explosion relief device, vent, or other protective measure
- designed in conformance with the applicable codes and VBBL requirements.
- In addition, where aerosol products are intended to be stored indoors, the requirements of the FBL will be applicable.
- Where the amount of stored dangerous goods (i.e., compressed flammable gases/aerosols) in a single fire compartment exceeds the values outlined in the FBL, the requirements of the VBBL of the FBL will be applicable.
- A ductless spray booth may be considered as an alternative option to be determined on a project-by-project basis. Consult with the City and Facility Operator.

7. Film Processing

Areas involved with the storage/handling of cellulose nitrate based film, will be subject to the requirements of NFPA 40-2011, "Storage and Handling of Cellulose Nitrate Film."

8. Hazardous Substances, Equipment, and Processes

- In accordance with the requirements of the VBBL, the storage handling and use of hazardous substances is to be in conformance with the applicable requirements of the FBL, and provincial regulations or other regulatory enactments.
- Where storage rooms are required by the FBL for the storage of flammable liquids or combustible liquids in an assembly occupancy, such rooms will not be permitted to be located above or below the first storey.
- Where the amount of stored dangerous goods (i.e., compressed flammable gases/aerosols) in a single fire compartment exceeds the values outlined in the FBL, the requirements of the VBBL and the FBL will be applicable.

2.16 MODULAR LAYOUT & FLEXIBILITY

- In shared studio facilities, artist tenants change regularly and along with them the nature of art practices. Therefore, a baseline environment that can be modified to suit such changes and include a standard level of servicing requirements (outlets, lighting, heating etc.) should be considered.
- The provision of a modular grid of spaces that could be used as individual studios, or combined as required for shared studio space, or larger studio space is an ideal approach.
- The provision of shared open layout studio space should consider the recommended range and distribution of studio sizes outlined in Section 2.10 Work Area.

- In addition to storage space, a minimum work area of 14m² (150sf) per artist is required for visual artists.
- The Studio Space should be flexible in the face of changing needs in the local Vancouver arts scene, and in the face of changing technology.
- Flexibility in layout will be sacrificed for acoustic separation purposes.

2.17 OUTDOOR WORK YARD

- Provision of a private (or shared with strata as applicable) outdoor work yard is recommended for Artist Studios Class A and Class B for visual arts.
- Area should be accessible from the exterior without entering the Facility or Live-Work Artist Studio unit.
- Work area to be paved and include:
 - Outdoor seating area.
 - Securable fence.
 - Hose bib access.
 - Area drain with sediment trap.
 - A weather-proof GFCI outlet.
- Work area should be provided consistent with the open space guidelines for residential development related to the relevant District Schedule or Official Development Plan.
- See technical section for outdoor work area guidelines.

2.18 GENERAL DESIGN CONSIDERATIONS

- Neighbourhood and Street Character
- The residential unit associated with the Live-Work Artist Studio should be visually screened so that it cannot be viewed from the street. It should generally not be located adjacent to the ground floor front wall of the building.

2.19 GENERAL HAZARDS

- Over-height spaces requiring access to high areas for maintenance, cleaning and art installation to be designed to meet best practices, per WorkSafe BC for fall arrest. Reliance on temporary scaffolding and genie lifts is not acceptable (unless approved and signed off by REFM during design).
- For prevention of entrapment, spaces (i.e., holes or openings) accessible to children must be smaller than 9cm (3.5") or larger than 23cm (9").

- Slots that vary in dimension such that either of the above conditions are encountered are not acceptable.
- Small dimension protuberances that may cause eye or puncture injuries are not acceptable.
- In general, edges and corners are to be rounded and eased. Sharp edges and corners are not acceptable.

3. TECHNICAL

3.1 GENERAL

- Artist Studios, or work areas within Live-Work Artist Studios, are to be built to light industrial, commercial grade construction and finishes.

3.2 GUARANTEES AND WARRANTIES

- In general, guaranties and warranties are to be provided per the industry standard.
- Where extended guarantees and warranties are required, they are noted in the following sections as appropriate.
- Where extended guarantees and warranties are provided, the certificates shall be issued to the City of Vancouver.

3.3 HAZARDOUS MATERIALS

All materials used in the constructing and finishing of the Facility are to be free of hazardous materials, including materials such as asbestos, lead, formaldehyde and PCBs. Contact the City of Vancouver Environmental Planning Group with any questions regarding the sourcing of appropriate materials.

3.4 GENERAL FINISH REQUIREMENTS

- Quality, durability and ease of maintenance are prime considerations when selecting finishes. Finishes and products are intended to be as simple and durable as possible to reduce maintenance and replacement costs.
- Only finishes and products of equal or greater durability will be considered acceptable for proposed substitutions.
- All surfaces, edges, corners and protrusions shall be finished to reduce or prevent hazards. All corners shall be rounded, edges eased, and surfaces shall be smooth. Particular attention shall be focused on concrete surfaces, windowsills, flashings, and laminate edges/corners.

3.5 ACOUSTICS

1. Acoustical responsibilities include the review of preliminary drawings to establish appropriate target criteria for all acoustical components and provide early guidance on:
 - Interior sound isolation which includes review of walls and floor/ceiling construction including components such as windows, doors, electrical boxes, etc.
 - HVAC noise and vibration control to limit background noise within the building.
 - Room acoustics for reverberation control and acoustic performance.
 - Environmental noise issues that include noise ingress from adjacent land uses and controlling mechanical equipment noise to the exterior which will impact on neighbouring communities.
2. Exterior noise
 - Outdoor landscaped areas to be effectively acoustically buffered from any noise from traffic, mechanical equipment or other disruptive noises.
 - Sound isolation for noise generated in outdoor work areas: Refer to Section 4, External Sound Isolation, Appendix 2, Appendix A "Preliminary Criteria for Acoustical Design".
3. Exterior-to-interior sound isolation
 Exterior noise, such as traffic, mechanical equipment or other disruptive noises is to be controlled by appropriate acoustical design of the exterior partitions to meet the allowable noise level criteria for studios and performance spaces.
4. Interior-to-interior sound isolation between tenants
 - At party walls between the Facility and any neighbours, an STC rating of 65 is to be achieved.
 - Refer to Appendix 1 "City of Vancouver Music Production Space - Preliminary Criteria for Acoustical Design", for additional recommendations and requirements.
5. Interior work areas – music production studios

 Refer to Appendix 1 "City of Vancouver Music Production Space Preliminary Criteria for Acoustical Design."
6. Room acoustics and reverberation control
 - Interior noise is to be controlled with appropriate acoustic surface treatment for interior finishes. Options for achieving appropriate interior noise control include:

- 75% of ceiling area shall be T-bar ceiling with NRC (noise reduction coefficient) = 0.70 or better, or
- Alternately the room design shall meet an equivalent acoustical performance.
- Spaces with ceilings higher than 3m (10'0") require acoustic treatment.
- For additional details, refer Appendix 1 "City of Vancouver Music Production Space - Preliminary Criteria for Acoustical Design."

7. HVAC and mechanical systems noise control

Refer to Appendix 1 "City of Vancouver Music Production Space Preliminary Criteria for Acoustical Design."

3.6 DIVISION 6 ARCHITECTURAL MILLWORK

Refer to the Facilities Standards Manual for details on architectural millwork.

3.7 DIVISION 7 BUILDING ENVELOPE AND ROOFING

1. Where a Development includes the building envelope and/or roofing as part of the City of Vancouver's capital asset, the following shall pertain:
 - The building envelope design and construction is to be in accordance with the principles and recommendations contained in the latest edition of Walls, Windows and Roofs for the Canadian Climate by the National Research Council of Canada (NRCC 13487) and per the Building Envelope Consultant's recommendations.
 - Target overall wall assembly RSI value shall be determined through energy modelling to meet Passive House or other zero emissions standard, as per the sustainability requirements.
 - If a floor of a studio space is over an unheated space, insulation shall be at minimum above the required RSI values by the City of Vancouver Building Bylaw and ASHRAE 90.1.

2. Roofs:

Refer to Facility Standards Manual for details.

3.8 DIVISION 8 DOORS AND WINDOWS

1. Windows (general):
 - Refer to Facility Standards Manual for additional information.

- Where a sill is 457mm (18") or less above the floor, or where impact with a window may occur, use tempered and/or laminated glass as appropriate. Interior and exterior glazing to individual studios to be translucent.
 - Tempered only at interior single glazed windows.
 - Tempered only at interior lite where exterior grade is within 610mm (2'0") of the interior floor level.
 - Tempered at interior lite and laminated at exterior lite where the exterior grade is a significant drop below the interior floor level (i.e., a storey or more)
 - Consider the location of Low-E coating, if used, in conjunction with the location of tempered and/or laminated glass as appropriate for each Facility.
 - Where visual privacy is desired, the translucency value of the glass needs to balance visual privacy with maximizing daylight penetration.

2. Exterior Openings

- Refer to Facility Standards Manual for additional information.
- All opening windows to be:
 - Limited to a maximum opening of 100mm (4") where accessible by children.
 - Screened.
 - For Class A studios, consider providing operable windows to allow for cross ventilation.
- Where a window opens into a walkway or occupy-able landscaped area, provide either a sliding window or restrict its swing so as not to create a safety hazard outside.

3. Doors and Hardware

- Main facility entry doors from the street and from the parkade to be equipped with a power- assisted door operator button for accessibility.
 - (a) Coordinate accessible operator button function with security requirements for these doors.
 - (b) Power-assisted door operator buttons on the interior side of doors leading to unsecured exterior areas (e.g. street, parkade) to be activated by card reader.
- All swinging type doors are to be insulated so as to provide for a minimum USI value of 2.1 (ASHRAE 90.1-2016).
- All non-swinging type doors are to be insulated so as to provide for a minimum USI value of 1.76 (ASHRAE 90.1-2016).
- Metal doors:

- To be commercial grade hollow metal with pressed steel frames.

4. Wood doors

- To meet AWMAC requirements for millwork (refer to 3.4 Architectural Millwork).
- To be solid wood core, except bi-fold and sliding doors to closets may be AWMAC hollow core doors.
- Refer to Appendix 1 “City of Vancouver Music Production Space Preliminary Criteria for Acoustical Design” for additional recommendations.

5. Hardware

- Refer to Facility Standards Manual for additional information.
- All hardware to meet accessibility requirements.
- Additional support for half doors when not mounted in regular door frame; use heavy-duty piano hinge for full height of door.
- Sliding doors to have the ability to pin in place at open position.
- Kick plates are required on the push side of all doors with closers and at all storage room doors.

6. Locks

- All locks to meet the City of Vancouver Security Standards.
- Lock type and grade to be established for each Facility.
- No magnetic locks, electric strike only for electronic locks.
- Final keys or fobs to be provided at Occupancy. Ensure that they are made accessible for people with varying levels of mobility.
- Interior locking strategy to be confirmed for each Facility with the following to be used as a guide:
 - All doors to have the same master key.
 - All exterior entry doors to be on same key (see also Security).
 - Internal doors and exterior storage to be on the same key, zoned where individual programs can be isolated.
 - Service rooms to be on the same key.
- All doors to have locks with “classroom” function except
 - Storage rooms and Laundry rooms may have “classroom or “storeroom” function.
 - Janitor and service rooms to have “storeroom” function.
 - Washrooms to have “privacy” function.

3.9 DIVISION 9 FINISHES

1. Partitions

- Acoustic measures
 - Acoustical insulating tape and strips, as required by wall assembly to meet required STC ratings.
 - Acoustical sealant, non-hardening, as required by wall assembly to meet required STC ratings.
 - Acoustical insulation, as required by wall assembly to meet required STC ratings.
- Provide adequate blocking inside walls at all millwork locations and furniture locations where furniture will be fixed to walls and at wall-mounted door stops, and where required to support art installations.
- High impact gypsum wall board to be provided to a 1800mm (6ft) A.F.F. minimum.
- Shower surrounds to be tile or acrylic, with water resistant cement fibre backer board. Standard drywall is not acceptable.
- Provide water-resistant wall protection around mop sinks 600mm (2ft) high minimum, with water resistant cement fibre backer board. Standard drywall is not acceptable.
- Where spray booth required, provide demising walls and door.
- Refer to Appendix 1 “City of Vancouver Music Production Space Preliminary Criteria for Acoustical Design” for additional recommendations.

2. Wall finishes

- General
 - Coordinate with acoustical consultant.
 - For Music studios (production/rehearsal spaces), wall finishes must consider the need for absorption and diffusion. Coordinate with acoustical consultant.

- Paint: painting and finishing to be to the “Premium Grade” Master

Painter and Decoration Association Recommendations and Standards; products to be MPI approved Institutional Low Odour VOC quality paint.

- Provide a two (2) year MPI Guarantee or 100% two (2) year Maintenance bond both in accordance with MPI Painting Specification Manual requirements.
- All painting work to be inspected by a Paint Agency Inspector acceptable to the specifying authority and the Operator.

- Provide documentation that the MPI approved Institutional Low Odour VOC quality paint is being used.
- All surfaces, including those to be covered with wall vinyl, to have one coat of Hi- hide sealer primer to suit surface.
- Apply three finish coats and additional coats to cover as required.
- Paint to be brush and roller applied, completely dried and sanded between coats and finished to a smooth surface without streaks or marks.
- Gloss levels:
 - Kitchens, washrooms, laundry and janitor's room walls and ceilings to be G5 (semi-gloss).
 - Painted doors and door frames to be G5 (semi-gloss).
 - All other surfaces to be either G5 (semi-gloss), G4 (satin), or G3 (eggshell) as required for the particular Facility.
 - G1 and G2 (matte) finishes are not acceptable.
- Wall protection to be provided as required for each Development. Top edges and corners of wall protection material to be in turn protected (details to be provided). Acceptable materials:
 - Plastic laminate.
 - Vinyl-acrylic sheet material (PVC-free) such as Acrovyn® or pre-approved alternate (c) High impact gypsum wall board.
 - Sheet flooring.
 - Or pre-approved alternate.
 - Note that due to re-finishing costs, wood is not preferred.
- Tile
 - Quarry and ceramic tile installation is to be in accordance with the recommendations of the Terrazzo Tile and Marble Association of Canada.

3. Ceiling finishes

- Coordinate with acoustical consultant for the need of a sound isolating ceiling assembly.
- No ceiling (this may occur in janitor, storage, utility rooms and studio spaces):
 - Paint all exposed structure and services (refer to paint section above).
- Gypsum board

- Paint (refer to paint section above).
 - Commercial quality suspended acoustic lay-in panel T-bar system:
 - Tiles to be minimum 19 mm (3/4") thick mineral ceiling tile.
 - System to have a minimum NRC rating of 0.70 and CAC rating of 35.
 - Access to be provided to all above-ceiling services.
 - All kitchens and washrooms to have ceiling finishes that are washable
4. Floor finishes
- General
 - Flooring for Theatre studio spaces must allow for ease of anchoring props and set pieces as needed. Floor finish should also be easily replaceable. Exposed concrete floor finish is not acceptable.
 - Flooring for Dance studios should also be easily replaceable. Exposed concrete floor finish is not acceptable.
 - Flooring for Music studios (production/rehearsal spaces) should be versatile: wood or non-absorptive flooring is preferred. A combination of carpet tile or rubber/resilient can also be considered.
 - Coordinate with acoustical consultant.
 - At high wear and tear locations in the Facility, such as the main entrance, consider the use of a more durable flooring material such as concrete or ceramic tile. All surfaces must be non- abrasive, washable and cleanable.
 - Base to be coordinated with flooring type, be continuous throughout, and a minimum 100mm (4") high.
 - Where demountable partitions and other items are indicated for installation on top of flooring material, install flooring material before these items are to be installed.
 - Carpet and resilient flooring installation to be in accordance with the recommendations of the National Floor Covering Association as detailed in their "Floor Covering Specification Manual" as issued by the BC Floor covering Association.
 - Use adhesives and sealants that have low VOC levels per LEED® requirements listed under credit 4.1 "Low-Emitting Materials, Adhesives and Sealants".
 - Maximize recycled content and end-of-life recycle-ability.
5. Concrete
- Concrete flooring is required in Class A and B visual arts studio work areas, and others as required for each Development.

- Concrete flooring is preferred in Live-Work Artist Studio work areas, unless specific disciplinary use determines other flooring preference.
- Densified concrete with smooth, troweled finish.
- Concrete to be sealed with Curing and Sealing compound.
- Flush finish at floor drains as required.

6. Resilient flooring

- Smooth, non-absorbent, non-slip and washable resilient flooring required in kitchens, washrooms, laundry, janitorial closets, and others as required for each Facility. Flooring to be:
 - Homogeneous sheet vinyl with heat welded seams, for example Tarkett or other pre-approved alternate (minimize VOC off-gassing).
 - Homogeneous sheet rubber with welded seams.
 - Or pre-approved alternate.
- Linoleum is not acceptable.
- All edges to be sealed.
- Resilient flooring may be tiles in less intense use contexts such as
- office environments, for example. The appropriateness of tile use vs. sheeting flooring to be reviewed for each Facility. If tiles are used, they are to be:
 - 0.25% dimensionally stable to minimize joint size.
 - Acceptable product:
 - Karndean International Heavy-Duty Commercial Vinyl Tile, or pre-approved alternate (minimize VOC off-gassing).
 - Either sheet flooring or tiles to be 0.11" or 2mm thick, minimum. Provide 5% extra of resilient flooring material of the same production run as installed for future maintenance requirements. Provide sheet materials in full roll width by the length required.
 - Resilient flooring installer to guarantee in writing the installation of the flooring material for two (2) years against loose fitting, breaking of seams, breaking away from the sub-base or any other installation defect.
 - Provide a minimum five (5) year guarantee that the resilient flooring will provide the specified level of appearance and wear, subject to proper care and maintenance.
 - Coordinate with acoustical consultant.

7. Sprung Floors

- If intended use is specifically for dance or theatre studios and a sprung floor is required, the floor structure must accommodate the sprung floor assembly depth to allow for flush installation of flooring surfaces.
- If added later as a tenant improvement, attention to transitions must be considered.
- Provision of a floating floor within dance studio will control structure borne transmission into the building structure.

8. Carpet (non-work areas)

- Carpet systems must meet or exceed the Carpet and Rug Institute's Green Label Plus testing and product requirements per LEED® requirements listed under credit 4.3 "Low-Emitting Materials, Carpet Systems".
- Underpad, if required, acceptable product: 6mm (1/4") Duracushion, or pre- approved alternate.
- The carpet pattern must be integrated, not applied.
- Carpet may be broadloom or carpet tile.
- Carpet to be solution dyed nylon, level loop construction, pile weight 950g/m² (28 oz/yd²) minimum if broadloom, or 610g/m² (18 oz/yd²) minimum if carpet tile.
- All edges to be sealed.
- Provide 5% extra of carpet of the same dye lot as installed for future maintenance requirements.
- Carpet installer to guarantee in writing the installation of the carpet for two (2) years against loose fitting, breaking of seams, breaking away from the sub-base or any other installation defect.
- Carpet manufacturer to provide a ten (10) year guarantee that the carpet shall retain 90% or more of its pile fibre. The guarantee shall also cover against defects of zippering, unravelling, colour fading, deterioration and delamination of backing materials, pulls, piling, matting, shedding or any other manufacturing defect.

3.10 DIVISION 10 SPECIALTIES

1. Toilet partitions:

- Refer to Facility Services Manual
- Plastic laminate covered high density particle board, acceptable product:
- Bobrick 1040 series
- Or pre-approved alternate.
- Metal with baked enamel finish; acceptable product:
 - Shanahan's baked enamel metal toilet partitions.

- Or pre-approved alternate.
 - Phenolic (if budget allows); acceptable product:
 - Bobrick 1080/1180 series FRP faced phenolic core partitions.
 - Or pre-approved alternate.
 - Hardware: heavy duty stainless steel with tamper-proof screws, concealed where possible.
 - Refer to Public Washroom Design and Technical Guidelines.
2. Washroom accessories:
- Paper towel dispensers to accommodate single-fold towels with no saw tooth cutting bar. Alternate types may be considered depending on Operator preference - confirm type required for each Facility.
 - Hand Dryers to be Dyson air blade mod. # EF1-CA-EDA0551A 4. Outside Lighting to have HOA (Hand/Off/Auto switch) controls for servicing.
 - Provide a waste receptacle in each washroom: confirm type required for each Facility.
 - Soap dispensers: generally, provide one at each sink (confirm type and locations required for each Facility). Confirm any other requirements for each Facility.
 - Provide a change table in one gender neutral washrooms. It may be a prefabricated item. Acceptable product:
 - Koala Kare surface mounted change station that supports static loads up to 200 lbs. complete with child protection straps.
 - Or pre-approved alternate.
 - Refer to Public Washroom Design and Technical Guidelines.
3. Lockers:
- Half-sized lockers required for dance and theatre rehearsal studios if not provided as millwork or as part of office furnishing (confirm number and type required for each Facility).
4. Blinds
- All blinds to be commercial grade; manual, chain operated roller style preferred. Motorized options to be used in hard to access locations.
 - Blinds to be installed on all exterior windows.
 - Blinds to be installed at interior windows as required for each Facility.

- All cords or chains to terminate 1.5m (5'0") above the floor, or to be supported on a hook at that height.
- Blind system should include both:
 - Solar Shades with fabric with a 3% open area and
 - Blackout Blinds.

5. Drapes:

- Heavy Drapes are required for Theater and Dance Rehearsal studios:
 - For additional sound absorbing material within the spaces, provide 25oz/yd² thick drapes.

6. Mailboxes:

One large mailbox accessible from interior at main entrance (confirm need for this for each Facility).

7. Entrance mats

At all entrances from the outdoors provide walk-off mats (minimum size should allow for an adult to take two steps before stepping onto another flooring surface). Either a recessed grille or surface walk-off mats are acceptable.

8. Notice boards

- Tackboards:
 - Corkboard complete with trim, or pre-approved alternate.
- White boards
- Magnetic white boards
- Confirm size, type and mounting locations for each Facility.

9. Mirrors

- Provide full height wall-mounted or movable mirrors (confirm preference with Operator) along at least 1 wall in dance studio rehearsal space.
- Confirm requirement for optional drapes to cover mirrored wall.

10. Signage

- To conform to the City of Vancouver Sign By-Law and Signage Graphic Design Standard.
- To conform to requirements for disabled persons:
 - Non-visual markers (tactile signage, auditory signage).
 - High contrast materials and colours.
- Multilingual signs may be required (confirm requirements for each Facility).
- Provide interior signage in common areas of the Development clearly specifying the City-approved use for Artist Studio purposes to ensure that all owners and occupants of the Development are aware of the approved use; a minimum of one sign shall be placed in a clearly visible location at all common entranceways and/or lobbies within the Development.
- Ensure signage is provided for the following:
 - To identify the Facility.
 - To indicate the entrance to the Facility.
 - At dedicated parking stalls.
 - For all necessary way-finding.
 - At entries.
 - At commons areas.
 - At service rooms.
 - Provide any other signage required for each Facility.

3.9.10.6 Ensure all signage required by Building Code, including Fire and Life Safety Evacuation Plans, is provided.

11. Fire and Life Safety Plans

- Fire safety plans to be reviewed with the Operator prior to submitting to the Fire Department at Occupancy.
- Ensure a copy is provided to the City of Vancouver with the operations and Maintenance Manuals.

12. Fire Extinguishers

- To be recessed
- If surface mounted, all corners and edges are to be rounded.

3.11 DIVISION 11 EQUIPMENT

- The requirements for the provision of equipment will vary from project to project and should be confirmed for each Facility. The list below is provided for guidance, but the final list shall be confirmed during the design phase:

- Refer to Facility Standards Manual.
- Refer to BC Housing Design Guidelines and Construction Standards.
- All appliances to be “Energy Star” where “Energy Star” has that appliance category.
- Provide minimum one (1) year warranty on all appliances except provide a minimum two (2) year warranty on microwave ovens.
- Kitchenette
- Typically provided within the lounge or multi-purpose area, if required. Provide the following as a minimum:
 - Minimum length of 2.4 m (8'-0") of upper and base cabinet, microwave outlet and shelf, and double bowl stainless steel sink
 - (a) Provide the following appliances in the kitchenette:
 - Refrigerator: providing a floor space of 840mm (33") wide; 21.5 cubic feet/ 0.41 m³ (14.5 ft³) refrigerator - frost free, with freezer compartment (bottom mounted preferred), or as required by the City of Vancouver.
 - If a dishwasher is required it shall have a sani-cycle, 700F heat booster, and back-flow preventer valve. Note that these dishwashers require deeper than standard millwork: millwork to be designed to suit.
 - Microwave oven: 2.0 cubic feet, 1100 watt, minimum.
 - Amenity kitchenettes are not intended for commercial cooking purposes.
- Laundry room (confirm requirements for each Facility):
 - Commercial washing machine is preferred, but residential style washing machine may be considered.
 - Commercial or residential dryer must be vented to outside.
 - Consider specifying a front-loading machine for water conservation.
 - Commercial dryer is preferred, but residential dryer may be considered.
 - May be stackers or side-by-side machines.
- Entrances:

Provide walk off mats at entrances if recessed grilles are not provided (minimum size should allow for an adult to take two steps before stepping onto another flooring surface).

- Live-Work Artist Studio - Kitchen appliances and fixtures
 - Provide for a stainless steel, double bowl sink with low-flow, single-lever faucet.
 - The base cabinets or pantries are to have dedicated, enclosed space for recycle bins of approximately 371mm - 557mm (4-6 sq. ft.) depending on unit size.
 - Provide a broom closet or pantry in the kitchen.
 - All units to have the following appliances in the kitchen:
 - Frost-Free Refrigerator;
 - Easy-clean range and range hood;
 - Dishwasher: Consider dishwashers in studio and one-bedroom units, based on cost/benefit lifecycle analysis and Operator preference. Dishwashers can be compact 534 mm (21") units in one bedroom and studio units. Millwork to be designed to suit.
 - Microwave oven: Combined Microwave and Hood Fans may be considered in small units. Dual function Convection/Microwave built-in units may also be considered.
 - Refer to BC Housing Design Guidelines and Construction Standards.
 - Refer to the Division 11 - 11300 - Residential Equipment for appliance specifications.
- Live-Work Artist Studio - Laundry equipment
 - Specify water efficient washing machine for each unit.
 - Residential dryer to be provided for each unit.
 - Refer to BC Housing Design Guidelines and Construction Standards.
 - Refer to the Division 11 - 11300 - Residential Equipment for appliance specifications.
- Live-Work Artist Studio – Bathroom fixtures
 - Refer to BC Housing Design Guidelines and Construction Standards.

3.12 DIVISION 14 ELEVATORS

Refer to Facility Standards Manual for details.

3.13 DIVISION 22 PLUMBING

1. Plumbing

- Common Requirements for Plumbing

- Refer to Facility Standards Manual for additional details.
 - Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
 - Offset piping where required to avoid interference with other work, to provide greater headroom or clearance, or to conceal pipe more readily. Offsets shall be properly drained or trapped where necessary.
 - Install piping such that any equipment connected to piping may be removed by disconnecting two (2) flanges or unions and removing only one or two pipe sections. All equipment shall have bolted or screwed flanges or unions at pipe connections.
 - Install fittings for changes in direction and branch connections. T-drill system for mechanically formed tee connections and couplings, and Victaulic hole cut piping system are not allowed.
 - Do not route piping through transformer vaults or above transformers, panel boards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.
 - Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
 - Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
 - Install drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
 - Cap and plug all openings in pipes during construction with suitable metal plugs or cap to keep out dirt and rubbish until equipment is connected.
 - Eccentric reducing couplings shall be provided in all cases where air or water pockets would otherwise occur due to a reduction in pipe size.
 - Piping Tests – Provide a hydrostatic test on all new piping at 1380 kPa (200 psig) for 3 hours and provide written proof to the City of hydrostatic test results. Domestic Hot Water Recirculation and Automatic Flow Valves.
 - Select valves flow settings for minimum flow required to maintain warm water throughout the system and size the recirculation piping and pump accordingly.
 - Provide sufficient balancing valves to ensure adequate flow through each domestic hot water recirculation branch to maintain hot water.
- All drains in outdoor work areas, especially if they are also roof drains, to have sediment traps. Type and style of trap to be confirmed with the City of Vancouver for each Facility.
 - Traps to be accessible for clean-out.

- If there is not sufficient head room in the space below for a sediment trap, then at minimum provide a wye 45° elbow complete with clean-out access. Review with the City of Vancouver for each Facility.
- Consider possible roof deflections when positioning roof drains. Do not locate drains near beams and columns which tend to become high spots on flat roofs with minimum slopes.
- Where roof areas are enclosed by parapet walls, coordinate with Architect for provision of scuppers for relief in emergency flooding situations as per the VBBL.
- Provide minimum of 2 roof drains to all major roof areas as insurance against clogging and flooding (e.g., two at 75mm diameter preferred even if 1 at 100mm diameter will do).
- At roof drains in occupy-able landscaped areas, use two level drains (at play surface and at roof membrane) and provide sediment traps in hard surfaces near loose fill and entrances - refer also to the “Drainage and Grading” section in 3.17 Landscaping.
- Interior floor drains to be provided in each washroom, kitchen and janitor room.
- All floor drains to have pre-approved trap primers.
 - Trap primers to be accessible within the same room as the floor drain behind access panels.
 - Provide trap priming for all floor drains and for hub drains.
 - With backflow prevention for a single trap where a regularly used plumbing fixture is close by, a trap primer with a fixed airgap accessory is required.
- Hose bibs requirements are identified and outlined in the City of Vancouver’s Facility Standards Manual.
- Power for hands free plumbing fixtures shall be building power. Battery-powered units are not acceptable even where automatic recharging is included in the fixture.
- In each kitchen
 - Provide a two-compartment stainless steel sink complete with faucet ledge.
- Utility Sinks
 - To be industrial grade stainless steel utility sink with hot and cold water and integral stainless-steel countertop.
 - Each sink to be equipped with a floor-mounted sediment trap.
 - Approved product: ZURN Z-1180 Solids Interceptor, or pre-approved alternate.
- Showers heads:
 - Mount shower heads at 1,980mm (6'-6") for men and 1,800mm (6'-0") for women.

- Shower heads should be flush vandal proof types from the approved list of products.
- Provide one handicap accessible shower with a telephone type adjustable shower head, with a quick disconnect.
- One shower in each bank of showers shall be equipped with a twin handle shower control to provide tempered and cold water. All other showers shall have self-closing shower controls.

3.14 DIVISION 23 MECHANICAL

1. HVAC

- HVAC system to be designed to suit spaces with operable windows.
- Heating system to be equipped with an airside heat recovery system with at least 65% overall sensible heat recovery or equivalent system concept.
- All rooms to be adequately ventilated to remove odours, especially from work areas, laundry, kitchen and washroom areas (to meet ASHRAE Standard 62).
- Studio spaces and Live-Work Artist Studio work areas to be provided with enhanced commercial grade ventilation to suit Class A and B studio activities as applicable, including specialized equipment and activity needs per Section 2.15 Specialized Needs. Refer to Section 1.1.1 for studio class definitions.
- Provide system capacity for exhaust systems to accommodate potential future uses of the following Artist Studio specialized needs as applicable:
 - Moving/still photography (excluding video) involving film processing
- Provide a minimum of 5.0 L/s*m² for dark rooms in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.
- Painting
 - Provide a minimum of 3.5 L/s*m² in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.
- Drawing (or low intensity Painting)
 - Provide outdoor air ventilation rates in conformance with ASHRAE 62.1-2013, Table 6.2.2.1.

- Pottery
 - Provide a minimum of 2.5 L/s*m² in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.
- Sculpture (involving use of fiberglass, epoxy and other toxic or hazardous materials)
 - Provide a minimum of 2.5 L/s*m² in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.
- Woodworking
 - Provide a minimum of 2.5 L/s*m² in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.
 - Provide a wood dust collection system. Dust collection system to be recirculating type with internal filtration to minimize space exhaust requirements.
- Spray Booth
 - Provide a painting booth where applicable with a minimum airflow velocity of 0.5 m/s across the cross section of the booth. Provide heated makeup air unit. Consider the use of airside heat recovery on exhaust stream via indirect method that does not allow for mixing of exhaust and outdoor air to reduce energy consumption.
- Silk screening
 - Provide a minimum of 3.5 L/s*m² in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.
 - Fired ceramics and Glass blowing
 - Provide a minimum of 2.5 L/s*m² in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.

- Provide additional heat extraction exhaust with hood over kilns as applicable. Provide adjacent switch control and adequate makeup air supply provisions.
- Welding
 - Provide a minimum of 2.5 L/s*m² in conformance with ASHRAE 62.1-2013, Table 6.5. Locate exhaust inlets so as to allow directed extraction towards point sources of space contaminants. Provide airside heat recovery on exhaust air to minimize energy consumption.
 - Provide additional point of use welding extraction arms for removal of point source contaminant emissions at each welding station as required.
 - All air intakes to be located away from sources of fumes or dust, including parking and/or loading areas. Separation distances to conform to ASHRAE 62.1-2013, Table 5.5.1.
 - If baseboard heaters or radiators are used, they are to be shielded to prevent child access to hot surfaces where applicable.
 - HVAC and Mechanical Systems must adhere to acoustic requirements per the City of Vancouver Music Production Space Programming Study and Guidelines, Appendix A “Preliminary Criteria for Acoustical Design.” Considerations include:
 - Independent HVAC systems for Performance Space, and also
 - Control Room
 - The acoustical design of music studios requires a high level of technical expertise and will require coordination with both Mechanical and Acoustical Engineers.
 - Measures to minimize indoor background sound levels will likely include the use of in-line silencers, cross-talk attenuators and acoustic lining of common airlines in order to prevent noise transfer or "sound bleed" between studios.
 - Artist studio space ventilation shall not permit mixing of different contaminant types between different space uses. Space-by-space individual systems is preferable to maintain efficiency and separation of contaminants.
- Refer to Facility Standards Manual for additional details and requirements.
- Refer to Appendix 1: “City of Vancouver Music Production Space Preliminary Criteria for Acoustical Design” for additional recommendations for HVAC noise control.

2. Controls Systems

- Refer to City of Vancouver’s DDC Technical Guidelines.

- Electrical Loads metering by BC Hydro meters (one meter for each studio space and one house meter).
- Lighting Control to be by dedicated lighting control panels complete with relay panels and interconnection to DDC System for monitoring.

3. Metering

- Facilities to have dedicated gas, electricity and water metering and/or sub-metering.
- Electricity, gas and water use for studios shall be separately wired and separately metered.
- Where a Facility occurs in a mixed-use building, meters and/or sub-meters are to be located in service rooms that are easily accessible to the staff of the Facility.
- All meters to be connected to DDC and trended for monitoring.

3.15 DIVISION 26 ELECTRICAL

1. Power

- All outlets to be childproof; to have childproof and shatterproof faceplates.
- AFCI/GFCI receptacles to be Tamper Resistant.
- Electric Panels to be bolt on Schneider or Eaton.
- A weather-proof GFCI outlet to be provided at any in exterior work areas, roof-top or exterior-located mechanical equipment.
- Surge protection provided at main service entry.
- Information meter with power quality with harmonic measurement.
- Outlets and light switches to be mounted in accordance with the VBBL.
- In each studio, or live-work artist studio work area, provide:
 - One 208-volt outlet, NEMA 14-50R, on GFCI protected circuit.
 - Four-plug 120-volt outlets at intervals of not more than 1520mm (5ft) with AFCI protection.
 - Provide additional grid of switchable ceiling outlets with overhead cord reels or similar.
 - All receptacles sharing a counter with any sink must have Class A GFCI protection.
- In studios with specialized equipment and/or Class B studios provide enhanced electrical power:
 - A 120/208V, 3P, 4W dedicated electrical panel complete with surge protection device for workshop machinery and loads.
 - Arc Flash Labels are required to be applied to CSA Z462 produced with IEEE 1584.

- In theatre production and rehearsal studios provide ceiling outlets:
 - Provide additional grid of switchable ceiling outlets with overhead cord reels or similar.
 - Four-plug 120-volt outlets at intervals of not more than 1520mm (5ft) with AFCI protection.
- Appropriate power provisions to be made for:
 - Photocopier.
 - Washer/dryer.
 - Fridge.
 - Microwave.
- Power in kitchen to be to residential standards plus additional outlets (confirm number required for each Facility).
- System energy use shall be designed in consideration of energy cost, power quality, and flexibility.
- Consider minimum 30% growth capacity.

2. Wiring

- Wiring to be copper. Aluminum alloy may be considered if the specification is pre-approved by City of Vancouver Facilities Development and Planning.
- Performance space control
 - DMX 5-pin prewire

3. Lighting

- All lighting shall be LED type and shall have minimum CRI of 90.
- Artist Studios and Live-Work Artist Studio work areas:
 - (a) General lighting system for all studios shall be tunable/dimmable LED type with local controls.
- Lighting levels to meet or exceed IESNA standards, minimum lighting levels shall be the following. Lighting design and levels are to be confirmed with REFM and the Operator before installation.
 - Art Studio: 500 lux
 - Music Studio: 300 lux

- Workshops: 1000 lux
- Dance: 1000 lux
- Performance Space: 1000 lux (horizontal luminescence)
- Provide additional LED track lighting at display walls to support changing art installations.
- Provide lighting grid with power at ceiling and along walls as required in dance and theatre or music production and rehearsal spaces, as applicable.
- Hazardous location / explosion proof type luminaires in studios shall be project specific and shall be confirmed by hazardous materials analysis by code consultant.
- Exterior lighting is required in work areas, to illuminate entries, exits and as required for security.
- Where the building has an emergency generator, the emergency lighting system shall be powered by the generator and not be powered by separate battery packs.
- Light fixtures shall be installed on a standard octagonal box. Direct-mount or cast-in-concrete fixtures are not preferred.
- Custom assembled light fixtures shall be marked with CSA SPE1000 placed in an observable location.
- Reduced or extra low voltage fixtures, systems, and assemblies will be evaluated in design.

4. Lighting Systems

- Lighting system shall be adaptable to allow different occupancies in space.
- Ambient and Task Lighting
 - Provide user controllability (local dimming) for ambient lighting, adjustable to 1% with minimum lighting levels as noted in 3.15.3.3.
 - Separate lighting zones shall be provided for each area usage type (ie: work area, stage, task area, etc.).
 - Provide flexible luminaire systems (ie: adjustable track lighting) to suit room usage and accommodate future program changes.
- Display space
 - Window display
 - Adjustable track or spot lighting system to highlight artwork
 - Dimmable
 - Controlled automatically with timeclock separate from interior space lighting controls

- Permanent installation works

- Flood or spot lighting luminaires to highlight permanent installation. In-floor or building mounted, to be coordinated with artist.
- Controlled automatically with timeclock and photocell.

5. Lighting Controls

- Each room or area is to have its own dimming controls – to be designed to be simple and intuitive.
- Storage rooms must have occupancy sensors.
- Vacancy sensors may be provided throughout to turn off lighting, in which case the wall switches function as manual on.
- Lighting control systems shall comply with ASHRAE 90.1 2016.
- Daylight harvesting:
 - Common Space or large open areas: Open loop
 - Artist Studios: Individual Closed Loop.
 - Continuous dimming of lighting in response to available daylight.
 - Local accessible photosensor adjustment tool for users of space.
- DDC controls to be provided for lighting such that:
 - Lighting is turned off 30 minutes after scheduled by the user without specific tools or software. During non-occupied hours, select lighting will activate on occupancy sensors.
 - Sweeps are to be programmed to turn lights off every hour until 30 minutes before opening. Provide 2-minute flicker warning.
 - Outdoor lighting to be separately programmable from indoor lighting such that they can be controlled for ambient light levels and schedule.
 - Wall switches to over-ride DDC controls at all times.
 - Heat and/or fume producing equipment shall be interlocked with exhaust fan operation and override DDC control. Exhaust fan operation should override DDC.
- Refer to City of Vancouver DDC Technical Guidelines.

6. Fire Alarm

- Coordinate set-up of fire alarm monitoring with the monitoring company of the City's choice – to be confirmed for each Facility.
- Addressable system with trouble alarm codes visible to Operator. Device schedule is required to be documented in commissioning.

- Coordinate with Smudging requirements. Refer to Facilities Standard Manual.

7. Cable

- Provide home runs to Electrical room from all offices and meeting/staff rooms (confirm cable requirements for each Facility).
- Provide cable outlet in studio work areas, and as required by the Operator.

8. Telephone

- Provide outlets in each studio and office area, and as required for each Facility.
- Alarm, fire, intruder, and emergency elevator phone can capture regular lines when needed.

9. Data

- Provide outlets as required for each studio and office (minimum 2 data outlets per studio or office), and as required for each Facility.
 - Include 1 with fixed IP address for DDC controls
 - Structured cabling to be CAT 6 A Type 4 or greater.
 - Wireless access points to be CAT 6 A Type 4 or greater,

10. Refer to Facility Standards Manual for additional information.

3.16 DIVISION 27 SECURITY

Refer to the City of Vancouver Electronic Security Systems specifications, and Facility Standards Manual for additional information.

1. Secure access system planning

- To ensure a proper security solution for each Facility (particularly if the Facility is located in a multi-use building), it is strongly recommended that meetings occur with the Security Consultant, the City of Vancouver, the Operator and any other interested parties at appropriate points in the design and construction phases.
- Utilize an appropriate entry security system e.g., bell, buzzer, intercom, etc., which will be operated during program hours.
- Secure access to and from the parking to be addressed to suit the proposed plan for each Facility.
 - If the Facility is accessed by elevator, secure access to the elevator and secure control of the elevator shall be addressed.

2. Access equipment

- Access equipment must be compatible with the City of Vancouver standards. Refer to City of Vancouver Security Standards, Electronic Security Systems Specification CPS.
- Acceptable product:
 - Keyscan System Aurora
- Pass cards / fobs or keypad controlled from Facility:
 - If swipe cards or fobs provided, confirm number required for each Facility.

3. Security systems

- Security systems to conform to the City of Vancouver Security Standards.
 - For intruder alarm type systems, acceptable product is the Ademco Vista, or pre-approved alternate.
 - For surveillance type systems, refer to the City of Vancouver Security Standards for acceptable products. Note that these systems are generally not required for Arts and Culture studios and will only be used in certain unique conditions.
- Entrance and exit doors may require chimes or other door monitoring system (confirm requirements for each Facility).

3.17 DIVISION 32 LANDSCAPING at OUTDOOR WORK YARDS (where provided)

Refer to Facility Standards Manual for details.

4. APPENDICES

4.1 APPENDIX 1- CITY OF VANCOUVER MUSIC PRODUCTION SPACE - PRELIMINARY CRITERIA FOR ACOUSTICAL DESIGN



BKL

MEMORANDUM

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Date: August 20, 2020

From: Phil Miville-Deschênes, Miville@bkl.ca

Page 1 of 5

File: 0834-20E

RE: City of Vancouver Music Production Space – Preliminary Criteria for Acoustical Design

Upon your request, we updated our preliminary recommendations issued on June 21, 2019 with regard to the acoustical design for mixed-use residential buildings including music studios, performance spaces and control rooms. Sound isolation to the adjacent noise sensitive spaces will be important. As you are aware, it is important to adequately address acoustics in the design stage. Once the building is occupied, inadequate sound isolation, excessive background noise or excessive reverberation can be much more difficult and costly to remedy and can detract from overall satisfaction with the owner and users.

Music production spaces, such as rehearsals, performance spaces and music recording studios, have specific acoustical requirements and we anticipate that some items may require special attention and/or be difficult/costly to carry out within a multi-family dwelling project. Common studio requirements include low background noise levels, high noise isolation from the surroundings, control of reverberation, reasonable diffusion and a freedom from acoustical defects.

Based on the information we have reviewed to date, the following paragraphs propose acoustic standards and performance requirements that are appropriate for the intended uses of the future City of Vancouver Music Production Space. These acoustic standards are based on well known acoustic standards and other relevant documents, for example:

- Marshall Long (2006), Architectural Acoustics;
- 2019 ASHRAE Handbook HVAC Applications: Chapter 49, Noise and Vibration Control;
- AHRI 885-2008: Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets;
- BC Building Code 2018; and,
- Vancouver Building By-Law 2014.

1. Room acoustics and reverberation control

The reverberation time is the most common parameter used to describe room acoustics and sound quality. It is a measure of how long it takes sound to decay, once the sound source has stopped. A shorter reverberation time is essential to ensure clear communication, whereas a longer reverberation time can be desirable in music performance spaces, giving the audience a feeling of ‘envelopment’.

However, rehearsal spaces should have slightly shorter reverberation times than performance spaces to provide better clarity for the musicians. Furthermore, amplified music in relatively small rehearsal spaces can result in excessive loudness which can lead to risk of hearing damage and also make it more difficult to provide adequate sound isolation between spaces.

Acoustical artifacts, such as flutter echoes, must be controlled in studios. More importantly, the design layout, room shape and interior finishes in music production spaces will be important. For instance, parallel walls without sound absorptive treatment can result in flutter echoes, depending upon the size of the room. In small rooms, such as the typical music production spaces, standing waves due to room modes can result in a lack of sound diffusion such that small changes in position within the room can produce noticeable differences in sound levels at low frequencies. These undesirable conditions cannot be totally avoided in a small room but they can be minimized by selecting favourable room ratios of room dimensions. Non-parallel walls can also help to some extent but this approach reduces room volume and useable floor space and may increase construction cost. Ideally, the walls would be off-parallel by 5 to 10 degrees in two planes and the ceiling would also be non-parallel with the floor but this is rarely practicable. Sound diffusion can also be increased by providing appropriate sound absorbing and/or sound diffusing panels on wall and ceiling surfaces.

Based on architectural acoustic standards for music production spaces, we recommend a reverberation time within music studios in the range of 0.6 to 0.9 seconds, depending on the room size and possibly longer for the performance space (i.e., 0.8 to 1.2 seconds). With regard to control rooms, reverberation times are usually in the low range of 0.3 to 0.4 seconds.

Sound absorptive treatment will be required to achieve the above reverberation time criteria and diffuser panels will be also beneficial in providing a more uniform sound field within the room.

BKL Consultants can develop 3-D acoustic model into a room acoustics modelling software to estimate the acoustical characteristics and select the type and amount of acoustical treatment required to modify the reverberation to an appropriate level for the space size and function. This would be more important for the performance space than for the relatively small rehearsal studios.

2. HVAC and mechanical systems noise control within the building

2.1 Elevator Noise Control

Where concrete walls around elevator shafts are located next to a noise sensitive space, a secondary stud wall should be added on the music or production studio side with a minimum 19 mm (¾") free airspace between the concrete wall and the studs with batt insulation and one layer of gypsum board on the Music or Production Studio side. There should not be any bracing across the air gap.

2.2 HVAC Noise Control

The preferred metric to describe internal ambient noise due to steady state mechanical and electrical systems is the noise criterion (NC) since it takes the frequency spectrum of the noise into account. We recommend the following limits in Table 1 below, based on ASHRAE Design Guidelines:

Table 1: Design Guidelines for HVAC-Related Background Sound in Rooms

Room Types		Noise Criterion (NC level)	Approximate Overall Sound Pressure Level (dBA)
Performing Arts Spaces	Control Room and Recording Space	20	25
	Performance Space	25	30
	Rehearsal	30	35
Office Buildings	Executive and private offices	30	35
	Conference rooms	30	35
	Corridor and lobbies	40	45

High air velocities at diffusers can contribute significantly to NC levels in rooms. Table 2 below lists the recommended maximum permissible velocities at the neck of supply diffusers or return registers to maintain a particular NC level. Ductwork should be sized accordingly.

Table 2: Duct Velocity Limits to meet Background Noise Criteria

Noise Criterion	At Neck of Supply Diffuser	At Return Register
NC 25	1.8 m/s	2.2 m/s
NC 30	2.2 m/s	2.5 m/s
NC 35	2.5 m/s	3.0 m/s
NC 40	2.8 m/s	3.4 m/s

HVAC equipment (e.g., VAVs, FCUs, etc.) will be required to control the airflow and/or temperature close to the occupied areas. Following good practice, this equipment should not be located above spaces with an NC (Noise Criterion) of 30 or less, and should be avoided above rooms with a rating of NC 35.

3. Internal sound isolation

It is difficult for us to provide Sound Transmission Class (STC) criteria between noise sensitive spaces at this stage of the project. Unfortunately, there is no clear criteria that tell us if the music/noise from the future music production space will be acceptable or not, and it is impossible to predict the response of human beings. A casual observer may or may not notice the noises generated in the rehearsal spaces depending on many factors that include hearing acuity, concentration on other tasks, and background noise levels. It is recommended to hire an acoustical consultant at early stage of the project design to ensure that the project location and the proposed room volumes are appropriate to achieve acceptable airborne sound isolation to the adjacent noise sensitive spaces.

In order to achieve high airborne sound isolation, rehearsal spaces will need to be isolated from the building's structure. Music studio construction should include:

- floating floor supported off the structural floor;

- sound isolating ceiling assembly;
- stand-alone furring walls without bracing it to OR resiliently connected to the main walls (e.g., concrete walls);
- double stud walls with multiple layers of gypsum board for common walls between studios;
- acoustic buffer spaces such as corridors around performance space.

As preliminary advice, with loud music played within the music and performance studios, the wall and floor/ceiling assemblies separating a residential unit and performance space should provide a minimum apparent sound transmission class (ASTC) rating of 75. Please note that it may not imply a final condition of “inaudibility” in the adjacent rooms. As an example, at music levels of 110 dBA with an assembly rated at ASTC 75, there would be a residual sound level of 35 dBA. With an ambient noise level in the range of 30 dBA this would be clearly audible. If the music has high levels of low frequency content, this will transmit more efficiently across the partition. Consequently, it will likely be necessary to place administrative controls on allowable sound levels within rehearsal studios, not only to avoid excessive transmission to residential spaces but also to avoid interference between adjacent studios. Sound levels above 100 dBA should not be necessary for rehearsals.

Although sound isolation between neighbouring rehearsal studios is important, it is not as critical as isolation between studios and neighbouring residential space. Furthermore, with sound levels as high as 100 dBA in one studio and a background noise level of 35 dBA in an adjacent studio, it is unrealistic to expect inaudibility since it may be impractical to provide separations with ASTC ratings higher than 65.

3.1 General Recommendations for STC Rated Partitions

Details at wall and ceiling junctions will need to be designed and constructed adequately to minimize the potential for flanking transmission. A minimum ASTC criterion is proposed rather than STC since it quantifies sound transmitted directly via separating partitions and also indirectly via the adjoining elements in common floors, ceilings and walls.

The following precautions should be taken during the construction of STC rated partitions:

- Caulk carefully the intersection of gypsum wallboards with walls and concrete columns and with the floor and ceiling structures by using an acoustical caulking that will remain flexible after installation without hardening, shrinking or cracking;
- The installation of gypsum board must be done in a way to minimize the number of joints. In the case of walls made of two layers of gypsum, the joints of each layers should overlap by at least 300 mm (12"). It is not necessary to tape the joints of the first layer of gypsum. Tape, mud and sand the second gypsum layer;
- Stud sole and top plates should be set on 2 continuous beads of non-drying caulking compound. As an alternate, a smoke and acoustic track seal such as the Hilti CS-TTS (see cut-sheet attached) could be installed between the plates and the concrete rather than the two beads of caulking, and;
- Minimize the number and the size of penetrations in high STC rating partition. Electrical outlets as well as switches should be offset at least 1 stud apart (not back to back). If back to back electrical outlets and switches are unavoidable, the electrical boxes should be wrapped with

3M Fire Barrier Moldable Putty Stix MP+ or equivalent. Caulk carefully the perimeter of all electrical back boxes between the gypsum wallboard and the electrical box.

3.2 Doors and Windows in STC Rated Partitions

The overall performance of acoustically rated partitions that contain doors and/or windows will be limited by the performance of the door/window. In order to maintain appropriate background noise level and to avoid noise intrusion into the adjoining spaces, sound rated doors/windows and/or vestibules should be provided for studios and the performance space. The use of glass partitions should generally be avoided whenever high-performance sound isolation is important.

Between studio/performance spaces and noise sensitive spaces, doors should be commercially engineered; sound rated door sets with a minimum Sound Transmission Class (STC) rating of 45. It should be possible to obtain 1- $\frac{3}{4}$ " thick wood or steel acoustic doors with flat thresholds that will meet or exceed the proposed STC 45 rating.

3.3 Public Address Systems

In the case of studios featuring wall-mounted public address (PA) systems, loudspeakers may need to be resiliently attached to the walls to minimize structure borne noise transmission. Additionally, suspended speakers should be resiliently attached to the underside of the concrete slab.

BKL Consultants can review the architect's and contractor's drawings, and visit the site for an appropriate number of times to review the constructions that are acoustically crucial to the success of the sound isolation. BKL can also perform acoustical testing to ensure that the design criteria are met.

4. External sound isolation

Regulations in residential neighbourhoods restrict noise levels at neighbouring properties. Furthermore, Clauses 11, 11a, 11b and 11c of the Vancouver Noise Control By-Law No. 6555 will all apply and will place limits on sound transmission to neighbouring spaces. Hence, depending on the project location and property lines, the building envelope should be designed to ensure that the above VBBL requirements are met in order to minimize noise egress to adjacent residential properties.

5. Other considerations

Impact noise mitigation e.g. due to footfall impacts, may also need to be considered for this project. For your information, an impact insulation class rating of minimum IIC 55 is recommended between multi-family dwellings in the BCBC 2018. Provision of floating concrete floors will adequately address this.

Please note that vibration isolation of mechanical and electrical equipment and plumbing noise control will also be important to be reviewed at the design stage to ensure good acoustic environment for the future City of Vancouver Music Production Space.

4.2 APPENDIX 2 – DEFINITIONS

In accordance with Vancouver Zoning and Development Bylaw, the following definitions are provided.

1. **Artist Studio – Class A:** The use of premises for the production of dance, live music, creative writing, painting, drawings, pottery or sculpture, video, moving or still photography, none of which involves amplified sound or one or more of the materials or processes specified under artist studio – class B.
2. **Artist Studio – Class B:** The use of premises for the production of:
 - Dance or live music involving electronically amplified sound.
 - Moving or still photography (excluding video) involving on-site film processing.
 - Paintings, drawings, pottery or sculpture involving the use of fibreglass, epoxy and other toxic or hazardous materials or one or more of the following processes: welding, woodworking, spray painting, silk screening or fired ceramics.
3. **Production/Rehearsal Studio:** The use of premises for the production of:
 - Motion pictures, videos, television or radio programs or sound recordings or for the rehearsal of dance, music or drama, but
 - does not involve the presence of an audience and
 - does not include artist studio – class A, artist studio – class B, or theatre.
4. It is the understanding that a **Live-Work Artist Studio** is a catchall term used in these guidelines to define any unit that allows for both Residential and Artist Studio uses within the same unit. There are two use options in the Zoning and Development By-law that permit Artist Studio use in live-work premises: Live-Work Use and “Residential Unit associated with an Artist Studio”. See Section 1.1.3 for full description of two typologies. An applicant’s choice of option should be made with an awareness of the differences as discussed in the applicable zoning and by-law definitions.
5. **Live-Work Use:** The use of premises for:
 - A dwelling unit;
 - General office, health care office, barber shop or beauty salon, photofinishing or photography studio, or artist studio – class A; or
 - Any use referred to in subsection (b) in conjunction with a dwelling unit use, but does not include:
 - Any dating service, entertainment service, exotic dancer business, social escort,

- Business, or other similar business, as determined by the Director of Planning in consultation with the Chief License Inspector; or
- Any tattooing, piercing, branding, or other similar service, as determined by the Director of Planning in consultation with the Vancouver Coastal Health Authority.

6. **Residential Unit:** A sleeping unit, housekeeping unit or dwelling unit.

- Live-Work Use and Residential Unit Associated with an Artist Studio Use
 - Under “**Live-Work Use**”, occupants including artists are permitted to have employees and walk-in trade in their units. Live-Work units need to comply with Vancouver Building By-law requirements for both residential and non-residential occupancies.
 - Under “**Residential Unit associated with an Artist Studio**”, occupants are limited to the production of art only, and employees and walk-in trade are not permitted. The Vancouver Building By-law allows these units to be designed as a residential occupancy, provided they comply with certain sprinklering and structural floor load requirements (i.e., generally the building code requirements are less onerous under this option).
 - Where “residential units associated with an Artist Studio” permit an occupancy of more than two persons and are located within a multiunit development, consideration should also be given to ensuring a high standard of livability, including on-site shared amenity space, bicycle parking and where applicable, compliance with the requirements of the High-Density Housing for Families with Children Guidelines.
 - There are separate zoning regulations for “Live-Work Use” and for
 - “Residential units associated with an Artist Studio.”