CORNERSTONE

# City of Vancouver Music Production Space

## High-Level Functional Program

**June 28 2019**

Prepared by: Cornerstone Planning Group

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# 1. INTRODUCTION

Through the City of Vancouver's comprehensive Cultural Plans including the *Creative City Strategy*, *Making Space for Arts and Culture: Cultural Infrastructure Plan*, and the *Vancouver Music Strategy*, the need for music rehearsal and production spaces for the city's growing community of musicians has become clear. Existing rehearsal and production spaces in Vancouver face rapid displacement due to rising real estate costs and development. Moreover, many of these spaces are neither accessible nor affordable, and do not cater properly to the diverse needs of Vancouver's unique array of professional musicians.

The City has the potential to secure specialized cultural space within a new development, and has commissioned Cornerstone Planning Group to undertake a short study to define the requirements of a Music Production Space as a desirable possibility. The introduction of a new Vancouver Music Production Space would address the Strategic Theme of Spaces and Places outlined in the *Vancouver Music Strategy*:

> ***"Affordable, safe, and accessible spaces are required by musicians, music industry professionals, and audiences, so they may enjoy the creating, performing, and experiencing music."*** *Vancouver Music Strategy Interim Report, 2018*

Moreover, the addition of this City-owned cultural amenity space would address one of the key objectives in *Making Space for Arts and Culture: Cultural Infrastructure Plan*, to partner with the community to secure, enhance and develop vibrant, affordable, and accessible arts and cultural spaces in Vancouver, as well as address the significant need for production, studio and music spaces*:*

> ***"Existing community and private spaces are facing rapid displacement due to the real estate market and pace of development (particularly production, studio, and music spaces)."*** *Making Space for Arts and Culture: Cultural Infrastructure Plan, 2018*

As a community amenity space owned by the City of Vancouver, the Vancouver Music Production Space will offer a stable environment for musicians into the future. The goal of the Music Production Space (likely to be within a mixed-use facility amongst residential condominium units) will be to provide spaces where musicians can hone their craft, and where occasional performances can take place. The Vancouver Music Production Space is intended to be City-owned, and operated by a Non-Profit Organization (NPO; to be determined through an RFP process).

The facility requirements are based on accommodating the desired activities and providing the staff, equipment, and storage space needed to support those activities. This document describes the vision of the facility, reviews key aspects of the operational concept and anticipated activities to be accommodated, and projects a likely staff complement. These operational parameters informed the space descriptions and list, which are followed by a relationship diagram and a set of design guidelines.

Acoustic performance of the facility is key to its success. A section specifically on acoustic requirements has been provided as performance specifications and possible solution mechanisms. If the spaces cannot meet these performance specifications, it will not meet the needs of its users and/or those sharing the facility above and adjacent. In this case, an alternative use of any space should be considered.

## Vision

The vision for the Music Production Space facility is as follows:

> ***"The City of Vancouver will provide affordable, accessible, music production and rehearsal space for its thriving community of professional musicians."*** *City of Vancouver Cultural Services*

Given the specialized nature of music production and rehearsal spaces and their high degree of variability, it is important to capture the vision for the Vancouver Music Production Space appropriately. The following word cloud was developed from interviews with musicians and user groups to reflect the distinct vision for the centre.

**Figure 1: Word Cloud emulating vision as identified by local musicians and user groups**

# 2. APPROACH AND METHODOLOGY

Cornerstone Planning Group was commissioned to develop high-level future facility requirements for the City of Vancouver Music Production Space. The goal was to create the High-Level Functional Program based on music studio, rehearsal, and production space best practices, City of Vancouver background information, and interviews with music studio specialists, local musicians, and NPO music presenters and music-space operators.

Cornerstone developed the High-Level Functional Program with the understanding that desired activities and capacities are the primary determinant of space requirements. This report describes the spaces required to meet the vision of the City of Vancouver's future Music Production Space, within the overall square-footage constraints of the requirement envelope. The program also establishes spatial and relationship priorities based on known challenges of developing rehearsal and production spaces in a mixed-use residential facility.

## Introduction to the Functional Program

The development of a functional program is an important pre-design process that provides documentation of a building's key characteristics. These building characteristics are developed to optimize the operations of the organization and the building while reflecting the values of the organizational vision.

This document provides a description of the space required to accommodate an NPO's services and activities within a mixed-use residential facility. The Functional Program does not include any specific references to locations within the development. The intent is to provide a clear statement of functional and spatial requirements that can be used to guide architectural design and to assess relative suitability of development concept options as they evolve.

- ⇒ The **Functional Program** is an inventory of all spaces included in the facility, their sizes, and general characteristics. The Functional Program also includes descriptions of specific spaces and their intended function. The information is organized by Functional Component.

- ⇒ A **Functional Component** is a grouping of physical spaces that need to be located as a group to optimize activities, circulation, and allocation of staff resources. The Music Production Space requirements have been organized into 5 components, described in detail in the sections that follow.

- ⇒ The **Relationship Diagram** shows the relative size and proximity of the Components, as well as requirements for entrances, circulation, proximity relationships among components, etc.

Several important terms are used throughout this document to describe the estimated areas for each component.

- ⇒ **Internal Circulation** is the area assigned to move between the spaces/rooms within a component. For example, the hallways within a staff only zone.
- ⇒ **External/Major Circulation** is the area assigned to the spaces between components.
- ⇒ **Net Square Metres (NSM)** is the usable space within a room/area, excluding wall thicknesses.
- ⇒ **Component Gross Net Square Metres (CGSM)** is the area of all usable and support spaces including internal circulation and interior wall thicknesses within the component(s).
- ⇒ **Building Gross Square Metres (BGSM)** is the total area of all levels of a building as measured to the outside face of exterior walls. It includes all Component Gross area, plus external/major circulation, building systems spaces (mechanical, electrical, HVAC, etc.), and exterior walls and major structural elements.

# 3. OPERATING PARAMETERS

## 3.1 Music Production Space Description

The Vancouver Music Production Space will consist of acoustically excellent spaces specifically designed and constructed for music rehearsal, production, recording, and performance activities. A variety of music studio spaces that differ in size are required to accommodate musicians of various genres who have different spatial requirements (instruments and equipment), as well as various income levels (as studio size corresponds with cost). The Performance Space will accommodate multiple genres as well, though the performance space will be best suited to support a 5-piece band (maximum). The Performance Space size is anticipated to feel sizeable yet intimate, with a maximum audience capacity of 50 seated (~75 standing). It will also accommodate rehearsal use, and will have an adjacent control room to allow for production and recording activities.

Given the mixed-use nature of the facility (adjacent to residential units), it is critical that the spaces are built to ensure that all spaces have excellent acoustic properties, and are soundproofed and acoustically isolated from the rest of the building (with the performance space and control room being soundproofed from all spaces, and the music studios having tolerable noise bleed between each other).

The following activities are expected to occur in the Music Production Space:

- NPO daily operations
- Musicians accessing music studio spaces (studio type depends on musician / band needs, and time of access depends on musician / band schedule)
- Musicians making use of music studio spaces for hours at a time (rehearsing)
- Rehearsal and occasional performances held in the Performance Space (small ticket table to be set up to accept admissions), and other occasional supporting uses (i.e. occasional meeting space, media screenings, etc.)
- Casual serving of beverages and light food
- General audio and/or visual recording (including recording of performances) in Performance / Production Spaces
- Loading instruments and equipment into studios and Performance / Production Spaces

## 3.2 Operational Concept

The Vancouver Music Production Space is intended to be run by a Vancouver-based arts and culture NPO. Key operating assumptions include:

- NPO staff will work primarily in the Administrative Area, approximately 8am – 7pm (but may work extended hours during performance events)
- Evening staff will work approximately 6pm-12am and will support the proper function of performance spaces (occasional basis)
- A kitchenette will be provided to support staff and performers and may support small catering capabilities. A vending machine may also be offered.
- The facility will have 24-hour security (e.g. fob & key code access). Security personnel are not anticipated.
- Music Studios will be available ideally for use on a 24/7 basis (loading is required 24/7, music space use can be 8am to 1am but is also ideally 24/7. Studios are likely to be accessed by individual key codes for each studio space.
- Anticipated that some of the music studios will be rented out by the hour, and some will operate as lock-out spaces, (monthly rentals), depending upon NPO business model.

- The Performance Space will occasionally host performances and will not open to the public later than 11pm - 12am (in consideration of nearby residents).
- A staff member will be on call in case of emergencies.
- Large instruments (including / up to an upright piano) must be able to move through the facility (hallways and elevators included) from delivery to appropriate areas of use.
- Some musical equipment will be on-site and available for rental (e.g. for out of town musicians and equipment such as amps and drum kits for hourly rental rooms).

## 3.3 Staffing

The expected Vancouver Music Production Space staffing requirements are outlined in the table below. These are preliminary estimates and have been developed to reflect the amount of office space required to support the successful operation of the facility by the to-be-selected NPO.

**Table 1: Vancouver Music Production Space NPO Staffing Requirements**

| Required Music Production Space Staff List (NPO) | | |
|---|---|---|
| **Position** | **Head Count** | **Location** |
| NPO Music Production Space Manager | 1 | Administration Area |
| NPO Music Production Space Assistant | 1 | Administration Area |
| **TOTAL:** | **2** | |

In addition to these staff members, a total of 75 patrons (plus band and staff) may be in the Performance Space at once. This may also correspond with rehearsal times for other groups; therefore, in the current envisioning, a theoretical maximum of 150 people could be within the entire cultural amenity space at once (assuming maximum rehearsal capacities, 75 performance patrons, band of 5 and 2 staff members).

# 4. FUNCTIONAL/FACILITY REQUIREMENTS

The facility requirements are summarized below, starting with component descriptions, then a relationship diagram describing their required adjacencies, and finally a space list.

## 4.1 Component Descriptions

The Music Production Space can be described using five components made up of spaces related to particular functions: administration, rehearsal, support, performance/production, and loading. These are summarized below.

***Administration Area***

The Administration component consists of the NPO office, and supporting spaces (Kitchenette, Copy / Storage Room, Vending Machines, and Community Notice Board). The NPO office will act as the reception and for the Centre, and as the primary work area for NPO employees.

***Rehearsal Spaces***

The Rehearsal Spaces component is the primary component of the Music Production Space. It will feature 4 different types of music studios (small, medium, large, and very large), which will allow for a breadth of local professional musicians to make use of the space, and provide spaces on a spectrum of affordability.

In total there will be 11 studios allocated (3 small studios, 3 medium studios, 4 large studios, and 1 very large studio[1]). The small studios will be the most affordable to rent (as rental cost is based on studio size) and will therefore offer more affordable space for smaller bands from 1-3 members, and individual artists. The medium and large studios will support the rehearsal of 3-5 and 5-6 (could support up to 8) musicians respectively, while the very large studio will support up 12 musicians at a time.

All studios will feature wall-mounted Public Address (PA) speakers and small in-room storage lockers, and will be fully connected to WiFi. A selection of studios (TBD) must also feature height-adjustable desks to support electronic music equipment and universal accessibility. The PA systems must be resiliently attached in order to minimize structure borne noise transmission. Ideally the majority of rehearsal studios will have a minimum of 11'6" – 12' high finished ceilings (to the interior acoustic treatment and fixtures), but if there cannot be more than 1 floor at this height, then other floors of rehearsal studios should have a minimum finished ceiling height of 9'6" to the interior acoustic treatment and fixtures.

The Rehearsal Spaces must be acoustically isolated from the greater building (critically important), and isolated from each other (lesser so). Please see section 6 for further discussion on acoustic separation.

***Music Support***

The Music Support component consists of instrument and equipment storage spaces. It is anticipated that some instruments and equipment will be available to rent/borrow from the NPO.

[1] The "Very Large Music Studio" is not large when compared to standard studio sizes; it is merely a "very large" relative to the smaller

***Performance and Control Spaces***

This component consists of the Performance Space and supporting Control and Performance Storage Rooms. The Performance Space will support rehearsal, production, and performance and will have a capacity for 50 seated audience members (75 standing), along with a 5-piece band. The capacity of the Performance Space is in demand in Vancouver, as it is sizeable yet intimate. The Performance Space will have a minimum finished ceiling height of 11'6" to the interior acoustic treatment and fixtures (preferably 12'; plus an additional 2' – 3' airspace of ceiling membrane above is needed for acoustic buffering) and must be acoustically isolated (e.g. "box in box" design[2]). A temporary riser rather than a permanent stage is likely the best option for this space as it provides flexibility. If a stage is used, it can be designed to act also as storage, but needs to be acoustically designed.

The Control Room is where lighting, sound mixing, and other equipment (e.g. recording) is operated and will be adjacent to the Performance Space. This room must have visual access to the stage (ideally from above or the rear of the room). The finished ceiling height for the Control Room can be at 11'6" but would function better with a dropped finished ceiling at 9'6" to the interior acoustic treatment and fixtures (with ~2'+ of ceiling membrane above it).

***Loading***

The Loading component consists solely of the Loading Bay. This space will be adjacent to the dedicated elevator, which must be sized and specified to accommodate an upright piano (ideally a baby grand piano).

***Alternative Space Considerations***

Vocal Studio: It is worth considering applying a Box in a Box design to one of the small studios fully, to allow for the dedication of a small recording room to record vocals. The space allowances may accommodate this, depending on design.

Green Screen Room: Likewise, a Green Screen Room (with Box in a Box design) could be adapted from a fully acoustically isolated studio space. The space could be used for filming and other video-based projects and would support the sustainability of the facility by providing more diverse services.

[2] This is currently accommodated within the space allowance for the Performance Space.

## 4.2 Area Requirements Summary

The following space list provides the spatial requirements of the Music Production Space as described above.

**Table 2: Vancouver Music Production Space - Required Space List**

| Vancouver Music Production Space Required Space List | | | | | | |
|---|---|---|---|---|---|---|
| **Component** | **Space** | **Unit SM** | **Qty** | **SM** | **SF** | **Notes** |
| Administration Area | NPO Office Space | 6.5 | 2 | 13.0 | 140 | 2 workstations, 1 of which doubles as a reception function |
| | Copy / Storage | 4.5 | 1 | 4.5 | 50 | Adjacent NPO Office |
| | Vending machine | 0.9 | 1 | 0.9 | 10 | |
| | Kitchenette | 6.5 | 1 | 6.5 | 70 | Primarily supporting staff & musicians. Not an enclosed room. |
| | Community Notice Board | 0.5 | 1 | 0.5 | 10 | |
| Rehearsal Spaces | Music Studio Small | 9.3 | 3 | 27.9 | 300 | Supports 1-3 musicians |
| | Music Studio Medium | 18.6 | 3 | 55.8 | 600 | Supports 3-5 musicians |
| | Music Studio Large | 20.4 | 4 | 81.6 | 880 | Supports 5-6 musicians, can support 6-8 |
| | Music Studio Very Large | 32.5 | 1 | 32.5 | 350 | Supports 6-12 musicians |
| Performance / Control Spaces | Performance Vestibule | 4.5 | 1 | 4.5 | 50 | Sound lock vestibule |
| | Performance Space | 77.5 | 1 | 77.5 | 830 | Capacity 75 (standing) |
| | Control Room | 15.7 | 1 | 15.7 | 170 | |
| | Performance Storage | 7.5 | 1 | 7.5 | 80 | Storage of tables and chairs |
| Music Support | Instrument + Equipment Storage | 8.0 | 1 | 8.0 | 90 | |
| Loading | Loading | 18.5 | 1 | 18.5 | 200.0 | |
| | | | **TOTAL:** | **354.9** | **3,820** | |
| | | | *Building Component Gross (Circ):* | *79.8* | *860* | @ 22.5% includes Lobby |
| | | | *Building Gross:* | *76.1* | *820* | @ 17.5% on CGSM |
| | | | *Box in a Box Gross*:* | *47.5* | *510* | |
| | | | **Total BGSM / BGSF:** | **510.8** | **5,500** | (note: developer space is at 5,500) |

**Note: A Box in a Box Gross has been added sized to the equivalent space needed if the Box in a Box design (thick concrete soundproofing) were applied to 1 of each studio size, the Performance Space, and the Control Room. This allocation is likely more than what is needed as this design solution will only be applied to music spaces sharing a wall / ceiling with residential units.*

Parking Requirements are additional to the sizes described previously. They are:

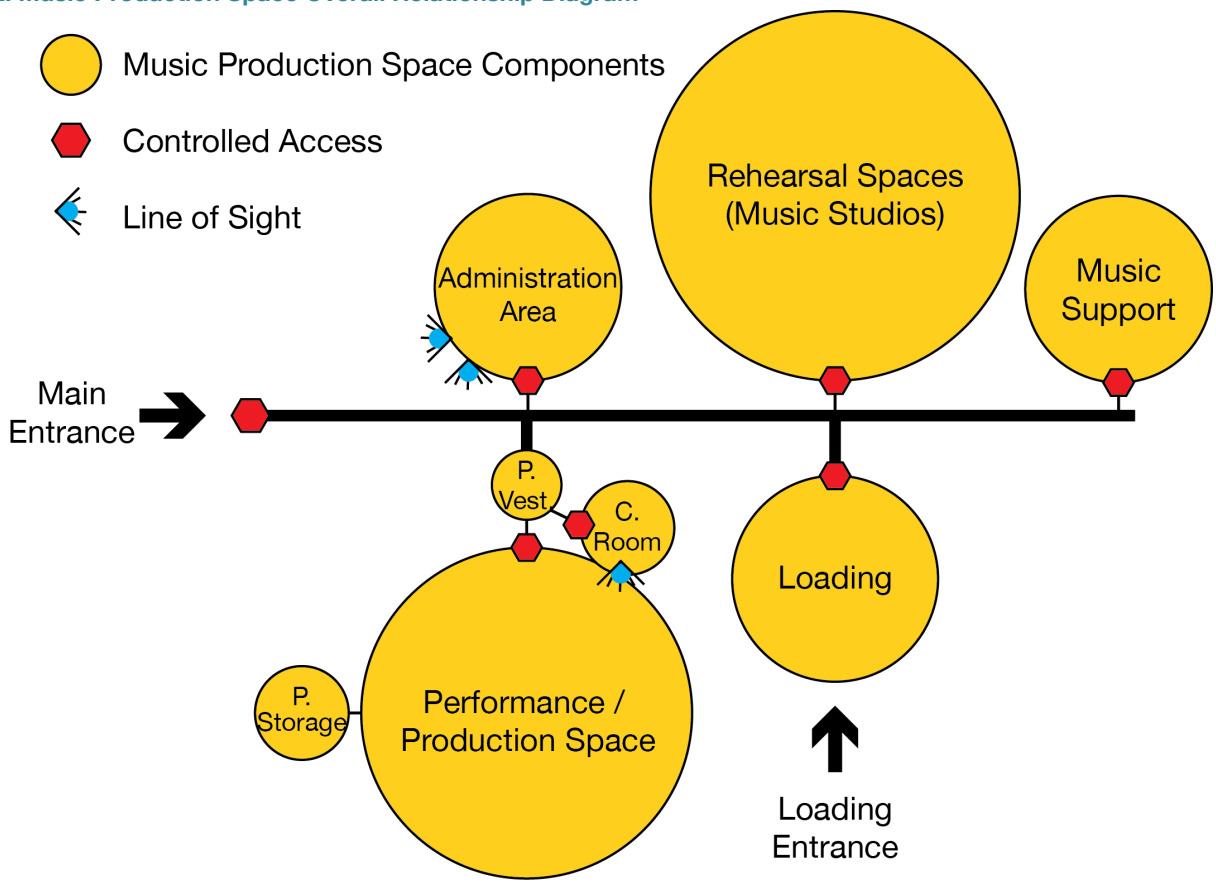
- 1 staff parking
- 1 accessible musician/user parking
- 1 secured car share parking
- 12 bicycles

The number of spaces allotted above – 3 – is less than what is required by the Vancouver Off Street Parking Bylaw for Artist Studios (non-residential), which stipulates a minimum of one space for each 100 square metres of gross floor area. This would yield a total of 5 parking stalls given the size of the facility. The Artist Studios (non-residential) parking requirement was used as proxy given that the Vancouver Parking By-law does not outline a parking requirement specifically for music studios in a residential building. The 3 parking stalls described are acceptable functionally, if supported by regulatory authority with regards to parking bylaw requirements.

## 4.3 Relationship Diagram

Each grouping has a number of spaces that are functionally related and generally benefit from some degree of proximity with access points that are discernable from the lobby and major circulation. The following diagram illustrates the relative proximity of the different sets of spaces and their relationship to major circulation routes. The diagram is intended to provide an overview of the key functional relationships and an approximate indication of the relative floor areas associated with each set of spaces. It is a two-dimensional diagram rather than a floor plan representation and does not imply floor levels.

**Figure 2: Music Production Space Overall Relationship Diagram**



Generally, spaces must be laid out in such a way to optimize the flow of equipment and to minimize acoustic interference with nearby residences.

Key relationships are:

- The Administration Area will house all staff members and should have lines of sight to both the Performance / Production Spaces component and the Main Entrance as possible.
- Every space will have controlled access –individual code access for musicians, and FOB access for Administration, Music Support, Performance/Production, and Loading.
- Access to the Performance Spaces (Performance / Production Space, Control Room, Performance Storage) will be through the Performance Vestibule / Sound Lock.
- The Performance / Production component must have close access from Loading, enabling easy access to stage area for pre and post show set-up and take down.
- The Performance/Production space will host the largest number of people. It should be the most easily accessible from the Main Entrance.
- The kitchenette and washrooms must be in close proximity to the Performance Space.
- Majority of washrooms to be close to the Performance Space and have easy access. Entry to the washrooms must not be through the kitchenette.
- Kitchenette to have easy access to Performance Space to support events.
- The Control Room and Performance Storage must be accessed from the Performance Space.
- The Control Room must be lockable, have controlled access, and have visible sight lines to the Performance Room (i.e. a window).

# 5. DESIGN GUIDELINES

Functional requirements relating to the design of the Music Production Space have been organized into 12 general guidelines. Functional requirements relating to specific components are noted in the Component Information section above.

## 5.1 Access & Entry

Clearly defined ground level access to the Music Production Space is required. Access from parking must be clearly defined as well. Loading access is required for instruments, equipment, tables, and chairs. Given the size of equipment being loaded, right-angle corners between the loading bay and Performance Space should be avoided. The Loading Area must be covered (can be inside or outside) with covered access to the elevator. Class B loading is not functionally required and instead should be driven by engineering requirements. Code access will be provided for entry into music studios. One mailbox must be accessible from the interior at the main entrance (per CoV Social Amenity Technical Guidelines).

## 5.2 Circulation

As there will be musical instruments and large supporting equipment entering and exiting the facility on a daily basis, major circulation routes must be designed to accommodate this. Hallways are required to be 4 ft or wider to accommodate equipment movement. Likewise, the elevator must be sized to support an Upright Piano (ideally a baby grand piano). Washrooms (5, based on a maximum theoretical capacity of ~150 people) will ideally be gender neutral. At least 2 must be accessible, with at least 1 having an accessible shower. These are captured in building gross along with the Community Garbage / Recycling Room and major circulation.

## 5.3 Wayfinding

As there will be many music studios in the building of varying sizes, as well as a performance space, signage indicating use must be visually prominent to make the Music Production Space easily navigable. The Community Notice Board will be visually prominent as well, informing musicians and visitors of future events, cultural programs, and opportunities. The Administration Area should be easily findable within the Centre. The Performance Space must be easily accessed by visitors from the Main Entrance.

## 5.4 Security

There will be 24-hour security in the building via security cameras and FOB system. The office in the Administration Area will also act as a security coordination room where security information can be relayed (a simple video security system is anticipated).

All rooms will feature keypad locks. Extra security may be needed before, during, and right after performances to ensure the security of performers' instruments and gear.

## 5.5 Adaptability / Flexibility

The Music Studio Space should be flexible in the face of changing needs in the local Vancouver music scene, and in the face of changing music-oriented technology. However, flexibility in layout will be sacrificed for acoustic separation purposes.

## 5.6 Accessibility

Universal design is required: the Music Production Space must be fully accessible, including washrooms, and a power-assisted doors where possible (front-door, washrooms, and music studios). The studios and performance spaces especially, must accommodate wheelchairs and power chairs, as well as the office and

the recording space. This is particularly important to consider, as the floating floors required by acoustic separation needs may create accessibility challenges. Ramps or elevator access must be provided if needed.

## 5.7 Garbage and Recycling

The Music Production Space garbage and recycling area will be captured in building gross and must be separate from the residential garbage and recycling area due to separate service agreements.

## 5.8 Storage

The Music Production Space will have Performance Storage (housing tables and chairs), Office Storage (Serving the Administration Area), and Instrument and Equipment Storage (housing items available for rent). An example of equipment available for rent could include: solid guitar amps, tube guitar amps, double kick pedals, and bass / guitar / keyboard /other small instruments.

## 5.9 Building Systems

*HVAC and Mechanical Systems must adhere to acoustic requirements as laid out in Appendix A.*

Approaches suggested by studio operators include:

- Independent HVAC systems for Performance Space, and also Control Room
- For music studios, the use of “send and receive” baffles ventilation boxes can be used. These boxes are housed outside or inside each studio (outside is preferred) and can be used to tie a common HVAC system together with minimal noise transfer or sound bleed between studios.

The Music Production Space will have separate, lockable mechanical and electrical rooms (captured in Gross) to safely accommodate items such as hot water tanks, electrical panels, data, telephone and security equipment panels, gas, water or hydro metres and any other mechanical or electrical equipment that needs to be accommodated within the facility. Mechanical and control systems should be designed to be as simple as possible to reduce maintenance costs and the need for specialized maintenance expertise.

All spaces will be sprinklered as per BC Fire Code. Sprinkler heads are to be recessed and concealed to protect against physical impact damage, and the design of the sprinkler system must consider acoustic decoupling in order to mitigate sound transmission between studio and performance spaces. Along with sprinklers, code requires the inclusion of visual signals (strobes) as floor areas in the Music Production Space will have ambient noise levels more than 87 dBA, and users will be located in sound-insulating enclosures (studios).

The Music Production Space will also provide separate lockable janitor rooms with floor sink, space for storing bucket, mops, brooms, vacuum, ladder, supplies for cleaning, shelves for paper products, light bulbs, etc. One janitor room will suffice (included in building gross)

## 5.10 Natural Light

Spaces at a priority for natural light are the Administration areas, Performance Space, and Music Studios. Ideally, every studio will have access to natural light. As this is an unlikely possibility, natural light should be allocated where possible.

The allocation of windows in studio and performance spaces may make acoustic isolation more challenging. It is recommended that an acoustic specialist should review the inclusion of windows. Likely, standard double glazed, angled windows should achieve a sufficient level of sound insulation to meet Canada Mortgage and Housing Corporation (CMHC) noise criteria.

## 5.11 Ceiling Height Guidelines

All ceiling heights listed in this program are to the interior acoustic treatment and fixtures. The finished ceiling height in music studio spaces should be at least 11'6" high to the interior acoustic treatments and fixtures where possible (plus ~2' of acoustic isolation space above it). Some music studios are likely to have a minimum finished ceiling height of 9'6" if there cannot be more than 1 floor at a height of 11'6". The Performance Space will feature a finished ceiling height of 11'6" (with 2.5 – 3' airspace of ceiling membrane above it for acoustic buffering). The finished ceiling height of the Control Room can be 11'6" (with ~2' of ceiling membrane above it), but ideally the finished ceiling should drop lower to 9'6" as control rooms function better with minimal sound reflection. In all other cases, a clear ceiling height of 12' is preferred.

## 5.12 Performance Space & Control Room Configuration

To achieve sound excellence, the Performance 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.

# 6. ACOUSTIC GUIDELINES

This section includes a set of Acoustic Guidelines as recommended by BKL Acoustical Engineering Consultants, followed by some concerns with respect to the achievability of a mixed-use facility that includes residences and music studio spaces. **It is required that an acoustic consultant/engineer be included in the design and build of the Music Production Space, to ensure acoustic excellence and containment throughout the facility.**

The acoustic quality of the Music Production Space must adhere to the guidelines as laid out by BKL Acoustical Consultants in Appendix A.

BKL's document addresses:

1. Room acoustics and reverberation control
2. HVAC and mechanical systems noise control within the building
3. Internal sound isolation
4. External sound isolation
5. Other considerations

An approach to acoustic separation suggested by studio operators is a "Box in a Box" space configuration. This method may be suitable for the Performance Space and Control Room given that events and recording sessions will take place here, as well as floors or any music studio space that is in close proximity to residences. The design usually involves the use of thick concrete on the exterior, "floating floors", and acoustic treatments (soundproofing of walls and ceilings, usually multi-layers of vinyl / absorbers and diffuser panels) to the interior wall. Such an arrangement takes up a significant amount of space, adding ~2 feet of wall/ceiling space for walls requiring it (e.g. walls bordering the residential component of the building). In this program, a *Box in Box Gross* space allocation has been included roughly equivalent to the box in a box design space needed for 1 of each music studio size, the control room, and the performance space.

# APPENDIX A – BKL Preliminary Criteria for Acoustical Design

#308 - 1200 Lynn Valley Road, North Vancouver, BC, Canada V7J 2A2
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**MEMORANDUM**

| | |
|---|---|
| To: Melanie Roskell, Cornerstone Planning Group | Date: June 21, 2019 |
| From: Phil Miville-Deschenes, Miville@bkl.ca | Page 1 of 4 |
| CC: Alec Young, Alec@cornerplan.com | |

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

Upon your request, we reviewed the Programming Study that you sent us on June 20, 2019. We understand that the above project will be part of a mixed-use residential building. It will include 2 offices, 11 music studios, a performance space of approximately 75 people capacity and a control room. Therefore, 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.

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

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 |
|---|---|---|
| NC25 | I.8m/s | 2.2 m/s |
| NC30 | 2.2 m/s | 2.5 m/s |
| NC 35 | 2.5 m/s | 3.0 m/s |
| NC40 | 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.

As mentioned in the Programming Study, 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 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.

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 overall performance of acoustically rated partitions that contain doors will be limited by the performance of the door. In order to maintain appropriate background noise level and to avoid noise intrusion into the adjoining spaces, sound rated doors 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.

We noted in Section 4.1 of the project Functional/Facility Requirements that all studios will feature wall-mounted Public Address {PA) speakers. Please note that loudspeakers may need to be resiliently attached to the walls to minimize structure borne noise transmission.

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, lla, llb and llc 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.

I trust this correspondence satisfactorily deal with your preliminary requirements. Should you require design advice to meet the proposed criteria, do not hesitate to contact us.