

SCHEDULE 3
DESIGN AND CONSTRUCTION SPECIFICATIONS

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SCHEDULE 3

DESIGN AND CONSTRUCTION SPECIFICATIONS

1 INTERPRETATION

1.1 Definitions

In this Schedule, in addition to the definitions set out in Schedule 1 of this Agreement:

“**City of Vancouver Building By-Law**” means the City of Vancouver Building By-Law latest version as amended;

“**CPTED**” means Crime Prevention Through Environmental Design;

“**Functional Program**” has the meaning set out in Section 2.3.1 of this Schedule;

“**Leeway Open Workshop**” is a multi-disciplinary resourced studio space for artists and designers for the general public as well as Emily Carr alumni, staff and faculty.

“**Open Architecture**” is a type of computer architecture or software architecture that is designed to make adding, upgrading and swapping components easily achievable.

“**Project Co’s End-Use Equipment**” has the meaning set out in Section 5.11.5 of this Schedule.

“**Project Design Objectives**” has the meaning set out in Section 3.1 of this Schedule; and

“**Great Northern Way Structure Plan**” means the development plan including roads, services, setbacks, approved by the City of Vancouver.

1.2 Interpretation

- 1.2.1 This Schedule is written as an output specification and defines what Project Co must achieve in the Design and Construction. Except as expressly stated otherwise, Project Co will carry out the Design and Construction as required and contemplated by each provision of this Schedule and its Appendices whether or not the provision is written as an obligation of Project Co or is stated in the imperative form.
- 1.2.2 Where “cost effective”, “appropriate”, “sufficient”, “minimize” and related and similar terms are used, they are to be construed and interpreted in terms of whether they are cost effective, appropriate, sufficient, minimizing, etc. from the perspective of a prudent public owner of a major post-secondary facility who balances capital costs against maintenance, operations, efficiency and other non-capital costs over the life of the Facility.
- 1.2.3 Unless expressly stated otherwise, each reference to a standard in this document will be deemed to mean the latest version of that standard as of the Financial Submission Date.

1.3 Acronym List

The following acronyms will apply to Schedule 3.

- 1.3.1 AAMA - Aluminum Association Standards (AAS) and the American Architectural Manufacturers Association
- 1.3.2 AAMA - American Architectural Manufacturers Association
- 1.3.3 AHC - Architectural Hardware Consultant
- 1.3.4 ANSI - American National Standards Institute
- 1.3.5 ASHRAE - American Society of Heating, Refrigerating and Air-conditioning Engineers
- 1.3.6 ASME - American Society of Mechanical Engineers
- 1.3.7 ASPE - American Society of Plumbing Engineers
- 1.3.8 ASTM - American Society for Testing and Materials
- 1.3.9 AV– Audio Visual
- 1.3.10 AWCC - Association of Wall and Ceiling Contractors
- 1.3.11 AWMAC - Architectural Woodwork Manufacturer's Association of Canada
- 1.3.12 BCICA - British Columbia Insulation Contractors Association
- 1.3.13 BCLNA - British Columbia Landscape & Nursery Association
- 1.3.14 BCSA – British Columbia Safety Authority
- 1.3.15 BCSLA - British Columbia Society of Landscape Architects
- 1.3.16 BICSI - Building Industry Consulting Service International
- 1.3.17 BIX – Building Industry Cross-connect
- 1.3.18 BMS - Building Management System
- 1.3.19 CaGBC - Canada Green Building Council
- 1.3.20 CCI/CRI - Canadian Carpet Institute/ Canadian Rug Institute
- 1.3.21 CCTV – Closed Circuit Television
- 1.3.22 CEC - Canadian Electrical Code
- 1.3.23 CFC - Chlorofluorocarbon

- 1.3.24 CIF – Common Intermediate Format
- 1.3.25 CMCA - Canadian Masonry Contractors Association
- 1.3.26 CPTED - Crime Prevention Through Environmental Design
- 1.3.27 CSA - Canadian Standards Association
- 1.3.28 CSDFMA - Canadian Steel Door and Frame Manufacturer's Association
- 1.3.29 DDC - Direct Digital Controls
- 1.3.30 DES – District Energy System
- 1.3.31 DHI – Door Hardware Institute
- 1.3.32 DSSS – Direct Sequence Spread Spectrum
- 1.3.33 EIA/TIA – Electronics Industry Association/Telecommunications Industry Association
- 1.3.34 EMT – Electric Metallic Tubing
- 1.3.35 EPA - Environmental Protection Agency
- 1.3.36 FACP – Fire Alarm Control Panel
- 1.3.37 FD – Floor Drain
- 1.3.38 FM – Factory Mutual
- 1.3.39 GCA - Glazing Systems Specifications
- 1.3.40 GNW – Great Northern Way
- 1.3.41 HAZMAT - Hazardous Materials
- 1.3.42 HCFC - Hydro chlorofluorocarbon
- 1.3.43 HOA – Hand/Off/Auto
- 1.3.44 HP – Horsepower
- 1.3.45 HRC – High Rupting Capacity (fuse type)
- 1.3.46 HVAC - Heating, Ventilating and Air-Conditioning
- 1.3.47 IDS / IPS – Intrusion Detection System / Intrusion Prevention System
- 1.3.48 IEEE - Institute of Electrical and Electronic Engineers
- 1.3.49 IGMAC - Insulating Glass Manufacturers Association of Canada

- 1.3.50 IP – Internet Protocol
- 1.3.51 IT – Information Technology
- 1.3.52 KW – Kilowatt
- 1.3.53 KWH – Kilowatt hours
- 1.3.54 KV – Kilovolt
- 1.3.55 KVA – Kilovolt Ampere
- 1.3.56 LCD – Liquid Crystal Display
- 1.3.57 LED – Light Emitting Diode
- 1.3.58 LEED – Leadership in Energy Efficient Design
- 1.3.59 LRT – Light Rail Transit
- 1.3.60 m – Metres
- 1.3.61 mm - Millimetres
- 1.3.62 Mb - Megabit
- 1.3.63 MCP – Motor Circuit Protector
- 1.3.64 MPI – Master Painters Institute
- 1.3.65 NEMA - National Electrical Standards Association
- 1.3.66 NFCA – National Floor Covering Association
- 1.3.67 NFPA - National Fire Protection Association
- 1.3.68 OFDM – Orthogonal Frequency Division Multiplexing
- 1.3.69 OS&Y - Open Stem and Yoke
- 1.3.70 PC – Personal Computer
- 1.3.71 PoE – Power Over Ethernet
- 1.3.72 PTZ – Pan Tilt Zoom
- 1.3.73 PVC – Polyvinyl Chloride
- 1.3.74 RCDD – Registered Communications Distribution Designer
- 1.3.75 RCABC - Roofing Contractors Association of British Columbia

- 1.3.76 RTLS – Real Time Location System
- 1.3.77 RFID - Radio Frequency Identification System
- 1.3.78 SES – Safety Engineering Society
- 1.3.79 SNR – Signal to Noise Ratio
- 1.3.80 STC – Sound Transmission Coefficient
- 1.3.81 TCP – Transmission Control Protocol
- 1.3.82 TDM – Time Division Multiplexing
- 1.3.83 THD -Total Harmonic Distortion
- 1.3.84 TIA - Telecommunications Industry Association
- 1.3.85 TS - Technology Support
- 1.3.86 TTMAC – Terrazzo and Tile Manufacturers Association of Canada
- 1.3.87 TVOC – Total Volatile Organic Compounds
- 1.3.88 TVSS - Transient Voltage Surge Suppressor
- 1.3.89 ULC - Underwriters' Laboratories of Canada
- 1.3.90 UPS – Uninterruptible Power Supply
- 1.3.91 V - Volt
- 1.3.92 VAR – Volt Ampere Reactive power
- 1.3.93 VFD - Variable Frequency Drive
- 1.3.94 VLAN – Virtual Local Area Network
- 1.3.95 VOC – Volatile Organic Compounds
- 1.3.96 VoIP – Voice Over Internet Protocol
- 1.3.97 WAN – Wide Area Network

End of Section

PART 2. GENERAL

2.1 Standards

- 2.1.1 Project Co will undertake the Design and Construction:
 - 2.1.1.1 in accordance with the standards set out in this Schedule;
 - 2.1.1.2 in accordance with the City of Vancouver Building By-Law and all applicable Laws;
 - 2.1.1.3 having regard for the concerns, needs and interests of:
 - 2.1.1.3(1) all persons who will be Facility Users;
 - 2.1.1.3(2) all Governmental Authorities; and
 - 2.1.1.3(3) the community;
 - 2.1.1.4 in accordance with Good Industry Practice; and
 - 2.1.1.5 to the same standard that an experienced, prudent and knowledgeable long term owner of a high quality University in North America operated publicly would employ.
- 2.1.2 If more than one of the above standards is applicable then the highest such standard will apply.
- 2.1.3 If Project Co wishes to make reference to a code or standard from a jurisdiction outside of Canada, then Project Co will demonstrate to the Authority's satisfaction that such code or standard meets or exceeds the requirements of this Schedule.
- 2.1.4 Without limiting Section 2.1.1 of this Schedule, Project Co will undertake the Design and Construction in compliance with all applicable standards, including:
 - 2.1.4.1 BCICA Quality Standards Manual for Mechanical Insulation
 - 2.1.4.2 ANSI / ASHRAE:
 - 2.1.4.2(1) 52.2-2007: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size;
 - 2.1.4.2(2) 55-2004: Thermal Environmental Conditions for Human Occupancy;
 - 2.1.4.2(3) 62.1-2007: Ventilation for Acceptable Indoor Air Quality

- 2.1.4.2(4) 90.1-2010: Energy Standard for Buildings Except Low Rise Residential Buildings;
- 2.1.4.2(5) 111-2008: Practices for Measurement, Testing, Adjusting & Balancing of Building HVAC Systems;
- 2.1.4.2(6) 129-1997: Measuring Air Change Effectiveness;
- 2.1.4.2(7) 135-2004: Data Communication Protocol for Building Automation & Control Networks;
- 2.1.4.3 ASHRAE:
 - 2.1.4.3(1) Handbooks: 2009 Fundamentals, 2006 Refrigeration, 2007 HVAC Applications, 2008 HVAC Systems and Equipment;
 - 2.1.4.3(2) Design of Smoke Control Systems;
 - 2.1.4.3(3) ASHRAE Guideline 12-2000 - Minimizing the Risk of Legionellosis Associated with Building Water Systems;
 - 2.1.4.3(4) ASHRAE Guideline 1.1-2007 – HVAC & R Technical Requirements for the Commissioning process;
 - 2.1.4.3(5) ASHRAE Guideline 0-2005 – The Commissioning Process;
- 2.1.4.4 ANSI / ASME:
 - 2.1.4.4(1) B31.1 Power Piping;
 - 2.1.4.4(2) B31.9 Building Services Piping;
 - 2.1.4.4(3) Section VIII: Pressure Vessels;
 - 2.1.4.4(4) Section IX: Welding Qualifications;
 - 2.1.4.4(5) Unfired pressure vessels;
 - 2.1.4.4(6) AWS D1.3-98 - Structural Welding Code - Sheet Steel;
- 2.1.4.5 TIAI / EIA:
 - 2.1.4.5(1) 568-C Commercial Building Telecommunications Cabling Standard;
 - 2.1.4.5(2) 569-B (CSA-T530) Commercial Building Standard for Telecommunications Pathways and Spaces;
 - 2.1.4.5(3) 606-B (CSA-T528) Administration Standard for Telecommunications Infrastructure of Commercial Buildings;

- 2.1.4.5(4) 607-A (CSA-527) Commercial Grounding and Bonding Requirements for Telecommunications.
- 2.1.4.5(5) 758-B Customer Owned Outside Plant Telecommunications Cabling Standard;
- 2.1.4.5(6) 942 Telecommunications Infrastructure Standard for Data Centers;
- 2.1.4.5(7) TSB-162 Telecommunications Cabling Guidelines for Wireless Access Points;
- 2.1.4.6 ANSI / ESNA American National Standard Practice for Lighting;
- 2.1.4.7 ASPE Plumbing Engineering Design Handbook, Volumes 1-4;
- 2.1.4.8 ASTM:
 - 2.1.4.8(1) A185-06 - Standard Specification for Steel Welded Wire Fabric;
 - 2.1.4.8(2) A82/A82M-05 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement;
 - 2.1.4.8(3) ASTM C568-03 - Standard Specification for Limestone Dimension Stone;
 - 2.1.4.8(4) ASTM C615-03 - Standard Specification for Granite Dimension Stone;
 - 2.1.4.8(5) ASTM C503-05 - Standard Specification for Marble Dimension Stone;
 - 2.1.4.8(6) ASTM C616-03 - Standard Specification for Quartz-Based Dimension Stone;
 - 2.1.4.8(7) BCSLA and BCLNA - BC Landscape Standard – Current Edition;
- 2.1.4.9 CAN ULC:
 - 2.1.4.9(1) S524 Standards for the Installation of Fire Alarm Systems;
 - 2.1.4.9(2) S537 Standards for Verification of Fire Alarm Systems;
- 2.1.4.10 CSA:
 - 2.1.4.10(1) B52-05: Mechanical Refrigeration Code;
 - 2.1.4.10(2) B51-2003: Boiler, Pressure vessel and Pressure Piping Code;
 - 2.1.4.10(3) B149.1-05: Natural Gas and Propane Installation Code;

- 2.1.4.10(4) B651-95: Barrier Free Design;
- 2.1.4.10(5) C22.1 & C22.2 Canadian Electrical Code as adopted in British Columbia;
- 2.1.4.10(6) C282 Emergency Electrical Power Supply for Buildings;
- 2.1.4.10(7) A23.4-05 - Precast Concrete - Materials and Construction;
- 2.1.4.10(8) W186-M1990 (R2002) - Welding of Reinforcing Bars in Reinforced Concrete Construction;
- 2.1.4.10(9) A370-04 - Connectors for Masonry;
- 2.1.4.10(10) A23.1-04/A23.2-04 - Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete;
- 2.1.4.10(11) S832-06 – Seismic Risk Reduction of Operational and Functional Components (OFCS of buildings);
- 2.1.4.10(12) S478 Guideline on Durability of Buildings;
- 2.1.4.10(13) S16-01 Limit States Design of Steel Structures;
- 2.1.4.10(14) S136-01 Design of Cold Formed Steel Members;
- 2.1.4.10(15) S304-04 Masonry Design for Buildings;
- 2.1.4.10(16) S832-06 Guidelines for Seismic Risk Reduction of Operational and Functional Components of Buildings;

2.1.4.11 NFPA:

- 2.1.4.11(1) 10-2002: Standard for Portable Fire Extinguishers;
- 2.1.4.11(2) 13: Standard for the Installation of Sprinkler Systems;
- 2.1.4.11(3) 14: Standard for the Installation of Standpipe System;
- 2.1.4.11(4) 90A - Current Edition: Standard for Installation of Air Conditioning and Ventilation Systems;
- 2.1.4.11(5) 92A - Current Edition: Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences;
- 2.1.4.11(6) 101 - Current Edition: Life Safety Code;

2.1.4.12 IEEE:

2.1.4.12(1) 802.1 series for Interworking, Security, Audio/Video Bridging and Data Centre Bridging;

2.1.4.12(2) 802.3 series of Ethernet Standards;

2.1.4.12(3) 802.11 series of Wireless Standards;

2.1.4.13 NETA:

2.1.4.13(1) ATS International Electrical Testing Association (Acceptance Testing Specifications);

2.1.4.13(2) MTS Standards for Maintenance Testing;

2.1.4.14 BICSI series of Telecommunication Standards; Master;

2.1.4.15 Master Municipal Construction Document (MMCD); and

2.1.4.16 BC Supplement to TAC Geometric Design Guide.

2.2 Use of Wood

2.2.1 As contemplated by the *Wood First Act* (British Columbia), Project Co will incorporate wood products into the design of the Facility to the extent that the use of wood products is consistent with the requirements of this Schedule.

2.3 Functional Program

2.3.1 The Authority and its consultants have prepared the Functional Program, which is attached as Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

2.3.2 The Functional Program describes 32 functional components, organized into four groups based on the type of function taking place, which include: Learning and Support Functions, Studio and Academic Programs, Student and Campus Services and Administration and Support Services.

2.3.3 The Functional Program summarizes the types of rooms or spaces with minimum numbers and sizes along with some contents of some rooms which the Authority has identified as being necessary so that the Facility can accommodate the Program Requirements.

2.3.4 Project Co will design and construct the Facility:

2.3.4.1 so that it accommodates all of the spaces, activities, functions, design features and adjacencies described in the Functional Program; and

2.3.4.2 in accordance with the requirements of the Functional Program, subject to any adjustments or refinements made in accordance with the Authority

Consultation Process and the Design Review Procedure. Refer to Appendix 2B [Consultation Process] and 2C [Design Review] of Schedule 2.

2.4 Rooms and Spaces

- 2.4.1 Notwithstanding anything in the Functional Program, Project Co will construct the Facility to include all rooms and spaces as required to comply with the terms of this Agreement, including sufficient rooms and spaces as necessary for the operation and maintenance of the Facility and for Project Co to perform the Services in accordance with this Agreement.

2.5 Lecture Theatres

- 2.5.1 In addition to the requirements of this Schedule, Project Co will construct the lecture theatres in accordance with the requirements of Appendix 3B [Audio Visual Requirements].

2.6 Integrated Design Process

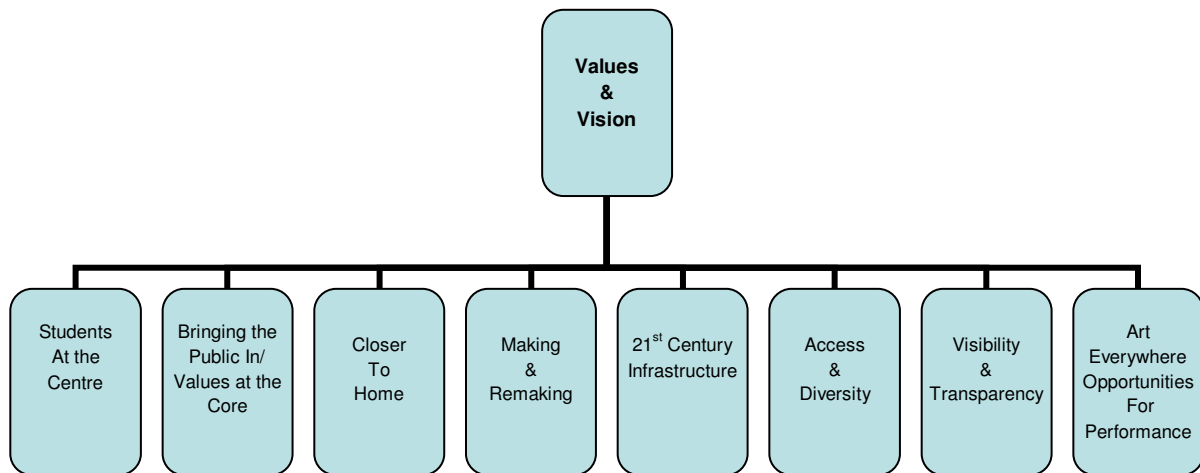
- 2.6.1 The Authority considers that quality and performance are linked to both the creativity of the team and the means and methods used to realize the Project. A team based approach that breaks down traditional barriers between builders, professionals and user agency is required. Project Co will provide an integrated design and engineering approach that merges aesthetic and technical consideration to achieve best value meeting design principles and requirements including lasting physical performance and technical quality.
- 2.6.2 Project Co will develop a method of managing and implementing the integrated design process, through all phases of design and construction, with respect to the Authority's requirements that acknowledges the Authority's statement of "best value". "Best value" for the Authority will be achieved through a Facility that has: high aesthetic quality, maximum support for the collaborative and social activities of the Authority's community, increased durability, energy and resource efficient building infrastructure and optimally efficient maintenance and lifecycle characteristics for the available level of capital investment.
- 2.6.3 Project Co will present their integrated design approach to the Authority indicating what tools and methods (which may include integrated design charrettes, performance analysis tools, benchmarking) will be utilized at each stage of the design and construction process.

End of Section

PART 3. DESIGN PRINCIPLES AND REQUIREMENTS

3.1 Design Values and Vision

The Facility will meet the Authority's values and the vision set out below.



3.1.1 Students at the Centre

3.1.1.1 The Authority serves a diverse student body across a broad range of programs (graduate, undergraduate, continuing education, low residency, etc.) The Authority seeks a campus that places the needs of the multiple student audiences at the centre of the Authority's physical and social organization.

3.1.2 Bringing the Public In/ Values at the Core

3.1.2.1 The Facility will be inviting and accessible for the many public audiences that the Authority serves through programs, events and exhibitions. The design and layout of the Facility and grounds will communicate the core values of the institution: creativity and experimentation, support for lifelong learning, community-building, respect for diversity of cultures and indigenous practices, and social and environmental sustainability.

3.1.3 Closer to Home

3.1.3.1 The Facility is close to areas of the city where the students, faculty and staff live off site, is more accessible than the existing facility to major transit lines and will include off site residences. This close proximity will create new opportunities for enhancing the connection between "home and school", including evening and weekend events and programs, and other elements of a residential campus community.

3.1.4 Making and Remaking

3.1.4.1 Contemporary art, media and design education is deeply connected to activities of experimentation, visualization and the making and remaking of material things. To support this kind of learning, the Authority requires buildings and facilities that are adaptive, flexible, and sturdy, and that address the continuous need to adapt, innovate and remake the processes and spaces that comprise our core work.

3.1.5 21st Century Infrastructure

3.1.5.1 The activities of teaching and learning in the existing Authority facility take place across a range of locations, platforms, and devices, utilizing global data stores and techniques of ubiquitous virtualization. The new campus will include a suite of technologies, services and physical designs that are integrated, ergonomic and supportive of these emergent practices of education and research.

3.1.6 Access & Diversity

3.1.6.1 The Authority is a relatively small (over 1,800 students), public University with an increasingly diverse and global student population. The challenge is to provide broad access and support for all our students, while retaining a cohesive sense of community and support for individual learning and developmental needs. The Facility will highlight key features and functions such as the learning commons, the Leeway Open Workshop, the aboriginal gathering place and student support services that address the dual demands of access and diversity.

3.1.7 Visibility and Transparency

3.1.7.1 The Authority seeks a campus and a Facility that expresses a general openness across disciplines, communities and workgroups. It will be legible, easy to navigate and supportive of interdisciplinary and cross-functional exchange. A broad range of core facilities and functions (such as studios, classrooms, workshops, etc.) will be designed to communicate this sense of openness and transparency of function. Sightlines, glazing and way finding will be utilized to amplify the visual availability of educational activities and community or public elements of the campus.

3.1.8 Art Everywhere/ Opportunities for Performance

3.1.8.1 The Authority is an intensely visual, material, experimental and performative culture. The Facility will maximize opportunities for both formal and informal displays of creative work, for gathering and discussion in the presence of creative work and for experimental and performative events and activities. Classrooms, studios, corridors and public spaces will serve as sites for display, exhibition, critique and performance.

3.2 Design Objectives

3.2.1 Design Introduction

The intent of Section 3 is to facilitate design excellence and establish the basis for an integrated and responsive design process. Project Co will provide an integrated project that fulfills the aesthetic, experiential and technical aspirations of the Authority.

The Authority requires:

- 3.2.1.1 A Facility with quality working and learning environments, reflective of the Authority's identity as a cutting edge international centre for learning, research and applied skills training, in a studio context recognized for innovation, creativity, leadership and collaborative partnership in the fields of visual art, design and dynamic media.
- 3.2.1.2 A Facility that reflects optimum and rigorous architectural and urban design concepts within Vancouver's unique context. The Facility will be an imaginative, timeless, architectural interpretation of 21st century learning, designed to empower and enrich the experience of the Authority's community, to promote multidisciplinary academic and professional exploration, productivity and collaboration, and convey a message of social openness, accessibility, diversity and well-being for those who use the Facility.
- 3.2.1.3 A Facility that meets the Authority's functional, aesthetic and performance goals, from both a quantitative and qualitative perspective. The Facility will incorporate appropriate, durable and flexible architectural, structural mechanical, electrical and technological systems designs, as well as institutional quality, efficiency and user responsive building systems.
- 3.2.1.4 The Facility design will be responsive to site characteristics and opportunities as well as climatic conditions, and will maximize provisions for environmental sustainability.
- 3.2.1.5 The Facility's space configurations, partitions and studio spaces will be flexibly transformed as disciplines and approaches change.

The Facility will meet the Design Objectives set out below:

3.2.2 Institutional Identity and Community Presence

- 3.2.2.1 The Facility will be a social hub in an emerging cultural zone, an urban anchor and a model of architectural design. It will function as both a physical and metaphorical point of connection, as a gateway to the campus and as a connector to the urban fabric of the city.
- 3.2.2.2 The Facility will provide an environment that is inviting to the public and engages professional artists, designers, the business community, and all

sectors of the creative and cultural economy. The physical lay-out will support the wide variety of programs, events and exhibitions anticipated.

3.2.2.3 The Facility will be a marketplace of ideas and a laboratory for the development, fabrication, display and discussion of concepts, images, objects, and experiences, the majority of which will make use of multi-faceted, applied learning.

3.2.2.4 The Facility will provide interdisciplinary workplaces to support innovative and collaborative methods of working.

3.2.3 Functionally Suitable Spaces and Environments

3.2.3.1 The Authority's community includes undergraduate and graduate full-time, part-time, and continuing studies students, faculty, staff, administrators, community participants and visitors. The core student group is young, culturally and linguistically diverse and includes a significant number of international students. The continuing studies program engages a diversity of students who seek an equally diverse educational experience. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

The design of the Facility will:

3.2.3.2 Anticipate the evolving values and culture of both current and future students and the impact of rapidly emerging technologies;

3.2.3.3 Provide a supportive setting for people, activities, and programs; target to set a model for the future of working environments, through an activity based workplace driven by the functions, activities, ergonomic requirements, and tools of students, faculty, staff and administration;

3.2.3.4 Ensure student services and other student resource spaces that are easy to navigate, conveniently located and as transparent and open as possible; and

3.2.3.5 Support equitable access to all parts, functions, programs and areas of the facility for the entire Authority community.

3.2.3.6 The Facility will be successful to the degree that the spaces and conditions it provides meet the complex functional requirements of the activities taking place within it; learning, exploration, interdisciplinary inspiration and collaboration require the use of both programmed space and non-programmed space. Design the Facility to accommodate non-programmed or "in between" spaces such as un-programmed spatial opportunities as a result of the design layout. In addition, potential innovative and efficient use of layout may allow for surplus area from gross up areas to foster opportunities for such spaces. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

- 3.2.3.7 The ability of the Facility spaces, features and components to evolve over time will be an intrinsic design principle, including user driven reconfiguration, adaptive re-use or reinvention in ways that may not be originally intended.
- 3.2.3.8 The Facility will provide for integrated and adaptive technology including high-performing, adaptive and innovative technology for telecommunications infrastructure, wireless access, audio visual infrastructure and security infrastructure.
- 3.2.3.9 The Facility will create an environment that promotes a sense of well-being for the users including: quality thermal and ventilation conditions, safe materials, the necessary acoustic and vibration separation between various functions and ergonomic furnishings that are tailored to uses and the diversity of users.

3.2.4 Operational Sustainability

- 3.2.4.1 The Facility will be designed and equipped as necessary to function as a progressive art and design University with a focus on producing students who meet the current and prospective labour market demands and contribute to the local, regional and national economies as artists, designers and entrepreneurs.
- 3.2.4.2 The Facility will be designed with an infrastructure that allows for upgrades and future flexibility in Authority technology or technological progression.
- 3.2.4.3 The Facility will be designed with the most up to date display technologies available at the time of installation including video terminals that display studio activities and exhibitions ongoing throughout the Facility.
- 3.2.4.4 The Facility will be designed to accommodate program, service, work and equipment changes with minimized utility infrastructure and Facility impact.
- 3.2.4.5 The Facility will be designed so the layout accommodates changes to uses and functions, such as changes in studio sizes and media, with minimal required changes to the Facility's structure and building systems.
- 3.2.4.6 The Facility will be designed to achieve: efficiency of energy, resources, and design and construction processes, effective use of natural systems such as natural light and natural ventilation, life-cycle costs, environmental sustainability and longevity. The Facility design, construction and operations will support the University Sustainability Policy and associated goals.

3.3 Site Design

- 3.3.1 Site Design criteria will reflect the requirements described in the preceding Design Objectives, and the following Architectural Character, Interior Systems, and Operational Systems sections.

3.3.2 Site Design is described in the following categories:

- Site conditions;
- Master planning;
- Urban integration;
- Site access;
- Site features;
- Connections to existing site services; and
- Site infrastructure.

3.3.3 Site Conditions

3.3.3.1 At the Effective Date, the Site will be in the following condition:

3.3.3.1(1) Free from the existing concrete slab, grade beam, pile caps and surface pavements;

3.3.3.1(2) Existing piles will remain;

3.3.3.1(3) The Site will not be re graded or re compacted.

3.3.3.2 The Site will have been remediated of soil and vapour environmental contamination to provincial regulatory numerical standards for residential land use in compliance with an Approval in Principle, subject to confirmatory testing of vapours and issuance of a Certificate of Compliance. Vapour testing will require site access during construction.

3.3.3.3 In the unlikely event vapour contamination remains following remediation, a soil vapour management system may be required. The vapour management system will be based on a design provided by the Authority and installed by Project Co. If a vapour management system is needed, the terms of this activity will be negotiated following the Effective Date.

3.3.3.4 [Intentionally Deleted]

3.3.3.5 [Intentionally Deleted]

3.3.4 Master Planning

3.3.4.1 Project Co will construct the Facility to respond to the key concepts outlined in the Great Northern Way Structure Plan.

- 3.3.4.2 Project Co will perform an overall site planning study to understand the site context and to plan a seamless integration of the new Facility to the existing GNW Campus within the context of the Great Northern Way Structure Plan.
 - 3.3.4.3 Project Co will demonstrate an understanding of the existing site constraints, infrastructure, unique context and site specific master planning in the design of the Facility and its outdoor amenities.
 - 3.3.4.4 Project Co will avoid creating an obvious non-public or overtly service-side in order to optimize the success of the Facility as a focus of community activity.
 - 3.3.4.5 The Facility will maintain a minimum distance of 15 metres between the north façade and the proposed LRT tracks.
 - 3.3.4.6 Project Co will locate and construct the Facility within the designated height limits and all other requirements to satisfy the City of Vancouver Zoning By-Laws.
 - 3.3.4.7 For the purposes of site planning, the Facility must function as a standalone facility and all access routes and emergency exiting routes must be located within the Site boundaries, except for those locations that have direct access to dedicated City roads to the north and east of the Site.
 - 3.3.4.8 Project Co will work directly with the City to determine the finished elevations at the SW corner of the Site based on the approved Great Northern Way Structure Plan.
 - 3.3.4.9 Project Co acknowledges that the development of the Great Northern Way campus lands may include sale of the parts of the campus immediately to the south and west of the Site, and that development of those parts may include some overlapping construction time frames with the Project, and/or application to the City for departure from the grades established in the Great Northern Way Structure Plan for the pedestrian spine. For certainty in their design, Project Co may assume that the grades in the Great Northern Way Structure Plan, as may be modified at the time that Project Co's development permit is returned by the City with "prior to" conditions, will be those that govern.
 - 3.3.4.10 The Authority notes that the Great Northern Way Structure Plan shows a finished grade level of 9.0m at the SW corner of the site, being the connection to St George's Plaza. The Authority will accept, and prefers, a grade reduction down to 8.0m. The City has indicated up to 1.0m in flexibility in this location depending on the characteristics of Project Co's design.
- 3.3.5 Urban Integration
- 3.3.5.1 The Facility will be constructed as a landmark within its urban and community context and will be situated to maximize its visibility from surrounding streets and adjacent buildings.

- 3.3.5.2 The Facility will support community and student access by including a highly visible main entry (or entries) and lobby to address the different entry conditions of the site, campus and Facility.
 - 3.3.5.3 Project Co will facilitate a pedestrian experience for the movement of its users and the public throughout the common areas of the Facility and greater site.
 - 3.3.5.4 The Facility will be configured to provide exposure to the fabrication of art and design, display of finished pieces and/ or works in progress from the exterior and the adjacent exterior pedestrian pathways.
 - 3.3.5.5 The Facility will be designed with a level of transparency that exposes the activities of the interior and encourages interaction with passersby.
 - 3.3.5.6 Project Co will locate the gallery so that it is visible and perceivable from Great Northern Way.
 - 3.3.5.7 The Facility will be constructed for the legibility, quality and consistency of the overall treatment of the public realm, including public open space, pedestrian corridors and streets, to achieve the urban design objectives for a unified and attractive built environment.
 - 3.3.5.8 The Facility will provide exterior public spaces with consistency of treatment that engage users, protect from the elements, are durable, safe and are low maintenance.
 - 3.3.5.9 The Facility will provide exterior spaces suitable for occasional teaching, studying and socializing.
 - 3.3.5.10 The Facility will provide exterior spaces that are appropriate for the installation of art pieces.
 - 3.3.5.11 The Facility will provide a programmable exterior space visible from Great Northern Way that accommodates a gathering of people without interrupting pedestrian traffic as referenced in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 3.3.6 Site Access
- 3.3.6.1 Consider site traffic patterns, including connections to the future LRT station and developments adjacent to the Site and their impact on site circulation, Facility location and configuration.
 - 3.3.6.2 The Facility will allow pedestrian traffic to flow easily into the building via adjacent sidewalk space leading to multiple entrances into the common areas of the Facility.
 - 3.3.6.3 The Facility will provide on site driveways as required to connect between the surrounding roads and the main entrances to the Facility.

- 3.3.6.4 Project Co. will provide dedicated vehicular driveways to off site surface parking.
 - 3.3.6.5 The Facility will accommodate (in addition to transit stops), taxi stands, bicycle access, bicycle storage and vehicle drop-off points for users.
 - 3.3.6.6 A passenger drop-off will be provided near the main entry (or entries) of the building.
 - 3.3.6.7 The Facility will provide functional separation of traffic for service vehicles from student, visitor and staff.
 - 3.3.6.8 The Facility will provide for convenient delivery access for the handling of materials on a daily basis.
 - 3.3.6.9 The Facility will provide dedicated vehicular access to the shipping and receiving zone, and secure recycling and garbage marshalling areas.
 - 3.3.6.10 The Facility will provide loading that is screened from public view.
 - 3.3.6.11 The Facility will provide circulation that coordinates the movements of vehicles, bicycles, pedestrians, wheelchairs and the physically challenged, which emphasizes safety.
 - 3.3.6.12 The Facility will use appropriate signage, markers or other levels of way finding along access routes to indicate the route terminus points or any required route changes to ensure convenient universal access throughout the Site.
- 3.3.7 Site Features
- 3.3.7.1 The Facility will provide dedicated exterior spaces for project fabrication (B9 Ceramics and Sculpture, B10 Integrated Technology Support) and for recreation (C5 Food Services). Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)]. Such spaces shall be secured from public access with weather protected enclosure. Enclosure will be of sufficient height and impermeability and shall include lockable features as required to achieve the functionality described in Schedule 3A Functional Program (including Pre-Design Data Sheets).
 - 3.3.7.2 The Facility will provide power to all exterior programmable areas.
 - 3.3.7.3 The Facility will provide secure, aesthetically pleasing, contained enclosures for trash and recycling located adjacent to public entrances.
 - 3.3.7.4 In proximity to the Facility, the Authority will provide land for Project Co to supply surface parking for up to 160 cars. Project Co will provide:
 - 3.3.7.4(1) Site surface and finish surfaces;

- 3.3.7.4(2) Drainage systems;
 - 3.3.7.4(3) Lighting;
 - 3.3.7.4(4) Landscaping including trees;
 - 3.3.7.4(5) Stall, stopping and walking striping;
 - 3.3.7.4(6) Concrete curbs and curb stops;
 - 3.3.7.4(7) Parking, parking lot and directional signage limited to site and off- site parking lands; and
 - 3.3.7.4(8) Service provisions for entry gate(s) and ticket dispenser(s).
- 3.3.7.5 Dedicated spaces will be required for the following on the Site:
- 3.3.7.5(1) Delivery vehicles;
 - 3.3.7.5(2) Garbage and recycle collection; and
 - 3.3.7.5(3) Bicycles including lock-up and storage.
- 3.3.7.6 Provide dedicated spaces on the Site or curbside location acceptable to the City for the following:
- 3.3.7.6(1) Persons with disabilities;
 - 3.3.7.6(2) Emergency vehicles.
- 3.3.7.7 The Facility will provide secured bicycle storage for a minimum of 250 bicycles.
- 3.3.7.8 The Facility will provide multiple illumination systems within the Site (or as required by the City to supplement street lighting provided by others) to highlight vehicular and pedestrian approaches, Facility entrances, signage, urban design elements, significant architectural features and adjacent parking area.
- 3.3.7.9 The Facility will provide lighting for public outdoor spaces associated with the Facility to create an unobtrusive, human scale lighting concept with a hierarchy of fixture types designed according to functional and security needs (including CPTED), and that highlight pedestrian corridors.
- 3.3.7.10 Within the Site boundary the Facility will provide lighting on pedestrian paths that primarily illuminates the path but also includes the area adjacent to the path to facilitate ease and safety of pedestrian access particularly enroute to transit connections.

- 3.3.7.11 Project Co. will minimize light pollution through the use of full cut-off lighting, avoiding light reflectance and directing lighting downwards. Exceptions may be made for signage and architectural lighting.
- 3.3.7.12 Project Co will provide accent lighting for prominent site features such as artwork.
- 3.3.7.13 Project Co will provide vandal proof light fixtures within the reach of pedestrians. Fixtures to be pre-approved with Authority.
- 3.3.7.14 Project Co will:
 - 3.3.7.14(1) Incorporate principles of Crime Prevention through Environmental Design (CPTED) in the Site Layout, Facility design, landscape development and lighting;
 - 3.3.7.14(2) Provide video surveillance to monitor public areas adjacent to the facility and parking areas in accordance with the Authority's policy attached as Appendix 3K [Closed Circuit Cameras Policy];
 - 3.3.7.14(3) Design pathways and sidewalks in a configuration that provides maximum natural visual surveillance; and
 - 3.3.7.14(4) Refer to the safety and security requirements outlined in Section 5.12 [Electronic Safety and Security (Division 28)].
 - 3.3.7.14(5) Provide storage area, complete with concrete pad, for the Authority's emergency preparedness supplies bin (min size 9.95 cubic metres), in keeping with the facility emergency preparedness management plan. Proposed location, whether exterior or interior to be reviewed with the Authority.
- 3.3.7.15 The Facility will provide pathways leading to and from emergency exits.
- 3.3.7.16 Emergency telephones will be provided in exterior public areas including off-site parking.
- 3.3.7.17 Storage areas will be provided for furniture, equipment and supplies required to stage and maintain the exterior.
- 3.3.7.18 Peripheral service areas will be provided to accommodate equipment required for service access to the roof and the exterior envelope of the Facility.
- 3.3.7.19 The Facility will provide exterior storage areas for waste chemicals and chemical products.
- 3.3.7.20 Project Co will:

- 3.3.7.20(1) Provide hard and soft landscaping for the Site and the adjacent parking area that contributes to the creation of a liveable, healthy and responsive community;
- 3.3.7.20(2) Locate trees or shrubbery, lighting, artwork and other elements to support way finding with particular emphasis on Facility entrances;
- 3.3.7.20(3) Use a variety of plant materials to reflect seasonal change;
- 3.3.7.20(4) Use indigenous flora to minimize maintenance and express an attitude about the Pacific Northwest context;
- 3.3.7.20(5) Group plants to minimize the use of water, chemicals and fossil fuel use for routine maintenance and to promote a healthy local ecosystem using sustainable measures;
- 3.3.7.20(6) Use appropriate trees to promote natural avian habitation;
- 3.3.7.20(7) Incorporate plantings, where appropriate, to help absorb storm water;
- 3.3.7.20(8) Provide exterior spaces that have drainage and incorporate the use of permeable surfaces to reduce storm water runoff and blur the boundaries between soft and hard landscaping; and
- 3.3.7.20(9) Use retention and infiltration best management practices for rainwater.
- 3.3.7.21 Project Co will provide and coordinate design for street furniture, including benches provided at regular intervals. Select products on the basis of safety, consistency, comfort, design and materials that relate to the Facility architecture and landscape design, durability and required maintenance, and incorporate the use of Wood where applicable; and
- 3.3.7.22 Utilize a variety of scales, locations and orientations to cater to varied outdoor activities and experiences for students, staff and visitors.
- 3.3.7.23 Project Co will minimize grade changes for drop curbs and raised crossings. Drop curbs will be aligned to pedestrian crossings.
- 3.3.8 Connections to Existing Site Services
 - 3.3.8.1 The Facility will provide seamless and accessible service connections, and robust system capacity. Provide optimized utilization of building and site services.
 - 3.3.8.2 In addition to City services, Project Co. will provide connections to the following:

- 3.3.8.2(1) BC Net
- 3.3.8.2(2) Cable/satellite
- 3.3.8.2(3) Natural gas
- 3.3.8.2(4) Telephone
- 3.3.8.2(5) Electrical Power
- 3.3.8.2(6) Neighbourhood Energy Utility System (NEU)
- 3.3.8.3 Project Co. will provide an emergency generator plant and fuel tank. Refer to section 5.10.5.1(2) of this Schedule.
- 3.3.8.4 Project Co. will provide a BC Hydro connection to the building by way of new site located BC Hydro Vista Switchgear unit.
- 3.3.8.5 Project Co will work directly with the City to establish the date of installation of the Neighbourhood Energy Utility to the property line (the actual date is triggered by the Project Co application to the City for service). Project Co is advised that billing will begin directly upon the completion of the NEU connection to the termination point within the Facility. If Project Co chooses to obtain the connection more than three months in advance of Service Commencement, Project Co will be responsible for advanced service costs up to the date three months in advance of Service Commencement.
- 3.3.9 Site Infrastructure
 - 3.3.9.1 Project Co will construct all on-site servicing to meet or exceed the design and quality requirements of the City of Vancouver and the needs of the Facility.
 - 3.3.9.2 Project Co will provide sanitary sewer connections of a diameter, grade and depth to safely convey all effluent from the Facility. The sanitary sewer system will include the pipes, manholes and all other required appurtenances to comply with applicable municipal and provincial standards and to connect to the 500 mm sanitary main in Carolina Street. The connection location is subject to approval by the City under a sewer connection permit. Project Co is responsible for this cost.
 - 3.3.9.3 Project Co will:
 - 3.3.9.3(1) Provide (within the site) storm sewers and drainage network of a size, grade and depth to safely convey all storm water.
 - 3.3.9.3(2) Implement a storm water management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-developed peak discharge rate and quantity

for the storm events that meets or exceed City of Vancouver requirements.

- 3.3.9.3(3) Project Co will provide adequately sized water quality/sediment control inlet chambers as a component of the drainage system for any parking lot, before discharging to the offsite drainage system as required by City of Vancouver Bylaws.
- 3.3.9.3(4) A new 525 mm storm water connection from Thornton Street to the cul-de-sac at the NW property line of the Site will be provided by others. Project Co will be responsible for connecting the storm sewer at the property line to the new storm water main at this location. The connection location is subject to approval by the City as part of the storm sewer connection permit. Project Co is responsible for this cost.
- 3.3.9.4 Project Co will provide water main connection (water main and ancillary components) from Carolina Street capable of providing all required domestic and firefighting capacity and redundancy for the Facility. The connection location is subject to approval by the City under a water connection permit. Project Co is responsible for this cost.
- 3.3.9.5 Project Co will provide a second water service capable of providing domestic cold water for the Facility by connecting to Carolina Street. The connection location is subject to approval by the City under the water connection permit. Project Co is responsible for this cost.
- 3.3.9.6 Project Co will construct on-site roadways, including the pavement, curbs and gutters, sidewalks, walkways, signage, pavement markings, and traffic calming devices, that are handicapped accessible and wheel-chair friendly, to provide safe passage between parking areas (including off-site parking areas), loading areas, emergency vehicle areas and drop off areas.
- 3.3.9.7 A new gas main will be installed along Carolina Street from Great Northern Way to the intersection at East 1st Avenue. Project Co will be responsible for applying to the Utility for the connection from the gas main and installation of a gas meter which will be located within the Authority's property. Project Co will be responsible for this cost.

3.4 Architectural Character

- 3.4.1 Architectural character is described in the following categories:
- Image;
 - Form and scale;
 - Building envelope;

- Exterior building materials;
- Building Envelope Details;
- Access and entrances;
- Transparency and fenestration; and
- Structural systems.

3.4.2 Image

3.4.2.1 Project Co will provide a Facility that expresses unique and imaginative imagery reflecting the following:

3.4.2.1(1) The formal role of an institution of higher education;

3.4.2.1(2) Creative innovation;

3.4.2.1(3) The functional diversity contained within; and

3.4.2.1(4) A form that celebrates the core purpose of the institution.

3.4.2.2 The Facility will be constructed to have a distinctive architectural character, reflecting the Authority's values and role as the major centre for Vancouver's art and design community. This will be evident during both the day and the night.

3.4.2.3 The Facility will have a dynamic spatial capability, made possible by large structural spans, which allow for flexible, adaptable and transformative dynamic interior spaces that result in a creative inducing environment.

3.4.3 Building Form and Scale

3.4.3.1 The Facility will provide the elements of building height, site setback, proportion and spatial enclosure that are compatible to the context, buildings and spaces in relation to the human experience.

3.4.3.2 The Facility will be of an appropriate scale that does not render it intimidating or unapproachable to the public or its users.

3.4.3.3 The Facility will use massing and materials to achieve articulation, visual interest and human scale.

3.4.4 Exterior Building Materials

3.4.4.1 The Facility will utilize exterior materials that render the Facility visible and recognizable within its context and abroad.

- 3.4.4.2 The Facility will utilize exterior materials that reveal the process of art and design creation.
 - 3.4.4.3 The Facility will utilize exterior materials that are of high quality, durable and sustainable. Refer to Section 3.4.7 [Transparency and Fenestration] of this Schedule.
 - 3.4.4.4 Project Co will integrate mechanical louvers, where required, in keeping with the design, (shape, materials and colours).
 - 3.4.4.5 The Facility will use materials and finishes that hinder and inhibit graffiti.
- 3.4.5 Building Envelope
- 3.4.5.1 Project Co will construct the exterior walls in accordance with rain-screen principles, including a continuous air space of 25mm minimum clear width.
 - 3.4.5.2 Project Co will ensure continuation of the air barrier, vapour barrier, thermal barrier and rain barrier across the entire envelope including foundations, walls and roofs.
 - 3.4.5.3 Project Co will ensure that materials and systems of the wall and roof assemblies contribute to reducing heat gains and losses with minimal decline in performance over their expected lifespan.
 - 3.4.5.4 Project Co will utilize a professional building envelope consultant throughout the design and construction phases, who will be actively involved in the building envelope detail development and construction implementation.
 - 3.4.5.5 Building Envelope Details
 - 3.4.5.5(1) The Facility will incorporate clean and considered detailing at intersections where materials meet or change.
 - 3.4.5.5(2) Project Co will construct the building envelope details to avoid thermal bridging.
 - 3.4.5.5(3) Project Co will construct the building envelope details to avoid excessive avian habitation.
- 3.4.6 Access and Entrances
- 3.4.6.1 Project Co will construct the Facility to provide necessary multiple public, student and staff access points to the interior. These will be preceded by:
 - 3.4.6.1(1) Covered, weather protected forecourts at least 3 metres wide that extend at least 3 metres out from public entrances;

- 3.4.6.1(2) Bench seating on each side of the forecourts adjacent to each entrance;
 - 3.4.6.1(3) Steps and ramps required for accessibility with approved materials for wheelchairs; and
 - 3.4.6.1(4) Sheltering overhead rain and lateral wind protection systems to cover some part of each of the major surrounding pedestrian pathways. These features will not create a monotonous image or detract from the animation of street frontages.
- 3.4.6.2 The Facility will be constructed so that the entries are clearly articulated and defined to communicate the hierarchy of importance.
 - 3.4.6.3 The Facility will provide entry conditions of appropriate scale in the context of the programmatic areas situated near them.
 - 3.4.6.4 The Facility will provide entrance vestibules with complete transparency from the exterior and from the interior immediately in front of the vestibule.
 - 3.4.6.5 The Facility will provide entrance vestibules configured and sized to preserve the airlock effect for climate control. Ensure adequate distance between sets of doors to allow for accessibility in accordance with the City of Vancouver Building By-Law.
 - 3.4.6.6 The Facility will provide automatic doors at all entrances that are activated by accessible push-button controls located on the inside and outside of both sets of doors. Doors will be configured for push-pull manual operation in addition to automatic operation and card access.
- 3.4.7 Transparency and Fenestration
- 3.4.7.1 The Facility will provide daytime and nighttime views in and out of the building.
 - 3.4.7.2 The Facility will take advantage of street and neighbourhood views and views of natural features, including the sky.
 - 3.4.7.3 The Facility will provide the degree of fenestration required to meet the glare-free studio requirements indicated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
 - 3.4.7.4 Project Co will maximize glazing at appropriate areas on all building levels and all building sides to allow for the admittance of natural light. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] and Section 3.9 Natural Light Quality.
 - 3.4.7.5 The Facility will include a minimum of 30% glazing of the exterior and will provide a maximum level of glazing at grade.

- 3.4.7.6 The Facility will provide sun shading, for east and west-facing windows in the early morning and late evening to reduce glare and solar gain.
- 3.4.7.7 The Facility will provide operable windows, in consultation with the Authority, both for ease of cleaning and for ventilation. Inaccessible windows will be equipped with motorized electronic closers and control points. Refer to Section 4.8 Openings (Division 8).
- 3.4.7.8 The Facility will provide window placement and size to reflect interior wall display requirements, wall-mounted storage units, work counters and work surface heights.
- 3.4.7.9 Project Co will construct the Facility with ultra-violet filtering capabilities for all windows for building spaces that incorporate art making and display activities, including corridors and impromptu display spaces, where required, to reduce potential damage to artefacts, works in progress and other resources.
- 3.4.8 Structural Systems
- 3.4.8.1 Project Co will select a structural system that has minimal impact on the current and future use of the Facility. The column grid will be as regular and as large as practical.
- 3.4.8.2 Project Co will construct the Facility with minimum interior columns in accordance with Section 5.1 Structural Engineering of this document for ease of planning and re-planning of such areas as but not limited to studio, classroom, gallery, and library.
- 3.4.8.3 Project Co will provide structural module or bay spacing based on a standard module that accommodates most studio and group meeting spaces.
- 3.4.8.4 Project Co will construct the Facility with lateral load resisting elements (shear walls and braced frames) placed in locations that are unlikely to limit the flexibility of interior modifications, for example, adjacent to exterior walls, stair shafts, elevator shafts and washroom walls.
- 3.4.8.5 Project Co will construct the Facility to locate permanent elements, such as stairs, elevators and duct shafts, to minimize constraints on changes to the Facility.

3.5 Interior Learning Environment

- 3.5.1 Interior learning environments will meet the requirements described in the preceding Design Objectives Section.
- 3.5.2 Interior environments are described in the following categories:
- Building experience and animation;

- Building scale;
- Spatial character;
- Spatial adaptability;
- Orientation and way finding;
- Signage;
- Natural light quality; and
- Acoustics.

3.5.3 Building Experience and Animation

- 3.5.3.1 The Facility will provide an open and welcoming reception area.
- 3.5.3.2 The Facility will provide places for interaction, collaborative actions and places for secluded individual activities.
- 3.5.3.3 The Facility will provide flexibility and integration of informal learning spaces that support impromptu meetings and brainstorming sessions.
- 3.5.3.4 Informal learning spaces will be primarily located along major circulation routes and dispersed among the program areas throughout the Facility.
- 3.5.3.5 Seating will be located adjacent to the arrival and departure points on each floor, along circulation corridors and at unexpected locations that support spontaneous interaction.
- 3.5.3.6 In support of a student centred environment the Facility will;
- 3.5.3.6(1) Have a perceived centre to accommodate various activities and group sizes visible from many areas and that connects multiple levels such as the concourse described in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)];
 - 3.5.3.6(2) Include a learning commons that is a centrally located place of dynamic activity ranging from individual learning to group sharing as described in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)]; and
 - 3.5.3.6(3) Include technology support (TS) that is centrally located that provides technical support to the multiple disciplines. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

- 3.5.3.7 The Facility will provide opportunities for a new cultural hub experiences that fosters pedestrian circulation with indoor and outdoor views, activity plaza, entry, interactive concourse that is open, inviting and that includes views of other spaces and interactions that may include impromptu performance art viewing, collaborative gatherings, art displays and digital display features throughout.
- 3.5.3.8 The concourse will have both a physical and visual connections to the outdoors.
- 3.5.3.9 The layout of the Facility will provide exposure to the fabrication of art and design and the display of finished pieces adjacent to the main internal building circulation and continue this strategy along the secondary circulation routes.
- 3.5.3.10 Locate display and installation spaces adjacent to circulation corridors.

3.5.4 Spatial Character

- 3.5.4.1 The Facility will provide multiple opportunities for display, creating an overall environment that stimulates curiosity and facilitates serendipitous human interaction. Refer to Section 3.5.10 of this Schedule [Display of Art and Design].
- 3.5.4.2 The Facility will provide various spatial volumes and visual experiences to accommodate the range of environments required for the diverse functions of the Facility.

3.5.5 Spatial Adaptability

- 3.5.5.1 The Facility will provide spaces that are flexible and easily modified at frequent intervals.
- 3.5.5.2 The Facility will provide flexible spaces with base finishes to be used for temporary exhibitions and installations of various art and interaction design works/projects.
- 3.5.5.3 The Facility will provide major spaces such as studios, senior studios and creative rooms to accommodate rotating student exhibitions and interactive learning processes.
- 3.5.5.4 The Facility will provide studio spaces configured so that they are integrated with the corresponding faculty offices.
- 3.5.5.5 Project Co will incorporate the concept of an adaptable campus, meaning a Facility that;
 - 3.5.5.5(1) Allows building components, materials and finishes to be dismantled and rebuilt in a manner not originally anticipated;

- 3.5.5.5(2) Allows students and professors to restructure the space based on coursework;
- 3.5.5.5(3) Is simple and offers flexible spaces that are easily customized and inexpensive to build and re-build;
- 3.5.5.5(4) Utilizes movable, re-locatable walls or other innovative systems (including acoustic properties) to provide for impromptu critiques and the display of works/projects;
- 3.5.5.5(5) Encourages evolution and captures the fundamental nature of art and design as an ongoing process; and
- 3.5.5.5(6) Animates the Facility and invites interaction.

3.5.6 Orientation and Way finding

- 3.5.6.1 Project Co will consult with a way finding professional with a design and communications background to provide a way finding and signage concept in graphic format with materials and samples at the early stage of design development. This concept will refer to and incorporate the Authority's identity and branding.
- 3.5.6.2 Project Co will provide a Facility to include:
 - 3.5.6.2(1) A circulation, exterior and interior way finding and signage system that is simple, easily readable, intuitive and fully coordinated with the Authority;
 - 3.5.6.2(2) A predictable progression from urban approaches and public spaces, through interior common spaces, to program spaces and semi-private and private meeting areas;
 - 3.5.6.2(3) Interior building forms, colour, lighting (natural and artificial), materials and furnishings that support way finding; and
 - 3.5.6.2(4) recognizable and identifiable elements such as internal courtyards or feature stairs in key and easily found locations as visual focal points and unifying elements for students, staff and visitors.
- 3.5.6.3 Project Co will locate major destinations directly off of entry spaces and/or along primary circulation paths for easy access.
- 3.5.6.4 Project Co will design public elevators, stair lobbies and public circulation routes to be distinct from service routes and other non-public routes.
- 3.5.6.5 Project Co will provide all building plan directories to reflect the direction from which they are viewed.

3.5.7 Signage

3.5.7.1 Project Co will provide all signage:

- 3.5.7.1(1) To be fully coordinated with the Authority and the Authority's identity and branding standards manuals, as well as meet the requirements of the City of Vancouver Signage By-laws;
- 3.5.7.1(2) Including digital signage that is easy to update;
- 3.5.7.1(3) To be highly visible (day and night), clear, concise, and well-differentiated from surrounding information, notices, advertising;
- 3.5.7.1(4) To include consistent materials, colours, letter fonts, sizes and other aesthetic and functional considerations, to conform to the overall way finding design system;
- 3.5.7.1(5) With tactile elements for users with visual impairments (such as braille);
- 3.5.7.1(6) With international symbols where and as applicable; and
- 3.5.7.1(7) To be resistant to graffiti and physical damage.

3.5.8 Project Co will provide all site signage including:

- 3.5.8.1(1) Large-scale external signage, fixed in an appropriate location that identifies the Facility, is easily visible during the day and night, minimizes light spillage and is readable from a distance along main approaches;
 - 3.5.8.1(2) An external electronic screen to allow pedestrians, motorists and others to have an at-one-glance view of internal events and activities;
 - 3.5.8.1(3) A flagpole assembly for at least three (permanent) flags and another assembly for three or more (seasonal) banners;
 - 3.5.8.1(4) Signage that is visible for drivers of vehicles to identify, at a far enough distance, so that they can safely slow down and follow the signage to enter the Facility and the campus; and
 - 3.5.8.1(5) Signage and access directions at grade developed in collaboration with the Authority.
- 3.5.8.2 Project Co will provide all exterior signage including:
- 3.5.8.2(1) A monument site sign identifying the Authority;

- 3.5.8.2(2) Branding and identity signage at the entrances; and
 - 3.5.8.2(3) Signage identifying the gallery.
- 3.5.8.3 Project Co will provide all interior signage including:
- 3.5.8.3(1) A main electronic, editable directory and map, installed at or near the main public entrance to the Facility that identifies the Facility in relation to the overall GNW campus and the location of every area and department within the Facility that is accessible to the public. Project Co will provide the Authority with a digital copy of the main directory;
 - 3.5.8.3(2) Electronic registration kiosk at the main entry;
 - 3.5.8.3(3) Electronic signage announcing the Authority's mission and its daily events;
 - 3.5.8.3(4) General building layout directories on each level and installed at each point at which a directional decision is required;
 - 3.5.8.3(5) Editable donor recognition display which may be electronic signage;
 - 3.5.8.3(6) A dedicated plaque and history wall with names of the Authority's board and president including dates and pertinent information;
 - 3.5.8.3(7) Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] for specific signage and display requirements for the library.
- 3.5.8.4 Project Co will present to the Authority, a room numbering concept (including room signage, door and frame signs) for use during the design and construction phases, as well as, during the operation phase at an early stage of schematic design phase in order to use one consistent system throughout all phases of the project that will meet the needs of the Authority, Project Co, consultants, sub-trades and all stakeholders.
- 3.5.8.5 Project Co will provide door signage to identify every space in the Facility including:
- 3.5.8.5(1) Consistent placement for every space;
 - 3.5.8.5(2) Any restrictions on entry and warn of hazards, including hazardous materials;
 - 3.5.8.5(3) Consistent with the following room numbering protocol as follows:

3.5.8.5(3)(a) A unique identifier number for each room;

3.5.8.5(3)(b) A numbering system that reflects normal movement through the Facility;

3.5.8.5(3)(c) Unique numbers for each room and space for service reasons. It is important that room numbers be determined early and maintained following occupancy. Follow the same numbering system on design and construction, (as well as operation); including documentation for all disciplines (architectural, mechanical, electrical, facilities); and

3.5.8.5(3)(d) Location of signage to be coordinated with the Authority.

3.5.9 Display of Art and Design

3.5.9.1 Project Co will:

3.5.9.1(1) Design the Facility to provide locations (including passageways) for major and minor installations of varying scales, and for in situ and spontaneous art works throughout;

3.5.9.1(2) Provide display opportunities along major circulation paths and areas with high visibility;

3.5.9.1(3) Design the building as a canvas for art and design and develop major public pathways and gathering spaces as galleries with hanging and display systems;

3.5.9.1(4) provide display cases for printed graphic material and lockable display cases for art work display, as required by the Authority, in keeping with the overall building and signage design concept;

3.5.9.1(5) Provide lighting to enhance the display of artwork in all areas including studios; and

3.5.9.1(6) Provide the necessary structural support, seismic restraint, vandal-proof mounting and other protective measures required for art works.

3.5.10 Natural Light Quality

- 3.5.10.1 Project Co will construct the Facility to address the need and regulation for access to natural light from work spaces, appropriate studios and common spaces.
- 3.5.10.2 The Facility will:
 - 3.5.10.2(1) Utilize natural light from the north and east primarily for studio spaces;
 - 3.5.10.2(2) Account for changes in light quality over the seasons; and
 - 3.5.10.2(3) Capitalize on the admittance and regulation of natural light in administration areas by locating open areas such as: meeting rooms, kitchens, conference rooms, food services eating area and open work spaces close to natural light sources.
- 3.5.11 Project Co will provide diffused light in designated studios. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 3.5.12 Project Co will provide natural light for the library, learning commons, common gathering areas, studios, labs, classrooms, offices and meeting rooms, food services eating area, etc. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 3.5.13 Project Co will provide designated spaces with the ability to switch between natural light and total darkness for the function of those spaces. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 3.5.14 Project Co will provide designated spaces to be completely dark for the function of those spaces. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 3.5.15 Acoustics
 - 3.5.15.1 Project Co will engage an professional acoustic engineering consultant throughout the design and construction phases. An acoustic report outlining acoustic requirements and methods of achieving to the Authority's requirements is to be provided for review in the design development phase and subsequently monitored for conformance. Acoustic meter reading tests to be performed, and reviewed with the Authority, in the newly built Facility environment to ensure design criteria are met. Refer to Appendix 3D [Sound Transmission Ratings].
 - 3.5.15.2 Project Co will comply with Appendix 3B [Audio Visual Requirements] for specific acoustic requirements and Appendix 3D [Sound Transmission Ratings] indicating general STC ratings required for the Facility.

- 3.5.15.3 Project Co will construct the Facility to take into consideration the future acoustic impact of the proposed LRT system.
- 3.5.15.4 Project Co will design and construct the Facility to address acoustics when organizing the building, grouping programs with intense activity and equipment away from less intense, quieter learning environments and offices.
- 3.5.15.5 Project Co will locate designated quiet rooms away from equipment and other sound transmitting rooms. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 3.5.15.6 The Facility will provide special sound containment and sound isolation requirements for the Authority's designated teaching studios, studio spaces, workshops, offices, meeting rooms and study facilities.
- 3.5.15.7 Project Co will provide sound booths and sound control rooms to meet the requirements set out by the Authority. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] and Appendix 3D [Sound Transmission Ratings].
- 3.5.15.8 The Facility will provide acoustically-friendly (non-reverberant) environments for persons with hearing disabilities in locations to be specified by the Authority. Assisted listening systems, such as those which amplify sound via microphones operating on an FM system or infrared system, will be used in designated areas of the Facility. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 3.5.15.9 Project Co will construct the Facility so that internal noise generating rooms and activities or exterior building systems and equipment, are acoustically shielded from interior and exterior spaces that require low noise levels. Mechanical systems will be appropriately isolated from solid-borne and airborne noises to all interior spaces.
- 3.5.15.10 Project Co will construct the Facility so that large velocity air circulation vents will not be located in proximity to or interfere with quiet environments.

3.6 Operational and Building Systems

- 3.6.1 Operational and Building Systems are described in the following categories:
 - 3.6.1.1 Sustainable features;
 - 3.6.1.2 People movement;
 - 3.6.1.3 Materials handling;
 - 3.6.1.4 Waste management;
 - 3.6.1.5 Storage systems;

3.6.1.6 Mechanical systems;

3.6.1.7 Electrical systems;

3.6.1.7(1) Artificial light quality;

3.6.1.7(2) Information & communication technology;

3.6.1.7(3) Security systems;

3.6.1.7(4) Door hardware;

3.6.1.7(5) Health and safety;

3.6.1.7(6) Furnishings and millwork; and

3.6.1.7(7) Materials and finishes.

3.6.2 Sustainable Features

3.6.2.1 In addition to the requirement to achieve LEED Gold Certification in accordance with the provisions of Schedule 2 [Design and Construction Protocols], Project Co will:

3.6.2.1(1) design and construct the Facility using design methods, building materials, operational practices, energy and life cycle considerations that promote environmental quality, social benefits and economic vitality throughout the construction and operating periods, including minimizing the Authority's operating costs;

3.6.2.1(2) Give priority to efficient use of resources, protection of health and indoor environmental quality;

3.6.2.1(3) Apply a total systems approach to minimize energy consumption and incorporate energy consumption management techniques that are targeted to stabilize and optimize energy flows;

3.6.2.1(4) Design the Facility to utilize the City of Vancouver's District Energy System (the Neighbourhood Energy Utility or NEU) heating source as the primary source of heat for the Facility;

3.6.2.1(5) Project Co to provide and manage connections to NEU as well as any necessary provisions for infrastructure (including mechanical space) at or within the project boundary.

3.6.2.2 The following LEED credits will be achieved:

3.6.2.2(1) SS Credit 6.2 Stormwater Design: Quality Control;

- 3.6.2.2(2) EA Credit 1 Optimize Energy Performance;
- 3.6.2.2(3) EA Credit 3 Enhanced Commissioning;
- 3.6.2.2(4) EA Credit 5 Measurement and Verification
- 3.6.2.2(5) IEQ Credit 4.1 Low Emitting Materials: Adhesives and Sealants;
- 3.6.2.2(6) IEQ Credit 4.2 Low Emitting Materials: Paints and Coatings;
- 3.6.2.2(7) IEQ Credit 4.3 Low Emitting Materials: Flooring Systems;
- 3.6.2.2(8) IEQ Credit 4.4 Low Emitting Materials: Composite Wood and Agrifibre Products;
- 3.6.2.2(9) IEQ Credit 7 Thermal Comfort: Design; and
- 3.6.2.2(10) IEQ Credit 7 Thermal Comfort: Verification.

3.6.3 People Movement

- 3.6.3.1 The Facility will be organized with external and internal traffic patterns to ensure that the movement of people does not interfere with environments and functional sequences required for teaching, meeting, studying and creative and technical activities.
- 3.6.3.2 The Facility will be organized so that administrative functions are central to and not isolated from the student body and therefore, functions as a student resource.
- 3.6.3.3 A secondary exit for the president's office and student services will be provided.
- 3.6.3.4 Exit Stairs will:
 - 3.6.3.4(1) Be located strategically for the convenience and safety of staff and students;
 - 3.6.3.4(2) Incorporate visual access to exterior and interior views, wherever possible and practical;
 - 3.6.3.4(3) Be conveniently accessible from circulation routes;
 - 3.6.3.4(4) Be located so as to enhance planning flexibility and accentuate desirable views; and
 - 3.6.3.4(5) Be provided with adequate lighting for staff and students' security at night.
- 3.6.3.5 Convenience Stairs

3.6.3.5(1) Provide convenience stairs, where door and security hardware and code requirements are met, to reduce elevator use by students, staff and visitors scaled to facilitate the comfortable movement of groups of people.

3.6.3.6 Corridors

3.6.3.6(1) Corridor widths will be as follows:

3.6.3.6(1)(a) A minimum of 3000mm in the main public circulation corridor of the Facility not including area for informal learning spaces;

3.6.3.6(1)(b) A minimum of 3500mm wide where storage lockers or sinks are provided;

3.6.3.6(1)(c) A minimum of 1800mm between studio areas and workshops where no storage lockers or personal lockers are located; and

3.6.3.6(1)(d) A minimum of 1200mm wide in all other areas.

3.6.3.7 The Facility will provide corridors that integrate views and daylighting wherever possible and practical.

3.6.3.8 The Facility will provide corridors that accommodate spontaneous learning, collaboration, socializing and display.

3.6.3.9 The Facility will provide a minimum clear aisle of 900mm, where informal learning spaces are located adjacent to corridors, between the designated space and the wall to allow for the installation of art and design.

3.6.4 Materials Handling

3.6.4.1 The Facility will provide a two bay loading dock designed to accommodate maintenance, delivery and waste disposal vehicles as required by the Authority. Provisions will be made to accommodate truck sizes that range from a 5 ton truck to 12 metre trailers. All vehicular movement areas will have a clear height of 4.1 metres. The loading dock requirements will be determined with the City of Vancouver.

3.6.4.2 The Facility will provide loading bay parking for three vehicles to support building maintenance, materials movement and shipping and delivery activities as required by the Authority. Loading bay parking will be determined with the City of Vancouver.

3.6.4.3 The Facility will provide a dedicated service elevator with class C3 loading capacity, terminating adjacent to the loading dock that connects all levels of

the Facility. The service elevator will be paired to an adjacent passenger elevator so that wait times will be reduced when the service elevator is not locked off for freight use.

- 3.6.4.4 Waste Management
- 3.6.4.5 The Facility will provide separate systems for recyclable and non-recyclable trash.
- 3.6.4.6 The Facility will provide a marshalling area for recyclable and non-recyclable materials located adjacent to the loading dock.
- 3.6.4.7 The Facility will provide for trash from food services, collected daily, to be transported directly to the marshalling area by the loading dock.
- 3.6.4.8 The Facility will provide secure, contained enclosures for trash and recycling, accessible by collection vehicles and located adjacent to public entrances.
- 3.6.4.9 The Facility will provide exterior storage for chemical waste and chemical storage.
- 3.6.5 Storage Systems
 - 3.6.5.1 The Facility will provide a central stores facility located adjacent to the loading dock that will include equipment storage, dedicated storage of hazardous materials, waste and supplies, housekeeping and general supplies. Heat to be provided where required.
 - 3.6.5.2 The Facility will provide designated studio spaces with integral specialized storage for unique equipment, materials, supplies and art and design work in various stages of production. Refer to Section 4.10 Specialties of this Schedule and Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
 - 3.6.5.3 The Facility will incorporate specialized storage areas for the food service component as indicated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
 - 3.6.5.4 The Facility will provide lockable storage for all assigned workstations, both inside offices and in open areas complete with mockup to be provided for review by Authority. Students and staff will be provided with lockers requiring locks provided by the users. Refer to Section 4.10 Specialties of this Schedule.
 - 3.6.5.5 The Facility will provide additional furniture and equipment storage located close to common areas and meeting rooms. Janitorial storage will be located at a central location on each level of the Facility. Specific locations to be determined in consultation with the Authority.

3.6.5.6 The Facility will provide hazardous and chemical storage as required within areas such as Studios as noted in this Schedule and Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

3.6.6 Mechanical

3.6.6.1 Project Co will provide mechanical systems (including HVAC, fire protection, plumbing and related systems) that:

3.6.6.1(1) Are designed to provide a comfortable and productive environment for users.

3.6.6.1(2) Are designed not to have an adverse effect on the Great Northern Way Campus;

3.6.6.1(3) Are designed to comply with ASHRAE standards with regard to air re-circulation; and

3.6.6.1(4) Are located and designed to minimize sound transmission to outdoor spaces that are intended for programmed or informal use.

3.6.6.2 The mechanical, plumbing, fire protection, speciality and gas systems will minimize impact on the natural and physical environment, through energy efficiency, optimization of resource use and simplification of the systems.

3.6.6.3 The building systems will be designed to achieve LEED Gold Certification under the LEED Canada New Construction 2009 rating system and attain a minimum of 10 Energy Credits (30% energy cost savings compared to ASHRAE 90.1 – 2007 Energy Standard).

3.6.6.4 The mechanical, plumbing, fire protection, speciality and gas systems component selection, system design, and installation will incorporate flexibility and adaptability for reconfiguration of space use without major disruption or alteration to the facilities infrastructure.

3.6.6.5 Mechanical units and ducting will not obstruct the admittance of light to the interior of the Facility. The avoidance of lengthy east west ducting is a priority.

3.6.6.6 Maintain flexible ceiling areas free from such systems as mechanical return air plenums, in areas designed for a high degree of flexibility and likely to be repeatedly modified such as presentation rooms, gallery and display areas. See Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] for additional spaces.

3.6.6.7 Maintain architectural feature ceiling volumes, free from mechanical and related services, including sprinkler piping, mechanical ducting, and

bulkheads, that may be perceived by the Authority to hinder the aesthetic visual impact of such features.

3.6.7 Electrical

3.6.7.1 Power

3.6.7.1(1) Power supplies will be designed to ensure that sufficient power is provided on building commissioning to support all equipment and technology devices and network drops in operation as well as spare capacity for future loads.

3.6.7.1(2) Design will minimize the potential for interference with and load variations on the electrical circuits used by technology devices.

3.6.7.1(3) Reconfigurable study workstations equipped with independent power and lighting will be intermittently located in the library, learning commons and concourse spaces found throughout the Facility. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

3.6.7.2 Static Electricity

3.6.7.2(1) Minimize the generation of static electricity. Protection will be achieved through precautions including but not limited to:

3.6.7.2(1)(a) Maintaining required humidity levels;

3.6.7.2(1)(b) Use of anti-static mats under chairs and technology devices such as computers; and

3.6.7.2(1)(c) Use of wood furnishings (e.g. chairs, desks, tables, shelving) where applicable.

3.6.8 Artificial Light Quality

3.6.8.1 Lighting systems will approximate natural lighting conditions, avoiding uniform and harsh levels of general illumination in favour of a combination of lower light levels and focused lighting areas.

3.6.8.2 Indirect and reflected lighting will be considered for public areas; the lighting focus will be on workstations, wall surfaces, seating areas, and circulation paths. Refer to Appendix 3A [Functional Program (including Pre- Design Room Data Sheets)].

3.6.8.3 The number of different types of lighting fixtures will be kept to a minimum; maintenance will be a consideration in fixture selection and location.

- 3.6.8.4 Consistent, low-intensity ambient lighting will be provided in any areas where students, staff or public computer or video screens are anticipated.
 - 3.6.8.5 Properly positioned task lighting at each workstation will be provided; such task lighting will position the light in front of the user, with baffles, reflectors and a diffuser to eliminate glare and veiling. Task lighting will be provided by the Authority,
 - 3.6.8.6 Lighting fixture types and configurations in public areas will achieve required light levels regardless of the arrangement of student seating and workstations.
 - 3.6.8.7 Evening and weekend lighting will be provided for student and staff course work.
 - 3.6.8.8 Night lighting and emergency lighting systems will be separate from general lighting systems and switched separately. Night lighting will provide for illumination at times the Facility is closed to the public. This system will also provide for safe egress.
 - 3.6.8.9 Studio lighting will be designed in consultation with the Authority.
 - 3.6.8.10 Emergency lighting as required by the City of Vancouver Building By-law latest version.
 - 3.6.8.11 Refer to Appendix 3J [Lighting Standard].
- 3.6.9 Information and Communication Technology
- 3.6.9.1 Electronic technology will be found throughout the facilities by way of high speed (copper and fibre optic) wired and wireless systems affording access from all student, public and staff work areas. Project Co to ensure receptivity levels meets Authority's needs.
 - 3.6.9.2 Basic subdivisions of the IT function include topography, communications and electronics.
 - 3.6.9.3 Topography describes the physical spaces required by the IT system, including server and communications rooms, program studios and computer labs, and office workstations.
 - 3.6.9.4 Project Co will provide:
 - 3.6.9.4(1) 10/100/1000 BASE-T and wireless LAN connectivity throughout the Facility;
 - 3.6.9.4(2) 10G BASE-T Ethernet connectivity in specific areas of the Facility (as indicated in section 5.11 herein);

- 3.6.9.4(3) ;
 - 3.6.9.4(4) additional Ethernet outlets in studios/ academic areas; and
 - 3.6.9.4(5) advanced media displays connected to the Ethernet.
 - 3.6.9.4(6) The Digital Output Centre includes four focus areas: Fine Art and Large Output, Document Production (laser printing), Digitization of Analogue Services, and File Preparation Assistance and Project Assembly.
 - 3.6.9.4(7) Designated furnishings and millwork systems must support computer usage and cabling/power access as defined by the Authority.
 - 3.6.9.4(8) Meeting rooms will include console-operated audiovisual equipment, network drops and computer and smart boards and data projectors of quality equivalent to post-secondary facilities.
 - 3.6.9.4(9) A combination of stand-up and sit-down workstations will be found throughout. Portable user access devices and fixed access devices will be found in all locations.
 - 3.6.9.4(10) The Facility will make use of multipurpose all-in-one computers and portable devices. Flat screens will be used throughout. Terminals may not have individual towers; one tower may be required for approximately 10 terminals.
 - 3.6.9.4(11) All staff will require access to a computer workstation and networked printer. These stations may or may not be shared, depending on functional requirements and utilization patterns as defined by the Authority.
 - 3.6.9.4(12) User service, training, and systems troubleshooting, along with workspace for Web Services and Systems staff, will be provided from a central IT suite; and
 - 3.6.9.4(13) Technology services will include set-up and support for presentation systems and technologies available in all learning studios and meeting rooms as well as technical support for the electronic signage system found throughout the Facility.
- 3.6.9.5 Communication describes network connections wiring closets, and hardware and virtualized servers. Server and communication rooms will be tied together by a fibre optic backbone.

- 3.6.9.6 In order to route network cabling through the Facility, and to house networking devices (hubs, switches, servers, wireless transceivers, etc.), the Facility will require a secure, climate-controlled communications room for technology management. This space must meet the Authority's needs for dimension, distance, electromagnetic interference and security. All voice, data and video cabling will run from this location in communications pathways to individual workstations.
- 3.6.9.7 Telecommunications demarcation with network switch will typically be located in the main communications room or entrance facility as required by the Authority.
- 3.6.9.8 Security controllers can be located in a secure room beside the phone and data network equipment.
- 3.6.9.9 Flexible cabling infrastructure will include a universal large tray cable support system, easy rerouting by cross connecting at punch down blocks or distribution panels, extra installer capacity on the floors and co-location of power, voice and data.
- 3.6.9.10 The cable delivery system will be flexible for access, repair and connectivity.
- 3.6.9.11 Communications wiring will be designed to be easily accessible to provide optimum flexibility for furniture and device locations. Furniture will have access for power and communications wiring, permitting flexibility and ease of servicing; network and cabling access will be based on the quantity of outlets noted in Appendix 3H Room Components.
- 3.6.9.12 Wireless communication will be available throughout the Facility, including stairwells, service rooms and programmed outdoor spaces as per Appendix 3A to Schedule 3.
- 3.6.9.13 The operation of studio equipment must not adversely affect wireless transmissions.
- 3.6.9.14 Materials used in walls and partitions must not adversely affect RF transmission in the 2.4 GHz to 12 GHz frequency ranges, in order to support wireless communications operating within this spectrum.
- 3.6.9.15 Communication devices may use infrared or spread-spectrum technology to link small, portable computer devices to the Facility's other automated systems.
- 3.6.9.16 Access to external telecommunications links (e.g., voice, data) must be provided for external database and information service access.
- 3.6.9.17 Electronics describes in use servers, network switches, and end user devices Power and data cabling will be required at each staff workstation and service

desk, with the capability of bringing network access to each user and staff workspace.

- 3.6.9.18 Instructional spaces will be equipped with wired and wireless IT access and manual and electronic presentation technologies.
- 3.6.9.19 Project Co will provide a Facility that accommodates the rapid cycle of innovation and change to support development and implementation of new processes and technology change by providing cable trays, other raceways and spaces that allow for larger future cables.

3.6.10 Security Systems

- 3.6.10.1 The Facility will provide a reception desk and security office adjacent to the main entrance for supervision of arrival areas and the common space. The reception desk and other designated spaces will be provided with emergency panic buttons linked to security systems. Refer to Panic Duress System in Section 5.12 Electronic Safety and Security of this document.
- 3.6.10.2 The Facility will provide the ability to monitor all Facility alarm and environmental systems from the reception desk and security office as well as from the central monitoring station in building support.
- 3.6.10.3 The Facility will provide security cameras throughout that are linked to reception monitors and adjacent security office. Refer to CCTV in Section 5.12 Electronic Safety and Security of this document.
- 3.6.10.4 . The Facility will provide a secure perimeter encompassing the Library/Learning Commons/CTL/Writing Centre areas. Electronic security gates will be provided at the main entry/exit in the Learning Commons component, allowing for secured use of equipment and circulation to all other designated components within the perimeter. The Facility will also provide electronic security gates at the point of access to the Library from the Learning Commons area. All other entry/exit points to the Library/Learning Commons/CTL/Writing Centre areas will be secured against unauthorized access. The Facility will provide gate count equipment at electronic security gates in order to accurately track traffic.
- 3.6.10.5 . The Facility will provide a Service Desk which is accessible both from the Library and the Learning Commons areas, and a means to secure the Library/CTL/Writing Centre areas when the Learning Commons is open and those areas are closed.
- 3.6.10.6 The Facility will provide security cards for faculty, students and staff to control entry to non-public areas and, where appropriate, override security zoning. Access to designated program areas may be restricted and may involve staff monitored security clearance. Separate alarm zones, complete with motion sensors/alarm keypads/card readers, to be provided. Applicable high value

rooms, include but are not limited to, computer labs and other high value portable equipment areas. Project Co to coordinate specific locations with the Authority. Refer to Access Control in Section 5.12 (Electronic Safety and Security) of this document.

- 3.6.10.7 Provide a system for library card usage that is compatible with digital currency (such as, Smart Card Technology (Combination Mifare/ProxII provision for Digital Currency and Compatibility with Translink's new Compass Transit).
- 3.6.10.8 The Facility will provide motion detection and/or secure building zone system that will detect/control unauthorized entry and movement within the Facility or zone during closed hours. Refer to the Intrusion Detection in Section 5.12 (Electronic Safety and Security) of this document.
- 3.6.10.9 Project Co will incorporate City of Vancouver Building By-Law and the Authority's requirements for doors and hardware with security requirements and access control systems.

3.6.11 Door Hardware

- 3.6.11.1 Project Co will work with an experienced, professional architectural hardware consultant early in the design phase to fine tune the Authority's requirements and to prepare a door hardware schedule and continue to work with the Authority through to project Service Commencement. Refer to Section 4.8.2.9 Door and Finish Hardware. Ensure compatibility between door hardware and electronic security provisions.

3.6.12 Health and Safety

- 3.6.12.1 The Facility will be constructed in accordance with the principles of Crime Prevention through Environmental Design (CPTED).
- 3.6.12.2 Project Co will provide:
 - 3.6.12.2(1) Detailed exterior and interior design features, including landscaping, which facilitate the physical activities of students and staff to increase their safety, efficiency and general wellbeing;
 - 3.6.12.2(2) hazardous materials and conditions designed using all applicable health and safety standards, including adjacent safety features and first aid equipment such as eye wash and safety showers;
 - 3.6.12.2(3) ergonomic design features throughout all spaces in the Facility that mitigate potential short and long term effects on the health of students and staff by implementing appropriate millwork, furniture, locker sizes, corridor widths, lighting or equipment manoeuvring spaces; and

3.6.12.2(4) Designated study workstations designed for use while standing or seated.

3.6.13 Furnishings and Millwork

- 3.6.13.1 The Facility will incorporate furnishings and furnishing systems, pre-approved by the Authority, that are easily moveable and reconfigurable within each room, as well as durable and easily maintained.
- 3.6.13.2 The Facility will incorporate flexible, informal, reconfigurable lounge seating (in conjunction with being able to be fixed and secure where required) with adjacent low tables intermittently located in social spaces in the common areas.
- 3.6.13.3 The Facility will provide access to power and communications systems infrastructure (cabling, power points, network ports etc.) to support possible rearrangement as well as access for maintenance and troubleshooting.
- 3.6.13.4 Project Co will ensure that computers, monitors and printers are secured to furniture and that monitors are not embedded in furniture to allow for flexibility.
- 3.6.13.5 The Facility will provide millwork that has complimentary and cohesive finishes, details and surfaces for storage and supply cabinets, work counters, doors, etc. Specify standard sizes and minimize the cutting of plywood, lumber, and other materials to reduce waste, disposal and construction labour costs.
- 3.6.13.6 The Facility will meet LEED requirements and principles for millwork in accordance with IEQ Credit 4.4 Low Emitting Materials: Composite wood and Agrifiber products.
- 3.6.13.7 The Facility will meet AWMAC guidelines for millwork,

3.6.14 Materials and Finishes

- 3.6.14.1 Project Co will provide a Facility with materials and finishes, pre-approved by the Authority, that require minimal maintenance including these basic approaches:
 - 3.6.14.1(1) Floors, columns, and ceilings will be materials with minimal, low maintenance finishes;
 - 3.6.14.1(2) Studio spaces, concourse and major corridors require easily repaired, durable wall finishes;
 - 3.6.14.1(3) Studio spaces involving substantial use of large equipment and potentially dirty processes will require special work surfaces;
 - 3.6.14.1(4) Meet LEED guidelines and principles for materials and finishes;

3.6.14.1(5) Review materials and finishes with the Authority through the Design and Construction phase process;

3.6.14.1(6) Provide materials and finishes that hinder and inhibit graffiti.

3.7 Emergency Preparedness

3.7.1 The Facility will provide an exterior supply storage bin area (existing 9.95 cubic meter secure bin or sized to serve supplies for 1000 people), and exterior assembly area, both complete with concrete pad and appropriate emergency lighting, as required by the Authority and the principles set out by the Emergency Management division of the Provincial Ministry of Justice, British Columbia, Emergency Response Management Systems. Proposed location (exterior, high ground, interior with exterior access) to be reviewed and approved by the Authority.

3.7.2 Emergency Evacuation Centre

3.7.2.1 The facility will provide an internal Authority designated emergency operations center within the building to be used by the executive and key personnel in the event of a large scale emergency. This space may be located within the Facilities area and may have a primary functional program purpose as a meeting room or similar. Space to accommodate approximately 20 people, procedural document storage, wireless, data and telephone (including analog) services.

End of section

PART 4. FACILITIES CONSTRUCTION SUBGROUP SPECIFICATIONS

4.1 Procurement and Contracting Requirements (Division 1)

4.1.1 Project Co will select all materials and finishes to comply with LEED standards.

4.2 Existing Conditions (Division 2)

4.2.1 Refer to Part 3 of this Schedule, Schedule 2 [Design and Construction Protocols] for information regarding the Site.

4.3 Concrete (Division 3)

4.3.1 Overriding Principles

4.3.1.1 Design and construct cast in place or precast concrete of appropriate properties for the intended use in accordance with the requirements of all applicable codes and specifications for the applicable concrete exposure class.

4.3.2 Basic Requirements

4.3.2.1 Design and construction will comply with all applicable standards and practices whether listed in Section 2.1.

4.3.2.2 Concrete left exposed, with no finish materials, will be sealed.

4.3.2.2(1) Project Co to provide concrete sample mock-ups to include but not limited to floors and exterior, interior, landscape and signage walls for review by Authority.

4.3.3 Quality Requirements

4.3.3.1 Cause cast in place concrete and concrete materials to be inspected and tested by a CSA certified testing laboratory.

4.3.3.2 Cause precast concrete materials and workmanship to be inspected and tested by the precast concrete contractor as part of its quality control program in accordance with all applicable standards.

4.3.4 Performance Criteria

4.3.4.1 Finish concrete floors and floor toppings with a smooth, dense, steel trowel finish with a Class A Flatness Classification in accordance with CSA A23.1. Overlay toppings to level floors will not be used.

4.3.4.2 Elevator core walls below grade to be water-proofed to prevent groundwater ingress. Construction joints to have purpose-made water stops. A perimeter draining system to be installed as necessary.

- 4.3.4.3 All exposed concrete (except in stair shafts) to be architectural concrete that complies with CAN/CSA A23.1-09 Section 8.3.
- 4.3.4.4 Repair cracks in concrete floors and walls to suit the floor finish and long-term serviceability requirements of the floor. Review repairs strategy with Authority prior to undertaking.
- 4.3.4.5 Water proof foundation walls to prevent groundwater ingress. Construction joints will have purpose-made water stops. A perimeter draining system will be installed around the exterior of the foundation.

4.4 Masonry (Division 4)

4.4.1 Basic Requirements

- 4.4.1.1 Masonry construction may be used as a component in exterior and interior walls and wall systems when priorities include permanence and maintenance, sound transmission control, fire resistance and separation requirements and security.
- 4.4.1.2 Design and construction will comply with all applicable standards and practices whether listed in Section 2.1.

4.4.2 Concrete Masonry Units

- 4.4.2.1 Concrete unit masonry may be considered for exterior wall systems as a structural backing to other finish materials or systems.
- 4.4.2.2 Concrete unit masonry for interior applications may be considered as a base for applied finish and as a structural backing to other finish systems except where it will interfere with the ease of display and associated maintenance.
- 4.4.2.3 Painted or unpainted concrete unit masonry will not be used as an exposed finish in public areas.
- 4.4.2.4 Where concrete unit masonry is used (not in public areas) as the exposed finish all exposed corners will be radiuses.
- 4.4.2.5 Masonry design and construction will comply with Canadian Masonry Contractors Association (CMCA) Masonry Practices Manual and all applicable standards.

4.4.3 Brick Masonry

- 4.4.3.1 Exterior wall systems comprising brick masonry as a finish veneer to concrete, concrete masonry or metal framing will be a rain screen or cavity wall system.

4.4.4 Brick masonry below grade for exterior applications is not permitted.

4.4.5 Stone Masonry

- 4.4.5.1 Stone masonry may be considered as a finish veneer to concrete walls or concrete masonry walls. Exterior wall systems in such applications will be a rain screen or cavity wall system.
- 4.4.5.2 Stone will be sound, hard and durable, well-seasoned and of uniform strength, colour and texture, and free of quarry sap, flaws, seams, sand holes, iron pyrites or other mineral or organic defects.

4.5 Metals (Division 5)

4.5.1 Basic Requirements

- 4.5.1.1 Structural steel, steel deck, and cold-formed steel stud design and construction may be considered for building elements and systems, where appropriate.
- 4.5.1.2 Design and construction will comply with all applicable standards and practices whether listed in Section 2.1.
- 4.5.1.3 Stainless steel surfacing will be provided as required to create surfaces that require antiseptic or clean characteristics, special or regular maintenance, and resistance to caustic action of chemicals or agents.
- 4.5.1.4 Stainless steel finish to be selected in keeping with approved interior design concept and the Authority.

4.5.2 Performance Criteria

- 4.5.2.1 Design structural steel, steel deck, and cold-formed steel stud systems to comply with the deflection and vibration criteria outlined in Section 5.1 Structural Engineering.
- 4.5.2.2 Erection tolerances for steel construction will be in accordance with all applicable CAN/CSA standards.
- 4.5.2.3 For steel floor and roof construction, the deflection of steel beams, joists, and girders due to the wet weight of concrete topping slabs is to be considered. Topping slab thickness may have to vary to maintain floor levelness tolerances. The additional concrete ponding weight is to be accounted for in the design of the structure.
- 4.5.2.4 Pay special attention to crack control of concrete topping slabs on steel deck to avoid random surface shrinkage cracking and radial cracking around re-entrant corners and special attention to curing is required for concrete topping slabs on metal deck.

- 4.5.2.5 Steel floor/roof decking is to be wide rib profile for ease of attachment of current and future services, equipment, and fixtures using drilled insert expansion anchors into the bottom of the deck ribs.
- 4.5.2.6 Steel floor/roof decking plus the concrete topping slab thickness is to satisfy the requirements of a ULC-rated assembly meeting the City of Vancouver Building By-Law fire rating requirements.
- 4.5.2.7 Fire proof structural steel floor/roof framing and supporting members to meet the fire rating requirement.
- 4.5.3 Structural Steel and Steel Joists
 - 4.5.3.1 Quality Requirements
 - 4.5.3.1(1) Cause quality assurance testing and monitoring of workmanship to be carried out by an approved testing laboratory using testing procedures in accordance with CAN/CSA standards to verify soundness of representative shop and field welds.
 - 4.5.3.1(2) Material quality including sourcing and welding quality will be monitored by an independent testing agency.
 - 4.5.3.1(3) The specification for preparation and painting of Structural Steel components will conform to the Master Painters Institute (MPI) Standards.
- 4.5.4 Load Bearing Steel Studs
 - 4.5.4.1 Overriding Principles
 - 4.5.4.1(1) Load bearing steel studs may be considered as a component of the exterior wall systems to support exterior wall finishes and form an integral part of the perimeter envelope.
 - 4.5.4.1(2) Load bearing steel studs may be part of the structural framing or may be independent of the principle structural system.
 - 4.5.4.2 Quality Requirements
 - 4.5.4.2(1) Design, detail and construct load bearing steel studs design and construction to comply with all applicable CAN/CSA standards.
 - 4.5.4.2(2) The steel stud manufacturer will be certified in accordance with CSSBI Standard 30M-06 and all applicable CAN/CSA standards.

4.5.4.2(3) The steel stud fabricator and erector will have a minimum of 5 years of experience in the type of work undertaken.

4.5.4.2(4) Conform to the Association of Wall and Ceiling Contractor's Specification Standards Manual (AWCC).

4.5.4.3 Performance Requirements

4.5.4.3(1) Design components to accommodate erection tolerances of the structure.

4.5.4.3(2) Design wind bearing stud end connections to accommodate floor/roof deflections and to ensure that studs are not loaded axially.

4.5.4.3(3) Design steel studs to take into account the anchorage of other materials being supported including but not limited to: sub-girts supporting metal cladding and composite panels, soffit finishes and the provision of lateral support at window heads.

4.6 Wood, Plastics and Composites (including Millwork) (Division 6)

4.6.1 Basic Requirements

4.6.1.1 Do not use urea formaldehyde containing materials in the Facility.

4.6.1.2 Provide rough carpentry, wood backing materials, backing boards for mechanical rooms and electrical/communication rooms, roof sheathing, copings, cant strips, finish carpentry and architectural woodwork, including but not limited to exterior fascia's, cabinets, casework, frames, panelling, ceiling battens, trim, installation of doors and hardware, and other wood-related products and applications as required:

4.6.1.2(1) To support functionality as defined in Appendix 3A [Functional Program (including Pre- Design Room Data Sheets)] or as required for operation of the Facility;

4.6.1.2(2) Provide wood backing materials as referenced in other sections of this schedule in relation to creative activities; and

4.6.1.2(3) As required for wood products exposed to view in finished interior and exterior installations.

4.6.1.3 Wood framing design will be certified by a professional engineer registered in the province of British Columbia.

4.6.1.4 Plastic laminate surfacing and/or solid polymer fabricated surfacing may be provided (with approval of the Authority) as required to create surfaces that

require antiseptic or clean characteristics, special or regular maintenance, and resistance to caustic action of chemicals or agents.

- 4.6.1.5 Stainless steel products will be provided as required for wall cladding, wall protection, corner protection, casework finishing, trims, ornamental elements, and other applications to achieve a quality of interior finish suitable for use by users.
- 4.6.1.6 Glued-laminated structural units to meet the requirements of CAN/CSA-0122 and CAN/CSA-0177. All timber connector hardware exposed to the exterior will be hot dipped galvanized. All other nuts, washers and bolts will be galvanized.
- 4.6.1.7 Cross Laminated Timber Panels to meet the requirements of ANSI/APA PRG 320-2011.
- 4.6.1.8 Use pressure treated wood for exterior exposed wood.
- 4.6.1.9 Incorporate the use of wood to reinforce the objectives of the *Wood First Act* (British Columbia).

4.6.2 Performance Criteria

4.6.2.1 Finish Carpentry, Millwork and Architectural Woodwork

- 4.6.2.1(1) Conform to Architectural Woodwork Manufacturer's Association of Canada (AWMAC) Quality Standards Manual for minimum "Custom Grade," and Door and Hardware Institute (DHI) standards for the design, fabrication, materials, installation and workmanship of finish carpentry and architectural woodwork.
- 4.6.2.1(2) Project Co will provide AWMAC review reports for finished carpentry, millwork and architectural millwork.
- 4.6.2.1(3) VOC emission levels will be in accordance with CaGBC (Canada Green Building Council) LEED requirements to minimize adverse impact on indoor environmental and air quality;
- 4.6.2.1(4) Adhesives will be non-toxic, non-solvent glue to comply with AWMAC Architectural Woodwork Standards, Canadian 'Eco-Logo' program, and CaGBC (Canada Green Building Council).
- 4.6.2.1(5) Use marine-grade plywood substrate for countertops and wood bases at cabinets. Do not use fibreboard or particleboard.

4.7 Thermal and Moisture Protection (Division 7)

4.7.1 Basic Requirements

- 4.7.1.1 Design construction assemblies according to building envelope principles outlined in Section 3.4.5 Building Envelope.
- 4.7.1.2 Design construction assemblies to prevent the ingress of moisture or water vapour from the exterior through the building envelope and the passage of air through the building envelope from the interior spaces to the exterior and vice versa.
- 4.7.1.3 Design construction assemblies to prevent the ingress of moisture through foundation walls below grade, both subject and not subject to hydrostatic pressure.
- 4.7.1.4 Provide protection (such as insulation) to resist the transfer of heat through exterior walls and roofs to create comfortable, liveable interior environments.
- 4.7.1.5 Provide resistance to the propagation and spread of fire for exterior walls and interior walls designated as fire-resistance rated separations where appropriate.
- 4.7.2 Performance Criteria
 - 4.7.2.1 Damp proofing
 - 4.7.2.1(1) Provide foundation wall surfaces with damp proofing coverage that is sufficient to repel and prevent moisture ingress.
 - 4.7.2.2 Waterproofing
 - 4.7.2.2(1) Provide waterproofing to prevent moisture ingress to occupied spaces below grade.
 - 4.7.2.2(2) Provide waterproofing to prevent water ingress over suspended slabs and decks and associated walls around habitable spaces where water collection is anticipated.
 - 4.7.2.2(3) Provide waterproof membranes in exterior walls as part of the building envelope and integral with rain screen or cavity wall assemblies.
 - 4.7.2.3 Vapour Barriers
 - 4.7.2.3(1) Prevent water vapour transmission and condensation in wall assemblies, roofing assemblies, and under concrete slabs-on-grade within the building perimeter by means of a continuous vapour barrier membrane.
 - 4.7.2.4 Air Barriers

4.7.2.4(1) Prevent air leakage caused by air pressure across the wall and roof assembly by means of air barrier assemblies.

4.7.2.4(2) Provide air barrier assemblies that:

4.7.2.4(2)(a) limit air exfiltration and infiltration through materials of the assembly, joints in the assembly, joints in components of the wall assembly, and junctions with other building elements including the roof; and

4.7.2.4(2)(b) prevent air leakage caused by air pressure across the wall and roof assembly, including interruptions to the integrity of wall and roof systems such as junctions with dissimilar constructions.

4.7.2.5 Thermal Protection

4.7.2.5(1) Provide thermal insulation as part of the building envelope to prevent the transfer of heat both from the interior to the exterior and vice versa, depending on seasonal conditions, and to resist the absorption of water.

4.7.2.5(2) Use thermal protection materials of a type and quality that will provide consistent environmental quality to enclosed spaces.

4.7.2.5(3) Foamed plastic insulation, if/where used, is required to be CFC and HCFC free.

4.7.2.5(4) Minimum insulation values will be R20 (U-Value 0.05) for exterior walls and R30 (U-Value 0.033) for roof areas.

4.7.2.6 Roofing

4.7.2.6(1) Comply with the Roofing Contractors Association of British Columbia Guarantee Corp (RGC) latest standards and requirements for a five (5) year Guarantee, as published in the RGC Roofing Practices Manual.

4.7.2.6(2) Perform roofing quality inspections as required by the RCABC to obtain the RCABC warranty.

4.7.2.6(3) Comply with RGC Roofing Practices Manual "Acceptable Materials List".

4.7.2.6(4) Roof assembly design including deck, vapour barrier, insulation, board stock, and membranes will comply with City of Vancouver Building By-Law for fire classifications and with

RGC requirements with wind uplift requirements, as well as structural requirements for live loads, dead loads, snow loads, and wind uplift.

- 4.7.2.6(5) Use foamed plastic insulation that is CFC- and HCFC-free.
- 4.7.2.6(6) Provide a complete horizontal barrier to weather and climate.
- 4.7.2.6(7) If a green roof, or similar approach, is used, design the assembly so that the system dead load, measured according to ASTM D2397, when added to the weight of the roofing membrane system, does not exceed the maximum allowable dead load for the roof. Green roof, or similar, is to be visually appealing, complete with live growing media, all year round. Green roof, or approved alternative, location(s), design and assembly to be reviewed with Authority.
- 4.7.2.6(8) Roofing systems will include:
 - 4.7.2.6(8)(a) flashings and sheet metal;
 - 4.7.2.6(8)(b) thermal insulation;
 - 4.7.2.6(8)(c) assembly components for green roofs if used;
 - 4.7.2.6(8)(d) roofing specialties and accessories required for completion;
 - 4.7.2.6(8)(e) interior access systems to roof areas;
 - 4.7.2.6(8)(f) protection from pedestrian traffic and solar radiation; and
 - 4.7.2.6(8)(g) roof drainage, including overflow scuppers.
- 4.7.2.6(9) Provide sheet metal flashings that divert water away from membrane flashing termination and protect the membrane from deterioration due to the exterior elements and mechanical damage. Provide roofing membrane continuously under the metal.
- 4.7.2.6(10) Metal roofing systems, if used, will provide clear internal paths of drainage to allow any trapped moisture to drain to the exterior and avoid the staining of architectural finishes, forming of puddles, forming of icicles and dripping on pedestrians.
- 4.7.2.6(11) Facility design and roof systems will ensure that entrance ways are protected from sliding snow and ice and will ensure that there are no accumulations of snow and ice in roof valleys.

4.7.2.7 Fire and Smoke Protection

- 4.7.2.7(1) Achieve fire and smoke protection with LEED/environmentally friendly, approved products and practices.
- 4.7.2.7(2) Use spray-applied cementations fireproofing if required to achieve a fire resistance rating.
- 4.7.2.7(3) Integrate barriers into vertical and horizontal space separations to protect against the spread of fire and smoke. Apply protection to exposed building elements (structural and non-structural) susceptible to fire and subsequent damage.
- 4.7.2.7(4) Apply protection around penetrations through vertical and horizontal fire-resistance rated separations.
- 4.7.2.7(5) Use fire stopping and smoke seal systems that consist of asbestos-free materials and systems, capable of maintaining an effective barrier against flame, smoke, and gases.
- 4.7.2.7(6) Use fire stopping that:
 - 4.7.2.7(6)(a) is compatible with substrates;
 - 4.7.2.7(6)(b) allows for movement caused by thermal cycles; and
 - 4.7.2.7(6)(c) prevents the transmission of vibrations from pipe, conduit or duct to structure and structure to pipe, conduit or duct.
- 4.7.2.7(7) When more than one product is required for an assembly, use products that are compatible with one another and from the same manufacturer.
- 4.7.2.7(8) Use fire stopping sealants and coatings that are silicone-based and guaranteed not to re-emulsify if subject to wetting or standing water. Do not use acrylic-based coatings and sealants.

4.7.2.8 Sealants

- 4.7.2.8(1) All sealants and sealant primers used on the interior of the Facility will be LEED/environmentally friendly approved products and will be used following LEED practices.
- 4.7.2.8(2) Apply sealant materials to achieve:

- 4.7.2.8(2)(a) seals to the building envelope systems and around openings in the building envelope systems as required to prevent water ingress;
 - 4.7.2.8(2)(b) sealed joints between dissimilar or similar materials to allow a smooth or even transitions; and
 - 4.7.2.8(2)(c) sealed expansion or controls joints in the building envelope systems or structural systems to allow movement.
- 4.7.2.8(3) For the exterior, use sealants to completely and continuously fill joints between dissimilar and/or similar materials.
 - 4.7.2.8(4) For the interior, use sealants (at frames such as those at doors, windows and skylights) to completely fill joints between dissimilar materials using one component, acrylic emulsion, paintable type.
 - 4.7.2.8(5) Use silicone caulking that is mildew-resistant and impervious to water for caulking washroom plumbing fixtures.
 - 4.7.2.8(6) Use sealants with self-levelling properties for expansion and control joints in concrete floors using two-component epoxy urethane sealants.
 - 4.7.2.8(7) Use non-sag sealants for exterior vertical expansion and control joints in masonry or wall cladding.
 - 4.7.2.8(8) Use sealants that allow for minimum 25% movement in joint width.

4.8 Openings (Division 8)

4.8.1 Basic Requirements

- 4.8.1.1 Except where wire glass is required in accordance with the City of Vancouver Building By-Law, construct interior windows and sidelights of tempered glass. For exterior glazing at doors and sidelights, use laminated glass.
- 4.8.1.2 Exterior glazing will provide UV protection.
- 4.8.1.3 Installation methods and locations for doors, frames, and hardware will conform to Door and Hardware Institute (DHI) standards.
- 4.8.1.4 Provide all door types and security hardware to suit the intended function of spaces.

4.8.1.5 Windows

- 4.8.1.5(1) Size, configure, and adequately construct windows to suit rooms that require daylight, views and/or natural ventilation.
- 4.8.1.5(2) Provide 'borrowed light' through interior windows to occupied rooms that do not have exterior windows unless otherwise stated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.8.1.5(3) Provide operable windows (windows that may be opened and closed) in rooms and spaces coordinated with the Authority for the functionality of the room or space. Primarily, operable windows will be in the classrooms, offices and studios as indicated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)]. Operable windows and window coverings that are inaccessible will be equipped with motorized electronic closers and control points. Operable windows and window coverings will be deemed inaccessible if they have a sill measured seven (7) feet (2.13 meters) high or more from the finished floor.
- 4.8.1.5(4) Coordinate glazing heights, handrails and other accessories to achieve functional and aesthetic cohesiveness.
- 4.8.1.5(5) Consider migratory bird safe glazing measures where appropriate and achievable, in an economical manner.

4.8.1.6 Doors

- 4.8.1.6(1) Provide doors that suit the intended function of spaces or rooms requiring acoustic or visual privacy, security, special HVAC requirements, fire-resistance rated separations or other closures.
- 4.8.1.6(2) Size Requirements for Doors
 - 4.8.1.6(2)(a) Door openings will be of adequate width to suit the intended purpose of rooms on either side of the doors and allow the movement of people and equipment associated with those rooms.
 - 4.8.1.6(2)(b) Double doors will be provided into rooms where large pieces of equipment will be moved in or out during the lifetime of the Facility and where such equipment cannot pass through 1200mm single door openings.

- 4.8.1.6(2)(c) Double glazed sliding door partitions between designated shops and studios must accommodate the movement of larger groups of people and projects. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.8.1.6(2)(d) No single door will be less than 750mm wide.
- 4.8.1.6(2)(e) Designated studios will have door openings large enough to accommodate access for vehicles and large equipment. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.8.1.6(2)(f) Provide a minimum of 2134 mm high door or door leaf, unless required for other purposes where height is restricted or where requirement indicated.
- 4.8.1.6(2)(g) Designated studios will have double doors (minimum total width of 1800mm) and a height sufficient to accommodate the movement of art pieces that are 3050mm in one dimension. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.8.1.6(3) Satisfy acoustic requirements for doors.
- 4.8.1.6(4) Apply door sizes and designs consistently to rooms of similar use, location and configuration.
- 4.8.1.6(5) Avoid doors swinging into corridors in a manner that may obstruct traffic flow or reduce the corridor width, except doors to spaces that are used infrequently and not subject to occupancy such as small closets.
- 4.8.1.6(6) Achieve security with the appropriate location, configuration, materials, construction, and detailing of doors and hardware.
- 4.8.1.6(7) Doors may swing into washrooms, provided they allow for ease of use and meet accessibility requirements. Such doors will be equipped with hardware to allow the door to be opened out of the room in an emergency situation.

- 4.8.1.6(8) Doors will have required hinges, edge protection, and face protection to minimize damage and resultant disruptive maintenance.
- 4.8.1.6(9) Doors and frames will have a suitable finish that prevents dirt and fingerprint accumulation, and can be easily cleaned.
- 4.8.1.6(10) Doors and door frames will have the capability to withstand the varying and high levels of humidity and impact that occur typically in the spaces they serve and maintain their inherent aesthetic and functional capacities.

4.8.2 Performance Criteria

4.8.2.1 Hollow Metal Doors and Frames

- 4.8.2.1(1) Materials and manufacture of metal doors will comply with the requirements of the Canadian Steel Door and Frame Manufacturer's Association (CSDFMA).
- 4.8.2.1(2) Provide interior metal doors with flush face construction.
- 4.8.2.1(3) Provide exterior metal doors with:
 - 4.8.2.1(3)(a) flush face construction;
 - 4.8.2.1(3)(b) edge seams to correspond with door function and minimize maintenance needed; and
 - 4.8.2.1(3)(c) prepared surfaces to receive finish that resist corrosion from exposure to weather.
- 4.8.2.1(4) Provide pressed metal frames with:
 - 4.8.2.1(4)(a) fully welded construction;
 - 4.8.2.1(4)(b) thermally-broken door frames for exterior doors; and
 - 4.8.2.1(4)(c) anchors to each jamb to suit wall type and receive the frame.
- 4.8.2.1(5) Door Glazing
 - 4.8.2.1(5)(a) For exterior hollow metal door glazing, use sealed units with warm edge, argon filled space in thermally-broken frames to prevent heat loss.

4.8.2.1(5)(b) For interior hollow metal door glazing use tempered glass.

4.8.2.2 Wood Doors

- 4.8.2.2(1) All wood doors will comply with all applicable standards, including the Quality Standards for Architectural Woodwork published by the Architectural Woodwork Manufacturer's Association of Canada (AWMAC).
- 4.8.2.2(2) Wood doors will be sized, constructed and be provided with hardware and finishes to suit the intended function and aesthetics of the Facility and its program.
- 4.8.2.2(3) Provide wood doors in flush design, Custom Grade quality (as defined in the AWMAC standards referred to above), and solid particleboard core.
- 4.8.2.2(4) Fire-resistance rated doors will be constructed with a homogeneous incombustible mineral core and AWMAC Quality Standards Option 5 blocking.
- 4.8.2.2(5) Install finish hardware securely to resist loosening over time. Fasten to solid wood backing, except where hardware is designed to be through-bolted.
- 4.8.2.2(6) Glue stiles, rails and faces to the core with Type II water-resistant adhesive to minimize de-lamination or disassembly as a result of moisture ingress.
- 4.8.2.2(7) Face veneer will be A-Grade hardwood veneer with AWMAC No. 3 edge clear urethane factory finish and finished to suit the intended use.
- 4.8.2.2(8) Visual appearance of grain will be reviewed with the Authority in relation to the interior design concept and door location, for such areas as, but not limited to, theatre, gallery, library, meeting rooms and offices.

4.8.2.3 Aluminum Entrances and Storefronts

- 4.8.2.3(1) Aluminum entrances and storefront framing and doors may form part of the exterior envelope of the Facility or glazed interior partitions as required.
- 4.8.2.3(2) Provide glazed interior partitions as appropriate to comply with the functions of the spaces as defined by Appendix 3A

[Functional Program (including Pre-Design Room Data Sheets)].

- 4.8.2.3(3) Use aluminum doors within aluminum entrances and storefront.
 - 4.8.2.3(4) Use frames that are thermally-broken, flush glazed, aluminum sections, to accept insulating glass units.
 - 4.8.2.3(5) Incorporate in the frames drained a vented system (rain screen) with a complete air and vapour seal, allowing any moisture entering the frame to drain to the exterior and allowing air into the pressuring chamber.
 - 4.8.2.3(6) Use aluminum swing entrance doors that are heavy-duty commercial or institutional grade that may be automatically operated and motion-detector controlled.
 - 4.8.2.3(7) Apply aluminum finish for exposed aluminum surfaces. Finish to be permanent and resistant to corrosion caused by weather exposure and climate.
- 4.8.2.4 Specialty Doors
- 4.8.2.4(1) Overhead Rolling Service Doors
 - 4.8.2.4(1)(a) Restrain lateral movement of door curtain slats. Provide wind locks as required by door size or wind load requirements.
 - 4.8.2.4(1)(b) Provide interlocking flat slats, complete with bottom bar and contact type bottom astragal.
 - 4.8.2.4(1)(c) For manually operated doors, provide inside lift handle and locking bar or chain hoist. Motor operation may be provided on doors requiring constant usage. Chain operation will be by means of reduction gears and galvanized hand chain.
 - 4.8.2.4(1)(d) For fire doors, provide automatic closing device operated by fire door release device connected to fire alarm system.
 - 4.8.2.4(2) Overhead Rolling Grilles
 - 4.8.2.4(2)(a) Provide grilles that allow visual access to secure areas.

4.8.2.4(2)(b) Provide aluminum or steel guides that are: fabricated to withstand vertical and lateral loads; counterbalanced by helical torsion springs; and sound-deadened.

4.8.2.4(2)(c) For manually operated closures, provide inside lift handle and locking bar or chain hoist. Motor operation may be provided on grilles requiring constant usage. Chain operation will be by means of reduction gears and heavy chrome plated hand chain.

4.8.2.4(3) Overhead Rolling Counter Shutters / Horizontal Sliding Grilles

4.8.2.4(3)(a) Provide shutter curtains fabricated with extruded aluminum, galvanized steel, or stainless steel interlocking flat slats, complete with guides of similar materials.

4.8.2.4(3)(b) Provide closures that are manually operated and with locking capability.

4.8.2.4(4) Interior Aluminum Sliding Doors and Sidelights

4.8.2.4(4)(a) Interior sliding doors and sidelights will have recessed mounted track with sliding and fixed panel(s), and suitable for single glazing with 6 mm clear fully tempered float glass.

4.8.2.4(5) Automatic Swing Door Operators

4.8.2.4(5)(a) Use automatic swing doors operators for interior and exterior locations as required by the City of Vancouver Building By-Law and in keeping with the Authority's equal access principles for example, accessible washrooms. In addition, provide automatic swing door operators for exterior doors (main entry points), main entry to student services area and oversized doors and gates as required to satisfy ergonomic considerations.

4.8.2.4(5)(b) If used, provide directional motion sensor control device that are unaffected by ambient light or ultrasonic frequencies.

4.8.2.4(5)(c) Equip all in-swing doors that are required exits with an emergency breakaway switch

that internally cuts power to the operator. No external power switch allowed.

4.8.2.4(6) Aluminum Curtain Walls

4.8.2.4(6)(a) Aluminum curtain walls will comply with all applicable standards, including the Aluminum Association Standards (AAS) and the American Architectural Manufacturers Association (AAMA) field testing specifications.

4.8.2.4(6)(b) Incorporate in the curtain wall framing a drained and vented system complete with air and vapour seal, allowing any water entering the framing/system and the glazing detail cavities to drain to the exterior and also allow air into the pressuring chamber.

4.8.2.4(6)(c) Provide curtain wall framing that incorporates a thermal-break.

4.8.2.4(6)(d) For exposed aluminum surfaces, provide a finish that is permanent and resistant to corrosion resulting from weather exposure and climate.

4.8.2.4(6)(e) Provide assemblies that resist local seismic conditions and 1-in-100 year climatic events (with a safety factor).

4.8.2.5 Aluminum Windows

4.8.2.5(1) Aluminum windows will comply with all applicable standards, including the Aluminum Association Standards (AAS) and the American Architectural Manufacturers Association (AAMA) field testing specifications.

4.8.2.5(2) Incorporate in windows a drained and vented system complete with air and vapour seal, allowing any water entering the framing/system and the glazing detail cavities to drain to the exterior and also allow air into the pressuring chamber.

4.8.2.5(3) Provide windows that incorporate a thermal-break.

4.8.2.5(4) For exposed aluminum surfaces, provide a finish that is permanent and resistant to corrosion resulting from weather exposure and climate.

4.8.2.5(5) Provide assemblies that resist local seismic conditions and climatic loads as defined by the City of Vancouver Building By-Law.

4.8.2.6 Skylights and Clerestory Glazing

4.8.2.6(1) Commercial grade clerestory, roof or skylight glazing may be provided where natural light is required in interior spaces to augment or complement interior ambient lighting.

4.8.2.6(2) Clerestory light sources may be preferred approach for rendered quality of natural light.

4.8.2.6(3) Project Co to review natural light strategy with Authority.

4.8.2.6(4) Skylights will comply with all applicable standards, including the Aluminum Association Standards (AAS), and the American Architectural Manufacturers Association (AAMA) field testing specifications.

4.8.2.7 [Intentionally Deleted]

4.8.2.8 Glass and Glazing

4.8.2.8(1) Glass and glazing will comply with all applicable standards, including the Insulating Glass Manufacturers Association of Canada (IGMAC) Guidelines and the Glazing Contractors Association of B.C. (GCA) Glazing Systems Specifications Manual.

4.8.2.8(2) Exterior and/or interior glass and glazing may be provided as integral components of the exterior envelope, interior partitions and screens, exterior and interior doors, handrail balustrades, skylights and decorative and ornamental glazing.

4.8.2.8(3) Provide assemblies that resist climatic loads as defined by the City of Vancouver Building By-Law.

4.8.2.8(4) Use laminated safety glass in single-glazed skylights, entry doors and sidelights, or as the inboard light of a double-glazed skylight.

4.8.2.8(5) Provide one-way glass in designated areas. Refer to Appendix 3B [Audio Visual Requirements].

4.8.2.8(6) Mirrors

4.8.2.8(6)(a) Mirrors will be provided in public amenity spaces where required and in accordance

with the City of Vancouver Building By-Law, accessibility requirements and the SSBC Technical Standards.

4.8.2.9 Door and Finish Hardware

- 4.8.2.9(1) Project Co will provide door and finish hardware including but not limited to door stops, gaskets, sweeps, closures, thresholds etc. that comply with all applicable standards, including the quality standards of the Door and Hardware Institute (DHI).
- 4.8.2.9(2) Project Co will work with an experienced architectural hardware consultant early in the design development phase to prepare a strategy for door hardware and security provision requirements and coordination and to prepare door and hardware schedules through the construction document preparation phase.
- 4.8.2.9(3) Provide all door and finish hardware from one supplier that is a member in good standing of the Door and Hardware Institute (DHI) and has in its employ one or more AHC (Architectural Hardware Consultant).
- 4.8.2.9(4) All door and finish hardware will be commercial grade.
- 4.8.2.9(5) Hardware will be integrated with the security requirements and coordinated with electrical wiring and power requirements.
- 4.8.2.9(6) All door and finish hardware will be of a suitable finish pre-approved by the Authority.
- 4.8.2.9(7) Select finishes to provide maximum longevity and preservation of the finish.
- 4.8.2.9(8) Provide, where applicable, ULC-listed hardware for the required fire rating.
- 4.8.2.9(9) Use heavy-duty commercial quality hardware; locksets and latch sets fully amortised type and lever handles of solid material.
- 4.8.2.9(10) Keying
 - 4.8.2.9(10)(a) Keying groups will be assigned by the Authority.
 - 4.8.2.9(10)(b) New key fittings will be given to and controlled by the Authority.

4.8.2.9(10)(c) Turn over keys from factory to the Authority.

4.8.2.9(10)(d) Supply four (4) keys for each lock cylinder.

4.9 Finishes (Division 9)

4.9.1 Basic Requirements

- 4.9.1.1 All material selections, deliveries and installations will meet LEED requirements as per pertinent credit requirements.
- 4.9.1.2 All interior finishes will comply with the low emitting material requirements for LEED Canada NC 2009 IEQ credits.
- 4.9.1.3 In areas where finishes and systems of installation will occur and water is anticipated to be present as part of cleaning or other procedures, allow water to collect and exit without causing damage to the finishes or substrate.
- 4.9.1.4 Use durable finish materials able to withstand damage and that are easily replaceable or repairable in sections if damage does occur.
- 4.9.1.5 Select the appearance of finishes and colours to prevent glare, and minimize artificial lighting requirements.
- 4.9.1.6 Select materials to promote sustainability by, for instance, having low-emissivity or comprising of renewable resources.
- 4.9.1.7 Present exterior and interior materials and finishes design concept, complete with labelled samples in large sizes, to Authority for review and approval. Provide to the Authority, completed exterior and interior material boards after approval.
- 4.9.1.8 Food Services (base building fit out of services and finishes), security and facilities management materials and finishes concepts will be in keeping with approved by Authority design intent. Review concepts, for these areas, with Authority.
- 4.9.1.9 Visible wood finishes will be selected to reinforce the objectives of the *Wood First Act* (British Columbia).
- 4.9.1.10 Stainless steel surfacing will be provided, as required, to create surfaces that require antiseptic or clean characteristics, special or regular maintenance and resistance to caustic action of chemicals or agents.
- 4.9.1.11 Stainless steel finishes (unless noted elsewhere) to be selected in keeping with approved interior design concept and approval of the Authority.

4.9.2 Performance Criteria

4.9.2.1 Interior Wall Framing

- 4.9.2.1(1) All interior finishes will comply with the low emitting material requirements for LEED Canada NC 2009 IEQ credits 4.1-4.4. These include adhesives and sealants; paints and coatings; flooring systems and composite wood and agrifibre products.
- 4.9.2.1(2) Interior wall framing will comply with all applicable standards, including the Canadian Sheet Steel Building Institute Standards (CSSB1) and the Association of Wall and Ceiling Contractors of B.C. (AWCC) Wall & Ceiling Specification Standards Manual for materials and workmanship for interior walls, including steel studs and furring and gypsum board ceiling suspension systems.
- 4.9.2.1(3) Use prefabricated non-load bearing steel studs for interior partitions and furring with no axial load other than its own weight, the weight of attached finishes and lateral loads of interior pressure differences.
- 4.9.2.1(4) Construct steel stud framing to accommodate electrical, plumbing and other services in the partition cavity, and to support fixtures, wall cabinets and other such wall-mounted items. Provide reinforcement and backing.
- 4.9.2.1(5) Design for the differences in air pressure that may result on opposite sides of the wall or partition due to factors such as wind and other lateral pressures, stack effects, or mechanically-induced air pressurization.

4.9.2.2 Gypsum Board

- 4.9.2.2(1) Gypsum board will comply with all applicable standards, including the Association of Wall and Ceiling Contractors of B.C. (AWCC) Wall & Ceiling Specification Standards Manual.
- 4.9.2.2(2) Gypsum board will be no less than 5/8" (16 mm) in thickness.
- 4.9.2.2(3) Use cementitious backer board (tile backer board) behind ceramic wall tile in wet areas. Use glass mat water-resistant gypsum backing panels behind sinks.
- 4.9.2.2(4) Use plywood backed gypsum board where required for increased resistance to abrasion, indentation, and penetration of interior walls and to provide additional structural stability and loading for wall mounted equipment and artwork.

- 4.9.2.2(5) Use plywood backed gypsum board in designated areas for attaching of student artwork. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.9.2.2(6) Glass mat surfaced gypsum sheathing board will be used wherever exterior gypsum sheathing is required at exterior walls.
- 4.9.2.2(7) Provide airborne sound insulation for gypsum board/steel stud assembly to close off air leaks and flanking paths by which noise can go around the assembly. Make assemblies airtight. Do not locate back to back recessed wall fixtures such as cabinets or electrical, telephone and television outlets, which perforate the gypsum board surface. In addition, carefully cut any opening for fixtures to the proper size and appropriately seal piping penetration. Seal conduit/duct/piping penetrations with tape and fill at the plenum barrier. Make the entire perimeter of a sound insulating assembly airtight to prevent sound flanking. Use an acoustic caulking compound or acoustical sealant to seal between the assembly and all dissimilar surfaces (including at window mullions) in accordance with the recommendations of an acoustic consultant.

4.9.2.3 Ceramic Tile work

- 4.9.2.3(1) Ceramic tile work will comply with all applicable standards, including the Terrazzo Tile and Marble Association of Canada (TTMAC) Specification Guide 09300 Tile Installation Manual.
- 4.9.2.3(2) For installations on wet and exterior surfaces, use floor tiles that have the following static coefficients of friction as per the American Society for Testing and Materials International (ASTM):
 - 4.9.2.3(2)(a) Level Surfaces: Not less than 0.50 for wet and dry conditions.
 - 4.9.2.3(2)(b) Stair Treads: Not less than 0.60 for wet and dry conditions.
 - 4.9.2.3(2)(c) Ramp Surfaces: Not less than 0.60 for wet and dry conditions.
- 4.9.2.3(3) For exterior installations, provide frost-resistant exterior tiles with a moisture absorption rating of 3.0% or less.

- 4.9.2.3(4) Provide control joints and expansion joints in conformance with the recommendations of the TTMAC Tile Installation Manual.
- 4.9.2.3(5) Provide a waterproof membrane under ceramic floor tile in showers and other wet areas. The membrane may be trowel-applied, built-up, liquid-applied or sheet-applied.
- 4.9.2.3(6) Provide crack isolation membranes to resist crack transmission from the substrate due to lateral movement; design for use in thin-set applications of tile over a cracked substrate. Use elastomeric sheets or trowel-applied materials suitable for subsequent bonding of ceramic tile.
- 4.9.2.3(7) Set ceramic tile with latex modified mortar and grout with epoxy grout.
- 4.9.2.3(8) Consider anti-graffiti design strategies and coating to tile and grout in such areas as washrooms.

4.9.3 Partitions

- 4.9.3.1 A hierarchy of partition types should be developed for containment for elevators, washrooms, storage rooms, communications closets, janitor's closets and enclosed partially glazed meeting rooms and offices.
- 4.9.3.2 High partitions will be required in areas requiring secure storage, environmental containment and acoustic separation.
- 4.9.3.3 Use interior walls and partition systems that provide separations required for fire safety and protection.
- 4.9.3.4 Provide floating partitions, where necessary, to achieve required acoustic isolation. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.9.3.5 Seismic resistance capabilities will conform to the requirements of CSA S832-06 Guidelines for Seismic Risk Reduction of Operational and Functional Components of Buildings.
- 4.9.3.6 Design and select interior walls and partitions, partition systems and interior finishes to comply with the following criteria as relevant for the particular or specific functions enclosed:
 - 4.9.3.6(1) cleaning and maintenance;
 - 4.9.3.6(2) permanence and durability including impact resistance;

- 4.9.3.6(3) low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality;
 - 4.9.3.6(4) flexibility to permit adaptability of the internal spaces; and
 - 4.9.3.6(5) allow for ease in displaying art and design.
- 4.9.3.7 Provide fittings, attachments and internal bracing/backup as required to accommodate and support art and design pieces, wall mounted equipment at video-conferencing and other applicable items.
- 4.9.3.8 Partitions constructed to provide an ease of adaptability need not be limited to proprietary products but may include innovative alternatives reviewed and approved with the Authority.
- 4.9.4 Ceilings
- 4.9.4.1 Design and select ceiling systems and ceiling finishes to comply with the following criteria relevant to the particular or specific functions of the space:
- 4.9.4.1(1) cleaning and maintenance;
 - 4.9.4.1(2) flexibility and access to the spaces above;
 - 4.9.4.1(3) compatibility with mechanical, plumbing, electrical, communications services and fixtures; and
 - 4.9.4.1(4) low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality.
- 4.9.4.2 Generally, clear height requirements are as follows:
- 4.9.4.2(1) Offices, meeting rooms and janitorial rooms will be a minimum of 3 metres to the underside of ceiling;
 - 4.9.4.2(2) library, conference rooms, computer labs and classrooms will be a minimum of 3 metres to the underside of ceiling;
 - 4.9.4.2(3) studios, small galleries, critique rooms, and workshops will be a minimum of 4 metres to the underside of ceiling;
 - 4.9.4.2(4) specific studios such as film studios, photo studios, TS workshops, the main gallery space, installations rooms, the concourse and the learning commons will be a minimum of 6 metres clear; and
 - 4.9.4.2(5) corridors will vary in height with relation to access routes and accessibility of equipment for the spaces they are connecting to.

- 4.9.4.2(6) Project Co. will ensure that the ceiling heights of spaces designated with audio visual equipment are maintained free of mechanical, electrical, projector equipment and other sightline intrusions.
- 4.9.4.3 Provide ceiling access at appropriate locations in discrete areas such as storage areas, closets and service spaces).
- 4.9.4.4 Interior sound levels will be controlled to facilitate a comfortable working environment for the Facility users. Acoustic ceiling tiles will be installed where necessary to provide these levels.
- 4.9.4.5 Acoustic Tile Ceilings/Wood Batten
- 4.9.4.5(1) Ceiling tiles/wood batten may be used in the following locations:
- 4.9.4.5(1)(a) Corridors and common areas;
 - 4.9.4.5(1)(b) Offices, meeting rooms, lounges;
 - 4.9.4.5(1)(c) Clean studios, computer labs, library, and
 - 4.9.4.5(1)(d) General learning.
- 4.9.4.5(2) Acoustic Panel and T-Bar: select non-directional, fine fissured pattern, white ceiling panel, trim edge detail (square) to fit a standard 15/16" T-bar grid panel size. Acoustic tile and T-bar samples will be reviewed with the Authority.
- 4.9.4.5(3) Install acoustic ceiling tiles in the suspension system to provide the levels of sound attenuation required to suit the intended function of the room.
- 4.9.4.5(4) Provide accessibility to the ceiling spaces where access is required to mechanical, electrical or other service systems.
- 4.9.4.5(5) Special surface-treated ceiling tiles, such as wood, mylar or metal-faced tiles, may be used (if approved by the Authority) where maintenance, ease of cleaning, accessibility and acoustic requirements are priorities.
- 4.9.4.5(6) For ceilings installed in food preparation areas, use acoustic panels capable of being cleaned without undue wear on the panel. Provide anti-bacterial surfaces if available and applicable.
- 4.9.4.5(7) Provide acoustical panels that are appropriate for the normal occupancy condition range of 15°C - 29°C and maximum 60% relative humidity. When the service use temperature and

relative humidity are expected to exceed these ranges, use acoustical units specifically designed for such applications.

- 4.9.4.5(8) Use tiles with scratch-resistant surfaces and sealed edges in any area where lay-in ceiling panels frequently need to be removed for mechanical access.

4.9.4.6 Hard Ceilings

- 4.9.4.6(1) Construct hard ceilings of 16mm gypsum board where fire rating is not required. In fire rated rooms the gypsum board must be fire rated and the thickness of the gypsum board is to be determined by the rating required by the City of Vancouver Building By-Law. Finish hard ceilings as per the paint specifications outlined in Section 4.9.4.9.

- 4.9.4.6(2) Provide hard ceilings for the following rooms:

4.9.4.6(2)(a) janitorial and utility rooms;

4.9.4.6(2)(b) washrooms;

4.9.4.6(2)(c) change rooms and shower rooms;

4.9.4.6(2)(d) food service area and kitchens (unless otherwise specified in accordance with 4.9.4.5(10);

4.9.4.6(2)(e) gallery; and

4.9.4.6(2)(f) other designated areas to support the function of the space.

4.9.4.7 Flooring

- 4.9.4.7(1) Comply with all applicable standards, including the National Floor Covering Association (NFCA) Specification Standards Manual. US Federal Specification RR-T-650d.
<http://www.wbdg.org/ccb/FEDMIL/rrt650e.pdf>

- 4.9.4.7(2) The floor and floor systems form a part of the interior space. Accordingly, Project Co will provide flooring that is complementary and integral to the functional and aesthetic requirements of the interior space.

- 4.9.4.7(3) Project Co will design and select floor finishes to comply with the following criteria:

- 4.9.4.7(3)(a) ergonomic comfort, cleaning and maintenance including a minimized frequency of joints and also including ease of replacement if and when required;
 - 4.9.4.7(3)(b) imperviousness to concentrations of moisture anticipated to be existing on the floors and duration of that moisture;
 - 4.9.4.7(3)(c) permanence, durability and resistance to concentrated service traffic;
 - 4.9.4.7(3)(d) aesthetic and design qualities for the benefit of students, staff and public;
 - 4.9.4.7(3)(e) low VOC emissions to minimize adverse impact on indoor air quality and indoor environmental quality; and
 - 4.9.4.7(3)(f) compatibility of textures with the requirements for pedestrian safety.
- 4.9.4.7(4) Penetrations must be properly sealed to prevent the entrance of air, insects and rodents.
- 4.9.4.7(5) Where epoxy flooring is used in wet areas, use water and slip-resistant grade and prevent water or moisture transmission to the substrate. Provide integral cove base with the floor in wet areas.
- 4.9.4.7(6) Use heavy-duty materials for flooring on which wheeled equipment traffic is anticipated and to which wear and damage may result.
- 4.9.4.7(7) Use anti-static flooring material for telecommunication rooms.
- 4.9.4.7(8) Floating floors will be provided to achieve required acoustic isolation in areas designated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.9.4.7(9) Stair Covering
- 4.9.4.7(9)(a) Where not using concrete finish, use coordinated one piece treads, sheet risers and nosings, etc., in accordance with City of Vancouver Building By-law,
 - 4.9.4.7(9)(b) Use water soluble, low odour adhesive.

4.9.4.7(10) Polished Concrete

- 4.9.4.7(10)(a) Where polished concrete flooring is used, provide a motorized steel trowel finish with sealer, or approved alternative.
- 4.9.4.7(10)(b) Polished concrete floors will have integral conduit grids at uniform intervals.
- 4.9.4.7(10)(c) Consider use of anti-graffiti strategies and products, such as coatings.

4.9.4.7(11) Resilient Flooring

- 4.9.4.7(11)(a) Resilient flooring products will be vetted with the Authority for their application in areas such as: service corridors, service areas, staff work areas or other similar areas in the Facility.
- 4.9.4.7(11)(b) If used, provide rubber flooring tile formulated with 100% virgin elastomers, reinforcing agents, soil-resisting agents, and migrating waxes compounded to create durability, excellent cleaning characteristics, and exceptional slip resistance.
- 4.9.4.7(11)(c) Hot weld all seam joints.
- 4.9.4.7(11)(d) Use solvent based low odour flooring adhesive.
- 4.9.4.7(11)(e) Finish flooring with high speed buffing as per manufacturers specification.
- 4.9.4.7(11)(f) Provide tactile warning strips and stair nosings as part of integral product system to assist the visually impaired as per the City of Vancouver Building By-Law requirements.
- 4.9.4.7(11)(g) Use adhesive for resilient flooring that meets or exceeds the Environmental Protection Agency (EPA) Standards for acceptable VOC concentration and emission rates.

4.9.4.7(12) Seamless Quartz Epoxy Flooring

- 4.9.4.7(12)(a) Seamless Quartz Epoxy flooring will be vetted with the Authority for their application.
- 4.9.4.7(12)(b) If used, provide seamless epoxy flooring with 100% solids, zero VOC, solvent-free comprised of a two-component epoxy primer, a two-component epoxy resin and curing agent, coloured quartz aggregate broadcast into both primer and undercoat, and a high performance, UV-resistant two-component, clear epoxy sealer. Provide appropriate bases.

4.9.4.7(13) Carpet Tiles

- 4.9.4.7(13)(a) Use nylon carpeting that is certified under the Canadian Carpet Institute/ Canadian Rug Institute (CCI/CRI) Indoor Air Quality Program and having CRI Green Label Plus for VOC emission rate.
- 4.9.4.7(13)(b) Provide nylon carpeting that complies with NSF-140 (Gold or Platinum).
- 4.9.4.7(13)(c) Provide nylon carpet with:
- 4.9.4.7(13)(d) a maintained static generation at less than 3.5 KV at 21 °C and 20% relative humidity throughout its product life;
- 4.9.4.7(13)(e) 1/12 gauge solution/yard dyed with recycled content; and
- 4.9.4.7(13)(f) a minimum density of 6400 oz/ y³.
- 4.9.4.7(13)(g) Provide carpet of high quality and durability to meet long term quality and durability standards.
- 4.9.4.7(13)(h) Carpeting will not be used in wet areas unless Project Co provides a manufacturer's warranty for installation.
- 4.9.4.7(13)(i) Provide carpeting with lifetime warranties for: fibre performance for wear, delamination failure, and performance for static, colourfastness to atmospheric contaminants, stain removal, moisture barrier,

dimensional stability and colourfastness to light.

- 4.9.4.7(13)(j) Provide flat wiring underneath carpet.
- 4.9.4.7(13)(k) Provide appropriate base.
- 4.9.4.7(13)(l) Install with tile tabs or use non-solvent, non-toxic, odourless adhesive that, when installed, meets or exceeds EPA standards for acceptable VOC concentration and emission rate.

4.9.4.7(14) Generally, floor finishes will be as described below:

- 4.9.4.7(14)(a) water impervious flooring in washrooms, change rooms, shower rooms, kitchens and designated studios;
- 4.9.4.7(14)(b) slip-resistant flooring in washrooms, change rooms and shower rooms;
- 4.9.4.7(14)(c) polished concrete in major traffic and common areas, studios and workshops; and
- 4.9.4.7(14)(d) nylon fibre carpet, or approved alternative, in learning, study, office and social spaces.

4.9.4.8 Acoustic Treatment

4.9.4.8(1) Provide acoustic treatment where sound attenuation, soundproofing or other sound control measures are necessary to create a safe and comfortable environment where confidentiality is required.

4.9.4.8(2) Sound control will include:

- 4.9.4.8(2)(a) attenuation of sound within student, staff and public environments;
- 4.9.4.8(2)(b) sound isolation between the exterior and interior spaces;
- 4.9.4.8(2)(c) sound isolation between interior spaces within the building at both horizontal and vertical separations;

4.9.4.8(2)(d) sound and vibration isolation of building service noises and sound isolation of building service rooms; and

4.9.4.8(2)(e) sound isolation as required for specialty rooms such as video-conferencing.

4.9.4.8(3) Design partition and ceiling construction to provide approximately the same degree of sound control through each assembly. When a partition is used for sound isolation, extend the sound control construction from floor to floor.

4.9.4.8(4) Optimum sound isolation requires that the integrity of gypsum board partitions and ceilings (mass) never be violated by vent or grille cut-outs or by recessed cabinets, light fixtures, etc.

4.9.4.8(5) Where penetrations are necessary, minimize placing them back-to-back and next to each other. Stagger electrical boxes by at least one stud space. Use mineral fibre insulation to seal joints around all cut-outs such as electrical, TV and telephone outlets, plumbing escutcheons and recessed cabinets.

4.9.4.8(6) Minimize constructions such as ducts, rigid conduits, or corridors that act as speaking tubes to transmit sound from one area to another. At common supply and return ducts, provide sound attenuation liners at the diffuser and/or grill to maintain assemblies' STC. Seal around conduit.

4.9.4.8(7) Isolate structure-borne vibrations and sound with resilient mountings on vibrating equipment to minimize sound transfer to structural materials. Provide ducts, pipes, and conduits with resilient, non-rigid boots or flexible couplings where they leave vibrating equipment; isolate from the structure with resilient gaskets and sealant where they pass through walls, floors, or other building surfaces.

4.9.4.8(8) Use acoustic screens, vibration isolators, and carefully selected exterior equipment to prevent exterior noise that neighbours may find offensive.

4.9.4.9 Painting and Protective Coatings

4.9.4.9(1) Paints

4.9.4.9(1)(a) Project Co to present paint and finishes concepts for approval to the Authority

4.9.4.9(2) Walls, doors and shelving

4.9.4.9(2)(a) Use eggshell or semi-gloss for all walls, doors and shelving;

4.9.4.9(2)(b) application will be brush or roller spray;

4.9.4.9(2)(c) clean up: warm water;

4.9.4.9(2)(d) thinner if needed: water; and

4.9.4.9(2)(e) colour selection/ patterning will be at the discretion of the Authority.

4.9.4.9(3) Door frames and metal doors

4.9.4.9(3)(a) Use semi-gloss for all door frames and metal doors;

4.9.4.9(3)(b) application will be brush or roller spray;

4.9.4.9(3)(c) clean up: warm water;

4.9.4.9(3)(d) thinner if needed: water; and

4.9.4.9(3)(e) colour selection/ patterning will be at the discretion of the Authority.

4.9.4.9(4) Wood finish doors

4.9.4.9(4)(a) Use clear coat interior rub varnish for all wood finish doors;

4.9.4.9(4)(b) application will be brush or roller spray;

4.9.4.9(4)(c) clean up: warm water;

4.9.4.9(4)(d) thinner if needed: water; and

4.9.4.9(4)(e) colour selection/ patterning will be at the discretion of the Authority.

4.9.4.9(5) Paint Grade Doors

4.9.4.9(5)(a) Use semi-gloss for all paint grade doors;

4.9.4.9(5)(b) application will be brush or roller spray;

4.9.4.9(5)(c) clean up: warm water;

4.9.4.9(5)(d) thinner if needed: water; and

4.9.4.9(5)(e) colour selection/ patterning will be at the discretion of the Authority.

4.9.4.9(6) Ceilings, Exposed Structure and Mechanical (ductwork and piping in occupied areas)

4.9.4.9(6)(a) Use eggshell paint for all ceilings, exposed structure and mechanical ductwork in occupied areas;

4.9.4.9(6)(b) application will be brush or roller spray;

4.9.4.9(6)(c) clean up: warm water;

4.9.4.9(6)(d) thinner if needed: water; and

4.9.4.9(6)(e) colour selection/ patterning will be at the discretion of the Authority.

4.9.4.9(7) Exterior Walls

4.9.4.9(7)(a) Use exterior semi-gloss latex for all exterior walls;

4.9.4.9(7)(b) application will be brush or roller spray;

4.9.4.9(7)(c) clean up: warm water;

4.9.4.9(7)(d) thinner if needed: water; and

4.9.4.9(7)(e) colour selection/ patterning will be at the discretion of the Authority.

4.9.4.9(8) Floors, concrete

4.9.4.9(8)(a) Use a 2-component mixture (base component A, curing agent B);

4.9.4.9(8)(b) use a primer if part of coating system;

4.9.4.9(8)(c) application will be brush or roller spray;

4.9.4.9(8)(d) thinner: c70 or C25; and

4.9.4.9(8)(e) colour selection/ patterning will be at the discretion of the Authority.

4.9.4.9(9) Conform to all applicable standards, including the material and workmanship requirements of Master Painters Institute (MPI) Architectural Painting Specification Manual.

- 4.9.4.9(10) Use exterior paints of a quality designed to protect substrate materials from weather and climate conditions.
- 4.9.4.9(11) Provide graffiti resistant coating/ anti-graffiti system for the exterior from grade extending 1800mm.
- 4.9.4.9(12) Provide anti-graffiti resistant strategies and products, including coating, for both exterior and interior finishes, where applicable.
- 4.9.4.9(13) Achieve a visually consistent design approach, in keeping with the overall design concept and an aesthetically coordinated appearance throughout all areas of the Facility.
- 4.9.4.9(14) Use exterior and interior finish materials with surface finishes either as integral to the finish material or field-applied separately to the surface of the finish material.
- 4.9.4.9(15) Treat exterior masonry materials such as brick and stone veneer with water-repellent coatings to prevent water ingress into or through the material.
- 4.9.4.9(16) Provide a special protective coating on exterior and interior materials that are subject to corrosion from exposure to moisture or other corrosive agents, and where painting is deemed to be insufficient protection. Materials requiring a special protective coating include exterior and interior structural, galvanized, and miscellaneous steel.
- 4.9.4.9(17) Use interior paint materials of a quality to withstand regular or repeated cleaning as the function of the area dictates.
- 4.9.4.9(18) Do not use materials containing lead or mercury.
- 4.9.4.9(19) If seamless epoxy wall coatings are used, provide a two-component, high solids, zero or low VOC, solvent-free, epoxy glaze wall coating that is seamless and abrasion, chemical and UV-resistant.

4.10 Specialties (Division 10)

4.10.1 Basic Requirements

- 4.10.1.1 Provide specialty products manufactured for the specific purposes intended, and installed in strict accordance with the manufacturer's directions.

4.10.2 Tack boards, Whiteboards, Smart boards and Whiteboard walls

- 4.10.2.1 Project Co will provide all tack boards, whiteboards, smart boards and whiteboard walls required to support the programs and functions described in the Functional Program.
- 4.10.2.2 Project Co will provide:
 - 4.10.2.2(1) Tack board surfaces that allow pin penetration of the surface materials and have reasonable resistance to deterioration;
 - 4.10.2.2(2) Whiteboard surfaces that allow use of felt-type writing instruments and allow erasing and cleaning with minimal effort. Use porcelain ceramic on steel surface, magnetic, scratch and abrasion-resistant and have maximum contrast, glare control and reflectivity; and
 - 4.10.2.2(3) Smart boards that are interactive and use touch detection for user input.
- 4.10.2.3 Provide tack boards and whiteboards with extruded aluminum frames, accessory trays, map rails and map hooks.
- 4.10.2.4 Use non-toxic, water based lamination adhesive for tack boards and whiteboards.
- 4.10.3 Compartments and Cubicles
 - 4.10.3.1 Provide compartments and cubicles including toilet partitions, change cubicles, shower partitions, and other compartments and cubicles requiring privacy and security.
 - 4.10.3.2 Provide exposed surfaces that are permanent, water-resistant, corrosion-proof, and readily cleaned and maintained.
 - 4.10.3.3 Secure partitions and standards to the floor or ceiling structure, and in a manner to resist lateral loading and impact.
 - 4.10.3.4 For compartment/cubicle doors, use material matching the partitions and include permanent, purpose-made hardware. Design doors and hardware to provide privacy and security to provide barrier-free access in accordance with the City of Vancouver Building By-Law.
 - 4.10.3.5 Provide a mirror in all change compartments.
 - 4.10.3.6 Toilet Partitions
 - 4.10.3.6(1) Provide stainless steel toilet partitions conforming to ASTM A240 comparable to the existing Facility.
 - 4.10.3.6(2) Provide graffiti resistance coating where applicable.

4.10.3.7 Change Cubicle Partitions

4.10.3.7(1) Change cubicle partitions will comply with the above requirements for toilet partitions, unless adjacent to showers..

4.10.3.8 Shower Partitions

4.10.3.8(1) Provide solid phenolic laminated thick stock, factory-laminated with decorative finish both faces of core and conforming to CAN3-A172 or NEMA LD3.

4.10.4 Wall Guards and Corner Guards, Handrails, Wall Protection, Door Edge and Door Frame Protection

4.10.4.1 Wall and corner guards

4.10.4.1(1) Provide protection of exposed wall corners at service areas, and other areas as required, to prevent damage due to impact from traffic such as equipment and service carts.

4.10.4.1(2) Use stainless steel corner guards.

4.10.4.2 Handrails and Guardrails

4.10.4.2(1) Provide handrails and guardrails as required by the City of Vancouver Building By-Law.

4.10.4.3 Wall protection

4.10.4.3(1) Provide wall splash back protection behind and surrounding hand, studio and housekeeping sinks.

4.10.4.3(2) Provide stainless steel protection to faces of doors where impact damage is anticipated that complements the installation of door edge and frame protection.

4.10.4.3(3) Secure corner guards to reinforcing and backing in the sufficient to withstand expected impact loads

4.10.4.4 Door Edge and Door Frame Protection

4.10.4.4(1) Provide stainless steel protection for door edges and door frames in service areas including book/supply store, food services, shipping and receiving etc. and appropriate workshops/ studios from damage such as impact caused by the regular movement of materials and equipment.

4.10.4.4(2) Provide stainless steel protection for door edges and door frames in service and workshop/ studio areas from damage

such as impact caused by regular and non-regular service vehicles.

4.10.5 Metal Lockers

- 4.10.5.1 Provide 1350 storage lockers (360 dedicated to the foundation). Such storage facilities will be metal lockers and metal locker systems of sizes consistent with the existing Authority (3 tier, 600mmx750mmx1830mm).
- 4.10.5.2 Provide a continuous bulkhead above the lockers to prevent the storage of excess materials above.
- 4.10.5.3 Provide double tier lockers (305mmx457mmx1830mm) in the end of journey shower area, quantity to comply with the City of Vancouver Parking By-Law.
- 4.10.5.4 Provide 20 double tier lockers (305mmx457mmx1830mm) for staff.
- 4.10.5.5 For sheet metal, use galvanized steel conforming to ASTM A653 with ZF001 (A01) zinc coating.
- 4.10.5.6 Finish steel surfaces with polyester baked enamel or powder coating.

4.10.6 Storage Shelving Systems

- 4.10.6.1 Provide storage shelving systems for materials in studios, workshops, book/supply store and other areas required for the function of the space.
- 4.10.6.2 Adjustable shelving systems may be specifically manufactured for storage purposes, such as plywood or steel-slotted angle industrial shelving for bulk materials of plastic laminate-faced plywood for clean storage.
- 4.10.6.3 Provide storage shelves that are:
 - 4.10.6.3(1) Cleanable with approved detergents; and
 - 4.10.6.3(2) 450mm-510mm from ceiling to ensure adequate functioning of fire sprinklers.

4.10.7 Washroom Accessories

- 4.10.7.1 Provide washroom accessories in all public and staff washrooms in consultation with the Authority. Determine the type, size and number of accessories with regard for the numbers and categories of users, in consultation with the Authority and as required by the City of Vancouver Building By-Law.
- 4.10.7.2 Staff and public washroom accessories will include but are not limited to the following:

- 4.10.7.2(1) Automatic soap dispensers;
 - 4.10.7.2(2) Double toilet paper dispensers;
 - 4.10.7.2(3) Hand dryers – “hands free” type;
 - 4.10.7.2(4) Mirrors;
 - 4.10.7.2(5) Barrier-free grab bars (with integral tactile grip finish);
 - 4.10.7.2(6) Coat hooks;
 - 4.10.7.2(7) Sanitary napkin dispensers;
 - 4.10.7.2(8) Sanitary napkin disposals
 - 4.10.7.2(9) Baby change tables, and
 - 4.10.7.2(10) Trash receptacles.
- 4.10.7.3 Shower rooms or showers in washrooms will include but are not limited to the following accessories:
- 4.10.7.3(1) Shower curtain and track or rod as appropriate;
 - 4.10.7.3(2) Barrier-free grab bars;
 - 4.10.7.3(3) Towel/ clothing hooks (minimum quantity 2 per stall); and
 - 4.10.7.3(4) Fold-down shower seat.
- 4.10.7.4 Hand wash sink accessories will include but are not limited to the following accessories:
- 4.10.7.4(1) Automatic soap dispensers
 - 4.10.7.4(2) Hand dryers – “hands free” type; and
 - 4.10.7.4(3) Paper towel disposals.
 - 4.10.7.4(4) Trash receptacles
- 4.10.7.5 Use commercial grade accessories free from imperfections in manufacturing and finish to meet CSA approved standards and all applicable standards and codes. Review proposed selection with the Authority prior to purchase.
- 4.10.7.6 Install washroom accessories to allow cleaning and maintenance of the accessory and surrounding wall area.
- 4.10.7.7 Use fittings with concealed fastening for security and discouragement of tampering.

4.10.8 Studio Accessories

4.10.8.1 Project Co will provide:

4.10.8.1(1) Film industry quality curtain, rods with both electrical and manual operation system as referenced in the Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)];

4.10.8.1(2) Long paper roll hangers as referenced in the Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)]; and

4.10.8.1(3) Drying racks as referenced in the Appendix 3A [Functional Program(including Pre-Design Room Data Sheets)].

4.10.9 Folding Partitions

4.10.9.1 Provide automatic folding partitions between the lecture theatres and designated classrooms. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

4.10.9.2 Folding partitions systems will be integrated with the design of the Facility and vetted through the Authority.

4.10.9.3 Provide folding partitions with acoustic performance and seal to comply with Appendix 3B [Audio Visual Requirements] and Appendix 3D [Sound Transmission Ratings].

4.10.9.4 Provide an access door in each folding partition system to allow access to the adjacent room.

4.10.9.5 Provide all parts for the folding partition system from one manufacturer, installed by trained and experienced personnel.

4.10.9.6 Provided operating and maintenance data to the Authority.

4.11 Equipment (Division 11)

4.11.1 Refer to Section 7 of Schedule 2 [Design and Construction Protocols] and Appendix 2E [Equipment and Furniture].

4.11.2 Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

4.11.3 Project Co will provide adequate servicing capabilities for all equipment.

4.11.4 Project Co will be responsible for providing the rough-in and coordination of equipment.

- 4.11.5 Public washrooms, water fountains, and trash and recycling stations will be located on each level. They will be grouped together adjacent to the main user vertical circulation stairs and/or elevators. Their location and configuration will support the general clarity of the building layout. At a minimum, Project Co will provide female washrooms with 28 toilets, mens' washrooms with 13 toilets and 22 urinals, plus one gender neutral washroom per floor.
- 4.11.6 Project Co will provide sound booths and sound control rooms as per the requirements of Appendix 3B [Audio Visual Requirements] and Appendix 3D [Sound Transmission Ratings] and in review with the Authority.
- 4.11.7 Window Washing Systems
 - 4.11.7.1 Provide equipment and appropriate anchors to facilitate window washing as per acceptable safety and industry standards.

4.12 Furnishings (Division 12)

- 4.12.1 Furniture, Millwork and Casework
 - 4.12.1.1 Refer to Appendix 2E [Equipment and Furniture];
 - 4.12.1.2 Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)];
 - 4.12.1.3 Project Co will provide all furniture, millwork and casework to support the programs and functions described in the Functional Program.
 - 4.12.1.4 Project Co will provide fixed and retractable tiered theatre seating as noted in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] and Appendix 3B [Audio Visual Requirements]. Project Co shall provide for future installation of retractable tiered seating for B12 - 16 Motion Capture Studio.
 - 4.12.1.5 Wood finishes will be selected to reinforce the objectives of the *Wood First Act* (British Columbia).
 - 4.12.1.6 Materials to meet LEED principles and requirements.
 - 4.12.1.7 Millwork to meet AWMAC standards. Project Co to provide AWMAC inspection reports.
 - 4.12.1.8 Such furniture, millwork and casework include:
 - 4.12.1.8(1) Tables, workstations, furniture storage carts;
 - 4.12.1.8(2) Kitchen counters and cabinets;
 - 4.12.1.8(3) Food service/ eating area millwork;

- 4.12.1.8(4) Reception stations;
- 4.12.1.8(5) Library counters and millwork;
- 4.12.1.8(6) Curatorial millwork;
- 4.12.1.8(7) Shipping and receiving millwork;
- 4.12.1.8(8) Book/ supplies store millwork;
- 4.12.1.8(9) Studios, technology support and classroom millwork;
- 4.12.1.8(10) Work/study carrels; and
- 4.12.1.8(11) Lockable display cases.

4.12.1.9 For each of the above items, determine in consultation with the Authority whether the items will be furniture, millwork or casework.

4.12.1.10 Wood Casework

- 4.12.1.10(1) Cabinetwork and framing system will be constructed of prime grade selected materials to conform to AWMAC Premium Grade; Flush Overlay Cabinet construction.
- 4.12.1.10(2) Fabricate cabinets and cases as self-contained modules and in accordance with the best practices of the wood furniture industry. Finish exterior and interior surfaces to allow for relocation without the need of additional finishing.
- 4.12.1.10(3) Assemble units with concealed fasteners, or glued and screwed construction, making each unit rigid and self-supporting for use interchangeably in an assembly or for single unit use.

4.12.2 Window Coverings

4.12.2.1 Basic Requirements

- 4.12.2.1(1) Window coverings will be commercial grade and meet Authority's durability standards.
- 4.12.2.1(2) Project Co to provide design concept and subsequent samples for Authority approval.
- 4.12.2.1(3) Window coverings will allow control of exterior light entering the room during daylight hours and provide privacy during daylight and non-daylight hours.

4.12.2.1(4) Window coverings will be designed to minimize light spillage into adjacent areas.

4.12.2.1(5) Materials, tracks, seals and operation will be suited to the purpose in rooms requiring black-out blinds.

4.12.2.1(6) Window coverings will be designed and manufactured using materials and mechanisms that minimize cleaning and maintenance operations.

4.12.2.1(7) Provide window coverings as follows:

4.12.2.1(7)(a) To all exterior windows, vertical blinds, but other products will be considered provided they control privacy, sun and heat control consistent with the energy management plan;

4.12.2.1(7)(b) To all interior windows where privacy is a concern;

4.12.2.1(7)(c) To all program areas requiring black out blinds, and

4.12.2.1(7)(d) All window coverings must be easy to remove and clean.

4.12.2.2 Performance Criteria

4.12.2.2(1) Window Shade Systems

4.12.2.2(1)(a) Will be PVC or vinyl-coated polyester or fibreglass yarn.

4.12.2.2(1)(b) Will be waterproof, washable, rot-proof, flame-resistant, fungal and bacteria-resistant, colourfast to light, glare-reducing, and able to control heat gain and provide external visibility.

4.12.2.2(1)(c) Will pass Small Scale Vertical Burn requirements in accordance with CAN/ULC-S109 or NFPA-701.

4.12.2.2(1)(d) Will be tested in accordance with ASHRAE Standard 74073 for shading coefficient, fungal resistance in accordance with ASTM G21, and bacterial resistance.

4.13 Conveying Equipment (Division 14)

4.13.1 Basic Requirements

- 4.13.1.1 The elevator systems will be designed to accommodate the requirements / needs of the Facility in a manner that contributes to the overall efficiency and effectiveness of the Facility operations.
- 4.13.1.2 Elevator systems will be designed to ensure there is sufficient capacity to accommodate the wide range of user and functionality requirements, in a manner which satisfies expectations for safety, reliability, responsiveness, accessibility and operational efficiency.
- 4.13.1.3 Provisions will be considered for persons with special mobility needs.
- 4.13.1.4 Elevators will support access provisions, for people and materials, to all functional areas. Elevator access to all Facility levels, including mechanical levels, will be provided by at least one elevator.
- 4.13.1.5 Equipment provided will have a proven track record of at least five years field operation in Canada in similar environments and of similar configuration.
- 4.13.1.6 Durable elevator cab finishes (including stainless steel fronts, interiors, handrails and bumpers) will be provided. Interior cab design and finishes will be pre-approved by the Authority

4.13.2 Performance Criteria for Elevators

4.13.2.1 Scope of Work

- 4.13.2.1(1) Supply and install the necessary number of passenger elevators and one (1) service elevator, with equipment and performance characteristics as required. Provide all necessary components to make elevator systems fully operational and functional, whether or not specifically referenced in Schedule 3.
- 4.13.2.1(2) The service elevator will be sized for a minimum capacity of 5000 lbs. with double entrance doors to accommodate a regulation size skyjack/forklift for ease of delivery.
- 4.13.2.1(3) Supply and install an elevator to serve the function of the library should it be designed as a two-storey space. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 4.13.2.1(4) Provide all permits, labour, materials, products, equipment, services and all else necessary for the design, manufacture, delivery, installation and services required for a complete and fully functioning elevator system.

4.13.2.1(5) Obtain and pay for governmental design submission, registration, inspection and permit, as required (except for ownership and operation license), and make such tests as required by the British Columbia Safety Authority prior to licensing.

4.13.2.2 Codes, By-laws, and Regulations

4.13.2.2(1) Provide equipment and perform work in accordance with all local, provincial and federal codes, by-laws, and regulations.

4.13.2.2(2) Provide equipment and perform work in accordance with the latest edition of the B44 Safety Code for Elevators and any other code which may govern the installation.

4.13.2.3 Wiring Diagrams and Manuals

4.13.2.3(1) Prior to Service Commencement, supply to the Authority three sets of elevator manuals including the information itemized below:

4.13.2.3(1)(a) Design submission documents submitted to BCSA for permit;

4.13.2.3(1)(b) Final shop drawings;

4.13.2.3(1)(c) Description of special features such as firefighters emergency operation, independent service, emergency power operation, two-way voice communication and security operation;

4.13.2.3(1)(d) As-built wiring and schematic diagrams;

4.13.2.3(1)(e) Schedule of recommended routine maintenance procedures; and

4.13.2.3(1)(f) A description of diagnostic procedures, including complete fault code listing and troubleshooting instructions.

4.13.2.4 Training

4.13.2.4(1) At completion of the Project provide a training session for the Authority, consisting of a review of the documentation and operation of the equipment and features.

4.13.2.5 Barrier-Free Access

4.13.2.5(1) Arrange the controls and fixtures to meet barrier-free access requirements of the B44 Safety Code for Elevators and any other code which may govern the installation.

4.13.2.6 Fixtures

4.13.2.6(1) Provide buttons with LED illumination and stainless steel targets.

4.13.2.7 Operating Conditions

4.13.2.7(1) Provide elevating equipment that will operate normally when the machine room and hoist way temperature is between 5 and 35 degrees Celsius.

4.13.2.7(2) Provide elevating equipment that will operate normally when the power supply is within 10 percent of its rated voltage.

4.13.2.8 Seismic requirements

4.13.2.8(1) Comply with CSA B44 Safety Code for Elevators and any other code which may govern the installation.

4.13.2.9 Maintainability

4.13.2.9(1) Arrange the elevating equipment such that there are no times, dates, trips or other counters that would shut down the equipment or change its operation.

4.13.2.9(2) Elevator equipment provided will not contain proprietary features which limit the Authority's ability to engage a registered elevator maintenance contractor, other than the original manufacturer / installer, to provide routine maintenance services.

4.13.2.9(3) In the event specialized tools or software are required to perform routine maintenance services, such tools will be either provided as "on board" equipment, or as separate devices. Such tools or software will be provided with the equipment and will become the property of the Authority.

4.13.2.10 Operational Features

4.13.2.10(1) Provide the required wiring in the travelling cable run between the car top and the controller as well as power to the car top for the camera.

4.13.2.10(2) Provide equipment and labour for installation of a card reader security system. Provide the required wiring between the card reader and the elevator security box in the machine room

along elevator controller connections and circuits for the security system (including floor tracking).

4.13.2.11 Operating Performance

- 4.13.2.11(1) Levelling – Car will stop within 3 mm (1/8") of the floor level.
- 4.13.2.11(2) Operating time - The operating time between 2 floors will be 17.0 seconds or less (based on 1.2 metres wide two speed side opening doors and a speed of 45.7 mpm and travel of 4.5 metres. Measure the operating time from the time that the doors begin to close until they are 3/4 open at the next floor.
- 4.13.2.11(3) Ride quality - Lateral acceleration (front to rear and side to side) measured during express runs will be less than 150 mm/s/s (0.5 f/s/s) peak to peak.
- 4.13.2.11(4) Door equipment noise level will be less than 62 decibels during a full door open and door close operation. Measure the noise levels using a sound level meter set to the "A" scale for a fast response.
- 4.13.2.11(5) Machine room equipment will be arranged so that the noise level with the elevator running is less than 80 decibels. Measure the noise levels using a sound level meter set to the "A" scale for a fast response.

End of Section

PART 5. FACILITIES SERVICES SUBGROUP SPECIFICATIONS

5.1 Structural Engineering

5.1.1.1 Structural Design Principles

- 5.1.1.1(1) Project Co.'s structural engineer-of-record will be a professional engineer and a designated structural engineer licensed to practice in the Province of British Columbia with demonstrated experience in undertaking the structural design of buildings similar in size and complexity to the Facility.
- 5.1.1.1(2) The structural design, including minimum design loads and general provisions and material specifications, will satisfy the more stringent requirements of the City of Vancouver Building By-Law, other applicable or referenced design standards, loading criteria required by equipment suppliers or construction technique and the principles detailed in this Section.
- 5.1.1.1(3) As required by the City of Vancouver Building By- Law, prior to applying for a building permit for the Facility, Project Co will have a qualified second Professional Engineer licensed in the Province of British Columbia perform a concept review satisfying the requirements of the Association of Professional Engineers and Geo-scientists of British Columbia Quality Management By-law.
- 5.1.1.1(4) Project Co.'s structural engineer-of-record will perform field reviews of the construction at sufficient frequency and review of the reports of the applicable inspection and testing agencies to verify that the building structures of the Facility have been built in substantial conformance to the Issued for Construction structural drawings and any authorized amendments thereto.
- 5.1.1.1(5) Classrooms, lecture theatres, gallery, concourse and workshops will contain no internal columns, unless approved by the Authority.
- 5.1.1.1(6) Consider Wood First Act in designing the facility structural elements.

5.2 Sub Structures

- 5.2.1 Building foundation systems and site preparation design will be in accordance with recommendations from a qualified geotechnical engineer registered in the Province of

British Columbia. Building foundations, including piling, conventional footings, or raft slabs, will be designed by the structural engineer-of-record.

5.2.2 During site preparation and construction, a qualified geotechnical engineer, registered in the Province of British Columbia, will provide site reviews and appropriate testing to confirm the general intent of the foundation and site preparation design recommendations are carried out. Refer to Section 4.2 [Existing Site Conditions] of this Schedule. A geotechnical report is available.

5.2.3 Design Loads

5.2.3.1 Performance Criteria

5.2.3.1(1) Use the following minimum floor design specified live loads, except where the specific use and occupancy of a space requires a higher live load

5.2.3.1(1)(a) Main (ground) floor and Assembly Areas: 4.8 kPa (100 psf);

5.2.3.1(1)(b) Upper Floors 3.60 kPa (75 psf); and

5.2.3.1(1)(c) Mechanical/electrical service rooms: 6.0 kPa (125 psf);

5.2.3.1(1)(d) For any areas not specified above use the Live Loads specified by the City of Vancouver Building By-Law.

5.2.3.1(2) Design floors to accommodate concentrated loads from equipment, fixtures and machinery. Design floors for a minimum superimposed specified dead load allowance of 1.0 kPa to allow for partitions, and 0.5 kPa to allow for ceilings and mechanical equipment. Design roofs for a minimum net uplift wind load of 1.5 kPa and for the minimum snow and rain loads required by the City of Vancouver Building By-Law. Design roofs for the superimposed specified dead load of roofing materials, ceilings, mechanical equipment, but not less than 1.5 kPa (30 psf) to allow for future re-roofing alternatives.

5.2.3.1(3) Design floors and roofs above mechanical and electrical service rooms for a superimposed suspended equipment specified dead load of 2.0 kPa (40 psf) in addition to the minimum dead load allowances specified above.

5.2.3.1(4) Design all Facility elements, including overall building stability, for applicable wind and seismic loads specified in the City of Vancouver Building By-Law.

5.2.4 Flexibility for Future Change

- 5.2.4.1 Select a structural system that will readily accommodate future interior changes for similar design loads without the addition of structural members, welding, noise, dust, or demolition.
- 5.2.4.2 To accommodate flexibility in the layout of the Facility the minimum primary structural support grid will be not less than 10m x 10m. Atrium/Concourse and End spans may be less as approved by the Authority.
- 5.2.4.3 Deflection Limitations
- 5.2.4.3(1) Design the structure to meet the deflection limits of the City of Vancouver Building By-Law, and in accordance with the applicable materials design standards listed in Section 2.1 [Standards] of this Schedule as a minimum, and as appropriate for the non-structural components of the Facility.
- 5.2.4.4 Vibration Limitations
- 5.2.4.4(1) Design the structural system to minimize the effects of floor vibration due to use, occupancy, and equipment. Vibration is to be limited to acceptable levels for the use and occupancy of the floors.
- 5.2.4.5 Floor system vibration characteristics are to be in accordance with Commentary D of the NBC 2010 Edition.
- 5.2.4.6 Durability
- 5.2.4.6(1) Design the structure and structural components of the Facility for a minimum 60-year lifespan.
- 5.2.4.6(2) Design the structure in accordance with all applicable materials standards.
- 5.2.4.6(3) Design the structure and structural components of the Facility to minimize the effects of corrosion and deterioration due to the environment and use in accordance with the following:
- 5.2.4.6(3)(a) Adequate concrete crack control joints and expansion/contraction joints. Caulk exposed joints;
- 5.2.4.6(3)(b) Reinforce concrete for crack control and repair exposed cracks;

5.2.4.6(3)(c) Hot-dip galvanize exterior exposed steel; and steel protection angles to exposed columns in loading bays; and

5.2.4.6(3)(d) Embedded steel protection angles and skid plates for loading docks and garbage compactors.

5.2.4.7 Thermal Expansion

5.2.4.7(1) Design the primary and secondary structural elements to accommodate the effects of thermal movements of the Facility structure.

5.3 Mechanical Systems

5.3.1 General Design Principles

5.3.1.1 Project Co will provide mechanical systems (including HVAC, fire protection, plumbing and related systems) that:

5.3.1.1(1) Are configured and located in such a way to avoid, as much as reasonable, entry into regularly occupied areas to perform maintenance and repairs;

5.3.1.1(2) Are developed to provide reliability of continual operation. Adequate partial load redundancy will be included in system design of central plant systems (HVAC heating and cooling plant, and all central pumping systems). Partial load redundancy is to be accomplished at the central plant level by providing equipment such that with the failure of any one piece of equipment (pump, boiler, cooling tower, chiller etc.); the system can function with a minimum capacity of 50% of the peak design load. This requirement will not necessarily apply to air handling unit fans;

5.3.1.1(3) Are vibration isolated to minimize noise and vibration through the structure or other components of the Facility;

5.3.1.1(4) comply with all applicable codes, standards, regulations and guidelines including acoustic requirements in ASHRAE standards; All mechanical systems, equipment, material and installation will conform to the latest version of all the applicable codes, standards, regulations and guidelines; and

5.3.1.1(5) Incorporate flexibility and adaptability for future system modifications without major disruption to the Facility

infrastructure. Consideration will be given to allow future subdividing (or amalgamation) of HVAC system zones.

- 5.3.1.2 Project Co will accommodate the vertical and horizontal distribution of electrical and mechanical services to allow maintenance and changes to occur with the least amount of disruption.

5.3.2 Additional Requirements

- 5.3.2.1 Steam, water, glycol and other fluids used within mechanical systems will be treated to prevent corrosion, algae growth, buildup of deposits, disease, bacteria and will prolong the equipment life.
- 5.3.2.2 Pipes, ducts and fittings will be insulated to conserve energy, prevent condensation, attenuate noise and prevent accidental burns.
- 5.3.2.3 All plumbing and mechanical ducts will be routed away from all communication rooms, electrical rooms, server and elevator machine rooms unless servicing those rooms.
- 5.3.2.4 All mechanical, HVAC, plumbing, fire protection, and speciality systems and gas systems will be vibration isolated to minimize noise and vibration through the structure or other components of the Facility.
- 5.3.2.5 The mechanical system design will be developed in conjunction with BC Hydro's New Construction Program to pursue cost effective energy conservation measures. Refer to Schedule 2 [Design and Construction Protocols] requirements.
- 5.3.2.6 Provide Energy Model in BC Hydro Powersmart approved energy modeling software and adhere to all related requirements.
- 5.3.2.7 Provide environmental controls for specialty spaces (such as the gallery) to meet the performance requirements. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

5.4 Fire Suppression (Division 21)

- 5.4.1.1 Fire Protection

5.4.1.2 Basic Requirements

5.4.1.2(1) Provide all required fire protection for the Facility.

5.4.1.2(2) Provide a sprinkler system and equipment that is designed for the applicable occupancy classification.

5.4.1.2(3) Provide a double check valve assembly on the sprinkler system take-off connection from the water supply. The assembly will

be complete with OS&Y gate valves on both sides and tamper proof switches.

- 5.4.1.2(4) Provide a fire pump, if required as determined by the fire protection design engineer, with a transfer switch that is part of the fire pump controller. Mount the switch package in a separate mechanically attached enclosure that is approved by UL, ULC, FM and CSA and built to NFPA 20 standards for this application.
- 5.4.1.2(5) Provide a dry type sprinkler system or anti-freeze sprinkler system in areas that may be subject to freezing temperatures.
- 5.4.1.2(6) Sprinkler heads in areas subject to vandalism will be vandal proof.
- 5.4.1.2(7) Provide standpipes in all stairwells as required.
- 5.4.1.2(8) Provide fire extinguishers complete with fully recessed cabinets in corridors. Each fire extinguisher will be located and approved for the hazard and classification of the space that it serves. Fire extinguishers are to be installed to meet NFPA and VBBL requirements.
- 5.4.1.2(9) Provide zone shut-off valves that are readily identifiable and accessible from the floor level.
- 5.4.1.2(10) Provide fire department connections at a location that is approved by applicable authorities.
- 5.4.1.2(11) Provide a double-interlock dry pre-action sprinkler system in all critical areas where water damage may affect the operation of key areas or equipment, including but not limited to:
 - 5.4.1.2(11)(a) [Intentionally Deleted]
 - 5.4.1.2(11)(b) Main equipment and communications server room
 - 5.4.1.2(11)(c) The gallery; and
 - 5.4.1.2(11)(d) Archival storage areas such as the library archival storage.

5.4.1.3 Performance Criteria

- 5.4.1.3(1) Fire protection systems will comply with all applicable standards, including the applicable NFPA standards.

- 5.4.1.3(2) All equipment will be ULC and FM approved.
- 5.4.1.3(3) Equipment installation will comply with manufacturers' requirements.
- 5.4.1.3(4) Fire protection systems and equipment will be installed, tested and certified by a qualified and licensed contractor, who is regularly engaged in such installations.

5.5 Plumbing (Division 22)

5.5.1 Site Services

- 5.5.1.1 Provide individual water, fire protection, natural gas, sanitary and storm services as required and sized to suit the usage needs of the Facility.
- 5.5.1.2 Provide a water meter, reduced pressure backflow preventer and independent shut-off valve on the main water supply to the Facility. Calculate and submit to the Authority the estimated maximum flow requirement for the domestic water supply.
- 5.5.1.3 Basic Requirements
 - 5.5.1.3(1) Provide utilities-commission approved meters for domestic water and natural gas. The meters will be used to accurately measure water flow and natural gas consumption in all flow conditions. Refer to Appendix 2D [Energy].
 - 5.5.1.3(2) Provide the HVAC, plumbing, and fire protection to reasonably minimize disruption to the operation of the Facility during maintenance or repairs. Typical isolation, maintenance, balancing and other service valves will be located in the corridor ceiling spaces and will be accessible.
 - 5.5.1.3(3) Distribute plumbing by means of risers to each floor to a maximum of 33% of the floor area. Provide isolation valves to each area.
 - 5.5.1.3(4) Incorporate flexibility in the system designs to accommodate future alterations.
 - 5.5.1.3(5) Label all systems clearly, including painting and labelling of all pipes, ceiling identification dots, valve tagging, and emergency valve identification signage.
 - 5.5.1.3(6) Provide all fixtures and equipment to manufacturer's specifications and standards.

- 5.5.1.3(7) Provide water systems to ensure that water is supplied at the required pressures to all water outlets. Minimum water pressure will be maintained at 35 PSI to the most remote fixture. Provide booster pump system if necessary with partial load redundancy and variable frequency drives.
 - 5.5.1.3(8) Provide services with easy access and serviceability and to avoid interference with other services during operation and maintenance activities.
 - 5.5.1.3(9) Provide floor drains in all mechanical rooms and for all devices requiring these drains including but not limited to backflow prevention devices and systems with tanks. Ensure all drain piping is terminated in floor drains.
 - 5.5.1.3(10) Provide interceptors to intercept oil, grease, dirt, solids and all materials / chemicals required for the operation of the Facility.
 - 5.5.1.3(11) Provide a domestic water strainer at the incoming service into the Facility.
 - 5.5.1.3(12) Provide special drainage and treatment provisions, as required for studios,
- 5.5.1.4 Performance Criteria
- 5.5.1.4(1) Provide all drainage systems such that the system connects to the Site drainage services, utilizing gravity drainage wherever possible.
 - 5.5.1.4(2) If pile foundations are used to support the structure, all under slab piping will be supported (hung) from the concrete slab above or supported via strategic sleeving of grade beams. Hangers and rods will be of sufficient strength and be installed at intervals to carry the pipe and load and maintain the required slope. Hangers and rods will be corrosion resistant. Install light-weight fill above all piping that is supported (hung) from the concrete slab above.
 - 5.5.1.4(3) Pumping systems for subsurface, storm, or sanitary drainage will include 100% redundancy (one redundant unit for each active unit) and related equipment will be supplied with emergency power. The sump will have twin compartments for settling and pumping and will be sized to prevent short cycling of the pump. Provide local alarm and outputs to the BMS for high water levels and pump failure.

- 5.5.1.4(4) Insulate storm drainage, domestic water piping, cooling water and exposed p-traps throughout per BCICA quality standards. Where piping and/or piping components are subject to freezing, provide insulation and heat tracing. Ensure life-safety systems are not installed in locations subject to freezing.
- 5.5.1.4(5) Provide drainage as required to alleviate water pressure exerted onto the bottom of foundations and/or floor slabs.
- 5.5.1.4(6) All plumbing drainage for acidic fluids will be of 'acid' resistant material to a point where dilution, as a result of additional discharge from other sources, reduces the acidity of the discharge to a neutral pH.
- 5.5.1.4(7) Provide flushing and disinfection of domestic water systems. Provide independent testing of piping systems once flushing and cleaning has been completed.
- 5.5.1.4(8) Provide automatic trap primers in drains that are subject to losing the trap seal.
- 5.5.1.4(9) Provide electronic trap primers with solenoid valves where usage of plumbing fixtures is infrequent.

5.5.2 Plumbing Fixtures

5.5.2.1 Basic Requirements

- 5.5.2.1(1) All plumbing fixtures will be LEED compliant and suitable for an institutional facility. Fixtures selected must have proven acceptable institutional performance from previous installations.
- 5.5.2.1(2) Provide flush valves for toilets.
- 5.5.2.1(3) Barrier-free plumbing fixtures and fittings will be provided where required by City of Vancouver Building By-law.
- 5.5.2.1(4) Public toilets will consist of wall hung elongated bowls with an open front seat and wired electronic flush valves.
- 5.5.2.1(5) Showers will be provided with pressure balanced and high temperature limit shower valves, metal shower heads will be utilized. Shower bases will ensure that the water is contained within the shower area.
- 5.5.2.1(6) Urinals will be wall-hung and low-consumption with electronic hands-free flush valve operation.

- 5.5.2.1(7) Public washroom lavatory fixtures will be made of an impervious, durable material and will have electronic hands-free type faucets with single temperature supply that can be adjusted and set to the desired temperature.
 - 5.5.2.1(8) Provide stainless steel sinks with interceptors in studio spaces, workshops and corridors comparable to the existing Facility.
 - 5.5.2.1(9) Provide stainless steel sinks with non-mechanically fastened interceptors/ traps below to catch debris in studios, workshops and corridors.
 - 5.5.2.1(10) Provide vented, backlit and non-corrosive/non-reactive sinks as noted in the functional program for specific spaces.
 - 5.5.2.1(11) Equipment cleaning sinks will be made of stainless steel with blade handle faucets and gooseneck spout. Sinks sizes will be large and deep (comparable to existing) to accommodate proper washing of equipment.
 - 5.5.2.1(12) Provide electronic trap primers with automatic solenoid valves at p-traps for all floor drains. Provide suitable quantities of janitors' sinks (minimum 1 every 60m), exterior including roof top hose bibs (every 30m), eye wash stations in each workshop /studio (or other sources of potable water acceptable to the Authority acting reasonably) to provide sufficient service to the Facility. Provide all appropriate services and connections to all equipment to meet program requirements. Provide all accessories as needed.
 - 5.5.2.1(13) Provide water fountains in corridor recesses near washrooms, in reasonable quantity and locations as reviewed with the Authority.
 - 5.5.2.1(14) Provide FDs for all washrooms.
- 5.5.2.2 Performance Criteria
- 5.5.2.2(1) Provide isolation valves for all plumbing services and clearly identify the location of all valves.
 - 5.5.2.2(2) Provide accessible clean-outs for all sinks and lavatories below the flood-level rim of the sink.
 - 5.5.2.2(3) Size flush valves for the water consumption of the bowl. Toilet bowls will not splash or spray water onto the toilet rim or anywhere outside of the toilet bowl.

5.5.2.2(4) All electronic sensor-activated fixtures will be hardwired.

5.5.2.2(5) If system pressure exceeds the acceptable delivery pressure, then provide pressure reducing valves with 1/3 – 2/3 parallel operation. Place the valves in accessible locations.

5.5.3 Domestic Hot Water Systems

5.5.3.1 Basic Requirements

5.5.3.1(1) Provide a domestic hot water system with sufficient capacity and recovery rate as per ASPE standards for the hot water requirements of the Facility. Allow for expansion capacity within each system in accordance with Section 5.3.1.1(5)

5.5.3.1(2) Calculate domestic hot water demand in accordance with ASPE Plumbing Engineering Design Handbook.

5.5.3.1(3) Domestic hot water will be stored at an adequate temperature to serve the needs of the Facility at not less than 60°C. Provide mixing valves with thermal safety (fail safe) shut-off valves where temperatures are required to be less than 60°C at point of use. Generally piping distribution is 60°C and client/public outlets will be 43°C.

5.5.3.1(4) Ensure timely delivery of hot water to all fixtures. Provide a domestic hot water recirculation system.

5.5.3.1(5) The Domestic hot water system will follow the design requirements associated with the NEU District Energy System as published by the City of Vancouver.

5.5.3.1(6) Design the domestic hot water system to prevent growth and spread of Legionella bacteria within the piping, fixtures or any other component. Design methods may include eliminating dead-leg piping and minimizing uncirculated piping by connecting the circulation system as close as possible to fixtures.

5.5.3.2 Performance Criteria

5.5.3.2(1) Provide the hot water generating equipment based on parallel operation to allow part load redundancy.

5.5.3.2(2) Generate and store domestic hot water at 60°C to minimize conditions for Legionella bacteria.

5.5.3.2(3) Recirculate domestic hot water from the distribution system(s) back to the generating equipment.

5.5.3.2(4) Hands free fixture mixing valves will have hot water recirculation connection within 50 mm of thermal mixing device.

5.5.3.2(5) Monitor hot water supply temperatures via the BMS and provide alarm outputs when the temperature exceeds the design set point.

5.5.3.2(6) The domestic hot water generating equipment will meet the energy efficiency requirements of ASHRAE 90.1 2010.

5.5.4 Specialty Systems

5.5.4.1 Provide all specialty systems required for the operation of the Facility, including:

5.5.4.1(1) Acid waste piping and venting;

5.5.4.1(2) Oil, grease, dirt, and solids interceptors; and

5.5.4.1(3) Material / chemical interceptors used in the operation of the Facility.

5.5.4.1(4) PVC piping for area(s) noted in the functional program. PVC, with approved fire stopping and if crossing a fire separation, where required under the City of Vancouver Building By-law code classification.

5.5.4.2 Interceptors will be provided in accordance with manufacturer's specifications.

5.5.4.3 Acid waste, vent piping, and fittings will be suitable for the pH levels of the waste system.

5.6 Heating, Ventilating and Air Conditioning (Division 23)

5.6.1 Building Heat Source

5.6.1.1 Project Co will provide heating for the Facility by way of a hydronic heating system.

5.6.1.2 The hydronic system heating will connect to the Neighbourhood Energy Utility (NEU) District Energy System. Allowances will be made for the future installation of the required Energy Transfer Station as outlined in the published Design Guidelines as published by the City of Vancouver for systems intending to connect to the NEU system. An independent heating plant is not required.

5.6.1.3 Thermal generation may involve a combination of passive (solar and geothermal) and active (solar) energies, supplemented by the use of district energy.

- 5.6.1.4 The hydronic heating system will be designed to be compatible with the NEU District Energy Systems outlined in the associated Design Guidelines published by the City of Vancouver.
- 5.6.1.5 Performance Criteria
- 5.6.1.5(1) The projects heating system will be designed to meet or exceed the energy efficiency requirements of ASHRAE 90.1 2010 as required by the City of Vancouver Building By-Law; the project's energy use targets; and the project's LEED criteria.
 - 5.6.1.5(2) Refer to the design guidelines for the maximum DHR temperature from this building.
 - 5.6.1.5(3) The building heating and domestic hot water systems will be designed to be connected to the NEU District Energy System.
 - 5.6.1.5(4) Provide all necessary parts, components and appurtenances for an energy transfer station (ETS). Provide connections to the district heating water supply and return (DHS&R), heat exchangers, associated mechanical equipment and all work required for the installation in accordance with the design guidelines. Project Co will satisfy themselves as to the requirements of the City regarding interior space allocation, connection requirements and installation scope, including any applicable By-law and regulations.
 - 5.6.1.5(5) Provide all piping for appropriate pressures.
 - 5.6.1.5(6) All DHS&R piping run external to the campus building will be insulated, protected and direct-buried as per European Standard EN253.
 - 5.6.1.5(7) The connection from the NRU District Energy system will be used for the thermal energy source for all necessary heating within the facility, except where the high temperature requirement for a service or process cannot be achieved from the District heating System.
 - 5.6.1.5(8) Provide standalone steam generation equipment for all humidification and process steam requirements within the facility where required.
- 5.6.2 Heating
- 5.6.2.1 Basic Requirements

- 5.6.2.1(1) Provide adequate expansion compensation for heating piping. Location of anchors and guides, design of expansion compensation loops and selection of expansion compensation devices will be based on a thorough review of piping layout, and piping stress analysis.
- 5.6.2.1(2) All high points in piping will be equipped with air removal devices such as air collection chambers and air vents.
- 5.6.2.1(3) Equipment and piping will be installed with adequate service space, access panels and the ability to remove equipment for servicing or replacement.
- 5.6.2.1(4) Isolation valves, unions and bypass piping will be provided to allow for equipment isolation and removal without unduly affecting the system operation or major drain down.
- 5.6.2.1(5) Balancing valves, flow-measuring devices, temperature and pressure sensors will be provided throughout the system to facilitate system balancing.
- 5.6.2.1(6) Design pumps to operate at the system fluid temperature without vapour binding and cavitation. Pumps, will be non-overloading in parallel or individual operation, and will operate within 25% of the midpoint of published maximum efficiency curve. Where there is more than 40% variation in flow, variable frequency drives will be provided.
- 5.6.2.1(7) Pump construction and installation will permit complete pump servicing without disrupting piping or motor connections.
- 5.6.2.1(8) Locate services that require access for regular maintenance above non-critical spaces.
- 5.6.2.1(9) Insulate all heating water piping, equipment and accessories in accordance with all applicable standards, including applicable BCICA and ASHRAE standards.
- 5.6.2.1(10) Utilize screw fittings for piping 50mm and smaller and welded fittings for piping 65mm and larger.
- 5.6.2.1(11) Design seismic mitigation and building separation devices for all piping that crosses buildings and/or utility corridors.
- 5.6.2.1(12) All piping will be accessible. In-slab piping will not be allowed, except for radiant heating piping (PEX piping) downstream of the manifold.

5.6.3 Air Conditioning

5.6.3.1 Basic Requirements

- 5.6.3.1(1) Provide all necessary space, ventilation and process cooling for the Facility.
- 5.6.3.1(2) Provide 100% outdoor air for free cooling as the first means of space cooling.
- 5.6.3.1(3) Apply sensible and latent energy recovery systems as required to reduce plant cooling requirements. Provide analysis of energy savings, life cycle costing and operational and maintenance concerns. Supply the analysis to the Authority.
- 5.6.3.1(4) The design and installation will comply with all applicable standards, including CSA B52, Mechanical Refrigeration Code.
- 5.6.3.1(5) Equipment will be CSA approved, and will meet all applicable standards, including applicable sections of the ASME Code.
- 5.6.3.1(6) Welding materials, fabrication standards, and labour qualifications will comply with all applicable standards, including applicable ANSI and ASTM Codes.
- 5.6.3.1(7) Chillers will be rated in accordance with ARI 550/590-98.
- 5.6.3.1(8) Chillers will have multiple individual refrigerant circuits. Prime mover nameplate ratings for each circuit will not exceed 200 KW for groups A1, A2 or B1 refrigerants.
- 5.6.3.1(9) Cooling towers performance will be certified in accordance with CTI (Cooling Tower Institute) Standard STD-201. No open type cooling towers are allowed except the following:
 - 5.6.3.1(9)(a) Spray coil (closed circuit evaporative fluid cooler) type cooling towers; and
 - 5.6.3.1(9)(b) Conventional open type cooling towers, if such towers are located away from fresh air intakes.
- 5.6.3.1(10) Provide chillers and cooling towers for ease of operation, accessibility for maintenance, safety and appearance.

5.6.3.2 Performance Criteria

- 5.6.3.2(1) Provide dedicated and continuously available cooling systems for all areas containing specialized equipment, server rooms and electrical rooms where heat rejection to outdoors is not possible for managing continuous internal heat gains. Single pass or one through cooling systems are not permitted for any process or use within the Facility due to water use inefficiency.
- 5.6.3.2(2) Provide sufficient space cooling capacity to meet the required indoor design temperatures outlined in applicable ASHRAE Standards while using the July 2.5% outside design wet and dry bulb temperatures outlined in the City of Vancouver Building By-Law.
- 5.6.3.2(3) The large number of technological appliances and various types of equipment will place high demands on the HVAC system. Fluctuations in temperature and humidity, particularly going above 22-24°C temperature and below 40-50% relative humidity, are to be avoided, since they can contribute to equipment failure over the long-term.
- 5.6.3.2(4) Ensure that no air within the air conditioning system, outside of the central air handling equipment, drops below its dew point temperature.
- 5.6.3.2(5) CFC and HCFC based refrigerants will not be used in the refrigeration equipment.
- 5.6.3.2(6) Design piping to be installed in an orderly manner (aligned with structural elements and at right angles). Slope piping to permit complete drainage of the system.
- 5.6.3.2(7) All high points in the closed loop piping will be equipped with air removal devices, such as air collection chambers and air vents.
- 5.6.3.2(8) Provide equipment and piping with adequate service space, access panels and ability to remove equipment from the Facility for servicing or replacement.
- 5.6.3.2(9) Provide isolation valves, unions and bypass piping to allow for equipment isolation and removal without unduly affecting the system operation or major drain down.
- 5.6.3.2(10) Select pumps that operate without vapour binding or cavitation, are non-overloading in parallel or individual operation, and operate within 25% of the mid-point of published maximum efficiency curve.

5.6.3.2(11) Locate services that require access for regular maintenance so that there is minimal disruption to the function of the building.

5.6.3.2(12) Insulate all chilled water piping, equipment and accessories to all applicable standards, including BCICA and ASHRAE standards.

5.6.3.2(13) Utilize screw fittings, welded fittings or roll grooved mechanical couplings for all piping.

5.6.3.2(14) Provide seismic mitigation and building separation devices for all piping that cross seismic joints.

5.6.4 Ventilation

5.6.4.1 Basic Requirements

5.6.4.1(1) Provide all necessary ventilation for the Facility.

5.6.4.1(2) Provide the ventilation system and all components in accordance with all applicable standards, including ASHRAE standards.

5.6.4.1(3) Provide fans with Variable Frequency Drives (VFDs) for energy savings under part-load conditions per ASHRAE 90.1 2010 requirements.

5.6.4.1(4) Provide an indirect and/or direct heat recovery system on the general exhaust air systems where energy savings are possible.

5.6.4.1(5) Shop areas and other studio areas that facilitate programs that generate particulates, fumes, or other substances that are considered unsuitable for recirculation will be served by independent air handling systems. These areas will be designed to be variable airflow type systems and have the capability of providing 100% outside air to each area while maintaining flexibility for future adaptation. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

5.6.4.1(6) Separate ventilation systems will be required for designated studios, classrooms, meeting rooms, boardroom and food services. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

5.6.4.1(7) The digital output centre and all satellite print and copy centres will require separate ventilation.

5.6.4.1(8) Ventilation systems will be designed to maintain full efficiency and performance where stack effect are caused by adverse conditions; and back-up ventilation must be provided.

5.6.4.1(9) Local systems and/ or controls will be required in designated studios, main common spaces and building operations.

5.6.4.2 Performance Criteria

5.6.4.2(1) All equipment for supply air, return air and general exhaust systems located exterior to the Facility will be designed and constructed to with-stand the exposure to outdoor conditions.

5.6.4.2(2) The design of air distribution systems will identify intended airflow patterns; variable air volume (VAV) systems must maintain demand control ventilation supply of outdoor air under part-load conditions; air registry will feature low noise levels.

5.6.4.2(3) All ductwork and plenum spaces will have access for cleaning. Design will specify deterrents to the growth of micro-organisms.

5.6.4.2(4) Make allowances in duct sizing and equipment selections to provide flexibility for future changes in spaces. Allow for a future increase in capacity of 25% on ductwork carrying 10% or less of the total system design airflow capacity. Allow for a future increase in capacity of 10% on the air handling units and ductwork carrying more than 10% of the total system design airflow capacity. Air handling unit equipment and ductwork distribution will also be sized at reduced velocity to allow for future capacity increase.

5.6.4.2(5) Provide fresh air intakes, cooling coil drain pans, air handling units, duct mounted humidifiers, ductwork, and all other interconnected components to prevent moisture or contaminants from collecting within the system. Provide sufficient access panels to allow for inspection and cleaning.

5.6.4.2(6) Insulate all ductwork to all applicable standards, including BCICA and ASHRAE standards.

5.6.5 Exhaust Systems and Specialty Systems

5.6.5.1 Design Principles

5.6.5.1(1) Provide exhaust fans and locate them at the end of the exhaust ductwork systems. Ensure that the fans will be readily

serviceable and are separated from spaces that house other mechanical equipment.

5.6.5.1(2) Speciality systems will include compressed air, process exhaust and ventilation, natural gas as required by codes and standards and the Facility requirements.

5.6.5.1(3) Provide dedicated "source capture" exhaust systems (hoods, flexible arm systems etc.) for studio or shop areas with programs that generate particulate or fume / irritants in dedicated areas such as the assembly areas in Ceramics and Sculpture, Film, Video and Integrated Media, Technology Support etc. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)]. Source capture exhaust systems will be independent from other exhaust systems and consider the compatibility of all potential uses of equipment.

5.6.5.2 Performance Criteria

5.6.5.2(1) Dedicated exhaust systems will be provided as required for the equipment.

5.6.5.2(2) Fume hoods and other smoke / fume generating process booths / space will be provided with dedicated exhaust systems that are corrosion / chemical resistant to the exhaust media.

5.6.6 Metering Requirements for Energy Measurement and Verification

5.6.6.1 Provide all required system meters, and trend logging equipment sensors to comply with and fulfill the energy measurement and verification requirements set out in Appendix 2D [Energy].

5.6.6.2 Metering intervals will be one hour or less.

5.6.7 Sound Attenuation and Vibration Isolation

5.6.7.1 Basic Requirements

5.6.7.1(1) Provide all mechanical systems to prevent sound and vibration transmission between spaces, and transmission from mechanical equipment to the spaces. Provide sound attenuation to limit sound levels in accordance with Appendix 3D [Sound Transmission Ratings]. Design and install mechanical systems located at or near any exterior wall to minimize sound transmission to the neighbouring community.

5.6.7.1(2) Provide vibration isolation devices on all equipment with rotating components.

5.6.7.1(3) All hung equipment will utilize spring isolators designed for the weight and vibration characteristics of the equipment.

5.6.7.1(4) Provide flexible connections where needed to isolate mechanical equipment sound and vibration from ducting, piping and electrical wiring systems.

5.6.7.2 Performance Criteria

5.6.7.2(1) Ensure duct silencers meet or exceed the requirements of the ductwork for cleanliness and inspection.

5.6.7.2(2) Utilize fibre free internal insulation.

5.6.8 Testing, Adjusting, Balancing and Commissioning

5.6.8.1 Without limiting Project Co.'s commissioning obligations under Section 12 [Commissioning] of Schedule 2 [Design and Construction Protocols], demonstrate to the Authority that the mechanical and electrical systems are substantially operational by testing, adjusting and balancing the systems in accordance with Good Industry Practice.

5.7 Specialty Mechanical Systems

5.7.1 Project Co will provide for all special purpose mechanical and plumbing service requirements within each functional component of the Authority's program. Project Co to review locations with the Authority. The major program areas are listed below but not limited to:

5.7.1.1 Generic Rooms

5.7.1.2 A1 entrance concourse/ informal learning

5.7.1.3 A2 general classrooms and lecture theatres

5.7.1.4 A3 library/learning commons / centre for teaching and learning

5.7.1.5 A4 computer lab and classroom support services

5.7.1.6 B1 foundation

5.7.1.7 B2 animation

5.7.1.8 B3 film, video and integrated media

5.7.1.9 B4 interactive + social media art (isma)

- 5.7.1.10 B5 critical and cultural studies/ community engagement + projects
 - 5.7.1.11 B6 communications, industrial and interaction design
 - 5.7.1.12 B7 painting, drawing and illustration
 - 5.7.1.13 B8 photography, print media and digital output centre
 - 5.7.1.14 B9 ceramics and sculpture
 - 5.7.1.15 B10 integrated technology support
 - 5.7.1.16 B11 graduate studies
 - 5.7.1.17 B12 industry liaison office and research
 - 5.7.1.18 C1 student commons, student services and continuing studies
 - 5.7.1.19 C2 aboriginal gathering space
 - 5.7.1.20 C3 gallery
 - 5.7.1.21 C4 book/supplies store
 - 5.7.1.22 C5 food services
 - 5.7.1.23 C6 students' union
 - 5.7.1.24 C7 general meeting rooms
 - 5.7.1.25 D1 academic administration and deans
 - 5.7.1.26 D2 communications and university advancement
 - 5.7.1.27 D3 facilities
 - 5.7.1.28 D4 finance
 - 5.7.1.29 D5 human resources
 - 5.7.1.30 D6 information technology services
 - 5.7.1.31 D7 president's office
 - 5.7.1.32 D8 shipping & receiving/maintenance
 - 5.7.1.33 D9 faculty & staff lounge
- 5.7.2 Specialty Mechanical Exhaust Systems

- 5.7.2.1 Refer to Industrial Ventilation: A Manual of Recommended Practice, 25th Edition specialty mechanical and exhaust systems.
- 5.7.2.2 Project Co will provide for specialty mechanical exhaust systems including but not limited to:
- 5.7.2.2(1) Photocopy exhaust system to contain odors and control high heat gain;
 - 5.7.2.2(2) Exhaust hoods in food prep kitchen and remote fan over domestic stoves ducted directly outdoors;
 - 5.7.2.2(3) Exhaust fan rough in only for C5 Food services area.
 - 5.7.2.2(4) Central dust and/ or chip and/ or fiber extraction systems for each workroom, studio, or shop area with direct connections to all equipment and/ or articulation elephant trunk exhaust snorkels for equipment and multiple connections for work tables (multiple programs);
 - 5.7.2.2(5) Dedicated fume extraction systems with heat recovery for all process rooms as required including high air change rates and replacement filters where applicable for all speciality areas;
 - 5.7.2.2(6) Include canopy hoods, elephant trunk exhaust snorkels, paint booths, adhesives spray booth, print spray booth, high humidity processes, glazing spray booths, welding bays exhaust, resin room, soldering stations etc.;
 - 5.7.2.2(7) High rate direct exhaust systems with heat recovery rooms with high heat gain from equipment or process loads i.e. kilns, process equipment etc.;
 - 5.7.2.2(8) Slot ventilation process exhaust with heat recovery for all work surfaces as required in (multiple) program work spaces i.e. ceramics, welding, media and other areas as required to meet the program requirements;
 - 5.7.2.2(9) Provide dedicated lab room exhaust systems with heat recovery;
 - 5.7.2.2(10) Direct exhaust of hazardous materials storage areas and cabinets;
 - 5.7.2.2(11) Dedicated exhaust for rooms with direct connections from speciality process equipment;
 - 5.7.2.2(12) Provide air scrubbers on all hazardous, odorous or other polluting exhaust systems if Project Co determines, based on each exhaust system, that sufficient dilution or exhaust

discharge location is insufficient to meet good engineering practice, code, or bylaw requirements; and

5.7.2.2(13) Provide chimneys for all gas fired equipment and processes. i.e. kilns, foundry.

5.7.3 Speciality Plumbing Requirements

5.7.3.1 Project Co will provide for specialty plumbing systems including but not limited to:

- 5.7.3.1(1) stainless steel hand sink for coffee kiosks, presentation rooms, lounge areas and design studios;
- 5.7.3.1(2) single compartment stainless steel sinks for kitchenettes;
- 5.7.3.1(3) stainless steel hand sink and double compartment stainless steel kitchen sink for kitchen food prep areas;
- 5.7.3.1(4) plumbing connections for all dishwasher in food prep, coffee kiosks and kitchenettes;
- 5.7.3.1(5) non-refrigerated drinking fountains in all major public areas;
- 5.7.3.1(6) compressed air outlets with multiple connections in each space as required including overhead hose reels where required in workrooms / studio / shop / media areas;
- 5.7.3.1(7) custom fabricated stainless steel and / or acid resistant speciality service sinks with accessible sediment traps designed for the program purpose / needs in all workrooms / studios / shop areas, assembly areas and other areas as required. Sink material, quantity, length depth to be custom design to suite all program requirements and uses i.e. long sink for paint areas, multiple sinks in studio classrooms, speciality dark room sinks, multiple sinks in printmaking, custom sediment tank for stones grinding etc.;
- 5.7.3.1(8) provide suitable filtered water and pressure for water spray tools, pressure spray units and backlighting spray units;
- 5.7.3.1(9) all sinks and FD's in workshops / studios / shop areas, assemble areas and other areas with material use will have material sediment and solids interceptors including clay interceptors;
- 5.7.3.1(10) all sinks and FD's with acid use will be acid resistant and have acid waste and vent piping and acid neutralizers;

5.7.3.1(11) all equipment, sinks and FD's associated with keronite machine and chemistry areas will have silvery recovery;

5.7.3.1(12) deionized water will be supplied to all chemistry areas;

5.7.3.1(13) emergency eye wash and shower station in every workroom / studio / shops, assemble area, tool rooms, prep rooms etc. with material use; and as required to meet the program requirements;

5.7.3.1(14) provide paint helmet air supply and paint spray gun regulated supply air to meet program requirements;

5.7.3.1(15) provide oxy acetylene exterior manifold, bottled storage, switch over connections, piping distribution to all work bays; and

5.7.3.1(16) provide natural gas regulators, piping distribution and connections, to all process equipment and natural gas outlets to meet the program requirement e.g. small forge room gas outlets, foundry and kilns gas connections etc.

5.7.4 Specialty HVAC Systems

5.7.4.1 Humidity Control: for such areas as, but not limited to all periodical and main collection areas, reading rooms, archives, galleries etc. where sensitive material is stored, used or displayed will be served by air handling systems that maintain a targeted humidity level (20°C +/-3°C, 50% RH +/- 5%).

5.7.4.2 Technical offices or ancillary space in all workroom / studios / shops / assemble and other areas with material use will have independent pressure control to ensure positive pressure for dust and odour control.

5.7.4.3 Provide "silent" HVAC systems in all media, audio and photo screening and production spaces, broadcasting spaces etc. Design all HVAC systems to broadcast acoustical standards in these areas i.e. max 800 fpm supply and return acoustically lined ductwork, self-balancing symmetrical layouts with silencers on all air paths in and out of each space.

5.7.4.4 Provide dedicated auxiliary heating and exhaust for drying racks and drying rooms for all process uses.

5.7.4.5 Provide individual temperature zone control for key program areas i.e. reception areas, deans office, faculty, staff, individual offices, meeting rooms and all major classroom, seminar, theatre, gallery workrooms, studios, shops etc. large volume spaces.

- 5.7.4.6 Provide downdraft ventilation systems for downdraft tables, work surfaces and sanding tables etc. in required program areas including exhaust snorkels with multiple articulating arms as required.
- 5.7.4.7 Provide overhead radiant heating in outdoor studio / workroom / shop areas.
- 5.7.4.8 Provide dedicated make up air systems with heat recovery for all process and speciality exhaust systems e.g. labs, fume and dust extraction, process exhaust, equipment exhaust etc.
- 5.7.4.9 Design and provide an HVAC system to meet all high heat loads of process equipment, AV / projector equipment, broadcasting and other equipment required to meet the Design and Construction Energy Target and the specified mandatory minimum level of energy credits under the LEED Rating System.

5.8 Reserved for Future Expansion (Division 24) – NOT USED

5.9 Integrated Automation (Division 25)

5.9.1 Controls

5.9.1.1 Basic Requirements

5.9.1.1(1) Provide a building management system (“BMS”) for the Facility that performs the following functions:

- 5.9.1.1(1)(a) automatically operates, monitors and manages the Facility’s mechanical systems to provide a high level of occupant comfort and maintain a healthy and productive environment;
- 5.9.1.1(1)(b) provides an internet based means of external monitoring, including all associated hardware and software;
- 5.9.1.1(1)(c) interfaces with the building mechanical, electrical and communication systems and controls;
- 5.9.1.1(1)(d) annunciates building and equipment alarms, where required, including fire alarm, security alarms, freezer alarms, lighting, emergency power systems and switchgear alarms;
- 5.9.1.1(1)(e) acquires and collates all data associated with energy measurement and verification as required by Section 5.6.6 (Metering

Requirements) of this Schedule and
Appendix 2D [Energy].

- 5.9.1.2 Design the controls systems to allow monitoring and operation of the Facility from a BMS location in the Facility.
 - 5.9.1.3 The BMS will be a completely integrated (front-end and back-end) Native BACnet DDC system.
 - 5.9.1.4 The BMS will be non-proprietary and designed with open protocol.
 - 5.9.1.5 The BMS will optimize the system performance under all operating conditions to minimize Facility energy usage.
 - 5.9.1.6 The BMS will accommodate future technological changes and the architecture of the BMS will permit expansion of the system for future renovations.
 - 5.9.1.7 The BMS will be an independent system separate from the fire alarm and other control systems.
 - 5.9.1.8 The BMS will be provided as a complete package from one manufacturer, not a composite system from several manufacturers.
 - 5.9.1.9 Provide a separate physical network and any required network equipment for the BMS.
- 5.9.2 Performance Criteria
- 5.9.2.1 Zoning for HVAC systems will be based on occupancy, room location within the Facility, room orientation, and room heating and cooling loads. Configure zoning to minimize reheat/recool.
 - 5.9.2.2 Zone floor areas to provide control of smoke in a fire situation as required by the City of Vancouver Building By-Law.
 - 5.9.2.3 Provide adjustable type thermostats with temperature read out. The temperature range will be controlled by the BMS.
 - 5.9.2.4 Failsafe components will be hard-wired to provide reliable operation in all circumstances.
 - 5.9.2.5 Refer to Section 5.10.14 of this Schedule regarding energy management system, which may be connected to the BMS.
 - 5.9.2.6 The BMS will monitor, control, indicate alarms and provide trending where applicable for all connected sensors and control points.
 - 5.9.2.7 The BMS will be connected to emergency power.

- 5.9.2.8 The BMS will monitor critical alarms for essential building and life safety systems. Critical alarms include:
- 5.9.2.8(1) fire alarm system for alarm, supervisory and trouble;
 - 5.9.2.8(2) all temperature alarms resulting from set point deviations;
 - 5.9.2.8(3) failure of any major HVAC or plumbing equipment;
 - 5.9.2.8(4) all alarms relating to the fire protection system.
- 5.9.2.9 The BMS documentation will include a detailed narrative description of the sequence of operation of each system.
- 5.9.2.10 User interface will be graphical in nature with animated graphics to indicate equipment operation. Graphics will be grouped in systems and in departments.

5.10 Electrical Systems (Division 26)

5.10.1 General

5.10.1.1 Basic Requirements

- 5.10.1.1(1) All electrical systems, materials and equipment will be of a type and quality intended for use in an education facility. Configure electrical systems to meet requirements of the identified program in an efficient manner, with optimal utilization of space, staff and equipment resources.
- 5.10.1.1(2) Provide electrical systems that: allow the Authority to deliver the program described in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)]; and provide redundancy, protection, continuity of service and a comfortable and safe working environment for students, visitors and staff.
- 5.10.1.1(3) Integrate systems where integration provides efficiency, operational and cost advantage.
- 5.10.1.1(4) Incorporate into the design and construction the principle that change will be a constant and inevitable fact within the Facility. Completed electrical systems will permit change while minimizing the cost of change and the amount of interruption to the regular Facility activities.
- 5.10.1.1(5) Include systems and equipment coordinated to provide synergy and reliable electrical performance for the various Facility functions.

- 5.10.1.1(6) Provide provisions to minimize the noise and vibrations of electrical equipment/ components (transformers, luminaries, cables etc.) to below an acceptable level as required in an education facility.
- 5.10.1.1(7) Locate electrical rooms and power distribution equipment in order to minimize the distances for feeder runs, to provide easy access for equipment move and to avoid interference with other services and equipment.
- 5.10.1.1(8) Locate all electrical panels in electrical rooms or closets in “back of house” locations complete with required clearances and locked access. Refrain from placing electrical panels in corridors, public spaces, offices, meetings rooms, presentation spaces, galleries and “front of house” locations.
- 5.10.1.1(9) Incorporate energy management systems to minimize demand pressures on the building systems and minimize the anticipated increase to energy costs.
- 5.10.1.1(10) Refer to Section 2.2 [Energy Incentive Program] of Appendix 2D [Energy] regarding energy incentive programs. Integrate any requirements of those programs into the electrical systems.
- 5.10.1.1(11) Refer to Appendix 3B [Audio Visual Requirements] for additional requirements applicable to the Videoconference Rooms.
- 5.10.1.1(12) Project Co will provide access to all electrical, communication and security raceways such as access panels, hatches in ceilings etc.
- 5.10.1.1(13) The design will facilitate all forms of discussion while promoting communication and connection. It will enable global net-wide communication.
- 5.10.1.1(14) Project Co will accommodate the vertical and horizontal distribution of electrical and mechanical services to allow maintenance and changes to occur with the least amount of disruption.

5.10.1.2 Performance Criteria

- 5.10.1.2(1) Install electrical systems and equipment in a fixed and permanent manner, seismically restrained to meet local building codes. Plan installation of equipment to allocate space for future additions and to facilitate easy access to other

systems and equipment which may require inspection or maintenance.

5.10.1.2(2) Implement the latest proven technologies in the design of the electrical systems and equipment.

5.10.1.2(3) Incorporate redundancy into the electrical system design such that failure of any electrical equipment or feeder will not impair Facility operation or leave any area up to 100m² without at least one active light and one active receptacle. Single occupant administrative rooms shall be except from this requirement.

5.10.1.2(4) Design and construct all systems with protection, grounding, isolation and control to address the functional requirements where they are located.

5.10.1.2(5) Power throughout the building will comprise of a combination of 347/600V and 120/208V for all power, lighting and equipment loads.

5.10.1.2(6) Design and construct the Facility electrical systems with a minimum 25% spare capacity.

5.10.2 Wiring Methods, Materials and Devices

5.10.2.1 Basic Requirements

5.10.2.1(1) Use wiring methods, materials and devices that result in a safe reliable and flexible electrical power, lighting control, communication, data and life safety system.

5.10.2.1(2) Install all wiring in a neat and secure manner so that it is protected from damage, is not in conflict with mechanical or architectural components and allows for future changes and additions.

5.10.2.1(3) Colour of standby and hydro main power receptacles will be determined and implemented in consultation with the Authority. All power receptacles will be identified with panel and circuit number.

5.10.2.2 Performance Criteria

5.10.2.2(1) Utilize non-alloyed copper for all conductors and all conducting components of electrical equipment, which form part of the Facility's wiring systems. Minimum conductor size will be

#12AWG. Aluminum conductor installed in conduits may be used for feeders greater than 100 Amp current rating.

- 5.10.2.2(2) Do not install TECK cable unless approved by the Authority.
- 5.10.2.2(3) Provide panel boards, feeders and branch circuiting with double neutral(s) capacity where significant non-linear load(s) are anticipated. This includes open office and other areas with a medium to high density of personal computers.
- 5.10.2.2(4) Conceal all wiring and wiring support systems from public view except where concealment is not possible.
- 5.10.2.2(5) Separate all wiring for systems of different voltages and from different sources and do not run in common raceways. Maintain adequate shielding and separation between wiring for power and communication systems to prevent interference.
- 5.10.2.2(6) Identify system voltage, phase, neutral and grounding of all pull boxes, junction boxes, conduits and wiring. Provide additional colour coding for wiring and "P Touch" self-adhesive labelling for receptacles, switches and junction boxes.
- 5.10.2.2(7) Receptacles in all areas will be specification grade. Use colour coded receptacles to identify circuits for emergency power, UPS (Uninterruptable Power Supply) and normal power circuits. Use red receptacles for emergency power, orange receptacles for UPS, and white or other specified receptacles for normal power circuits as required in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.2.2(8) Utilize stainless steel cover plates for receptacles and switches. Grouped receptacles and switches will have a single cover plate for the whole group.
- 5.10.2.2(9) Provide a maximum connection of four general use receptacles to one 15 amp circuit.
- 5.10.2.2(10) Provide duplex convenience receptacles rated at 15A, 120V in all rooms. This is in addition to all other receptacles identified in this Schedule and in Appendix 3H [Room Components] and Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.2.2(11) Utilize 15/20Amp style receptacles for fax machines, printers and copiers. Provide separate dedicated circuits for each piece.

- 5.10.2.2(12) Utilize 15/20Amp style receptacles for housekeeping staggered on alternate sides of the hallways and common areas spaced a maximum of 10 meters apart and on each floor of the stairwells.
- 5.10.2.2(13) Provide a minimum of one duplex receptacle per room.
- 5.10.2.2(14) Provide a minimum of one 15Amp circuit per three enclosed offices for workstations.
- 5.10.2.2(15) Provide each single occupancy office with a minimum of three duplex receptacles, two for the desk and one on the opposite side of the room.
- 5.10.2.2(16) In each multi-occupancy office provide a minimum of two duplex receptacles for each desk or workstation and a minimum of one duplex receptacle spaced every 3 meters of open wall space.
- 5.10.2.2(17) Provide each workstation will have a minimum of two duplex receptacles.
- 5.10.2.2(18) In each classroom, studio, conference and meeting room provide a minimum of one duplex receptacle spaced every 2 meters of wall space and one duplex receptacle spaced at a maximum of every meter above work counters.
- 5.10.2.2(19) Provide receptacles for all dedicated equipment such as printers, microwaves, coffee makers, refrigerators, etc.
- 5.10.2.2(20) At all locations with overhead projectors provide 15Amp 120 volt receptacle located at the ceiling and run an empty 35mm conduit to the floor and wall outlet for remote control signal.
- 5.10.2.2(21) Provide one duplex receptacle for every 35 square meters, or portion thereof, of service, housekeeping and storage space. A minimum of one duplex receptacle will be provided per room.
- 5.10.2.2(22) Meeting rooms and similar spaces (including rooms with lecterns) will have a duplex receptacle within the floor box under the table, at each whiteboard, projector/display, within the floor box under the lectern and on each wall.
- 5.10.2.2(23) Provide an emergency duplex receptacle to each lectern within a floor box.

- 5.10.2.2(24) Provide a duplex receptacle to each light table within a floor box.
- 5.10.2.2(25) Provide a duplex receptacle every 1 meter along all work benches.
- 5.10.2.2(26) Provide a ceiling mounted retractable cord reel with 15/20Amp style receptacle on a dedicated circuit. Mount above work tables/benches.
- 5.10.2.2(27) Provide special receptacles for fixed and moveable equipment as defined on the Equipment List and in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.2.2(28) Install approved fire stopping to maintain all fire separations and as required by local Governmental Authorities.
- 5.10.2.2(29) Standard mounting elevations of devices on centre will be as follows:

Device	Elevation (mm) (AFF)
Motor starters, disconnects	1200
Local switches	1200
Panel board	1700 top edge
Power/comm/A/V outlets – general	300
Power/comm/A/V outlets – above counter	1090
Fire alarm pull stations	1200
Fire alarm horn/strobes	2300
Keypads	1200
Card readers	1200
Door operator push buttons	915
Audible alarms and motion sensors	2300
Wireless access points	Ceiling Mtd
CCTV cameras indoors	2300
CCTV cameras outdoors	3000 min

5.10.3 Raceways

5.10.3.1 Basic Requirements

- 5.10.3.1(1) Provide raceways for all wiring and cabling to support, protect and organize all wiring and cabling systems.

- 5.10.3.1(2) Design raceways to provide ease of access and install with capacity for expansion and change, consistent with the requirements of the equipment and systems that they serve.
- 5.10.3.1(3) Install all raceways in a neat and secure manner in such a way that it is protected from damage, is not in conflict with mechanical or architectural components and allows for future changes and additions.
- 5.10.3.1(4) Except as noted in Section 5.10.3.1(11), install power wiring in EMT with steel couplings and connectors.
- 5.10.3.1(5) Install low tension wiring (unless otherwise required by applicable Laws) in EMT with steel couplings and connectors and cable trays. Install EMT (or flex) conduits with low tension conductors between individual back boxes of devices (on walls or ceilings) and cable tray. Provide conduits and cable trays for low tension system wiring such that the maximum length of exposed wire between tray and conduit is less than 200mm.
- 5.10.3.1(6) EMT is to be surface mounted in service rooms and concealed in ceiling spaces and partition walls. Do not encase EMT in concrete.
- 5.10.3.1(7) Minimum EMT conduit size is 21mm (3/4"), except that minimum EMT conduit size for data drops is 27mm (1").
- 5.10.3.1(8) Use flexible conduit for all final connections:
- 5.10.3.1(8)(a) to devices located on suspended ceilings; and
 - 5.10.3.1(8)(b) to vibrating equipment, such as transformers and motors.
- 5.10.3.1(9) Minimum flexible conduit size is 21mm (3/4") and maximum length of any flexible conduit run is 1.5 metres.
- 5.10.3.1(10) Armoured cable (BX) may be used only for final connections from concealed junction boxes to lighting fixtures on suspended ceilings. The maximum length of any individual piece of BX cable is 1.5 metres.
- 5.10.3.1(11) Use rigid PVC conduits for the underground portion of services to lighting and power outlets located outside of the building.

- 5.10.3.1(12) Rigid PVC conduits will be used when encased in concrete.
- 5.10.3.1(13) Install individual ground conductor in each conduit and raceway.
- 5.10.3.1(14) Provide cable trays for installation of all low tension wiring for data, telephone, public address and other such systems. Install cable trays from communication rooms and above all corridors. If cable trays pass through walls with fire resistance ratings, provide removable “pillow type” or “brick type” fire stopping to allow easy installation of cables in the future. Install cable tray in all communication rooms, complete with vertical risers and drop out fittings.
- 5.10.3.1(15) Cable tray will be wire mesh Cablofil or Flextray. Provide continuous #6AWG minimum bare copper ground wire in the tray. Provide #6AWG bare copper bonding jumper between the cable tray and every associated conduit to ensure continuous bond between tray and low tension raceways.
- 5.10.3.1(16) Identify all conduits, raceways, pull boxes, and junction boxes using painted colour bands Major colour to be 100 mm wide and minor colour to be 50 mm wide. Identify raceways with coloured bands (using either spray paint or coloured duct tape) at intervals of 6 m, plus at the point where the raceway enters a wall or floor (i.e. raceway is identified on both sides of a penetration to facilitate tracing of raceway). Colour-code all junction boxes using spray paint on the cover. Neatly identify the relevant system and circuit ID using permanent marker pen. Identify parallel conduit runs at common locations. Indicate the location of conductors encased or embedded in concrete or masonry by acceptable permanent markers set in the walls, floors, or ceilings. Colouring scheme will be as follows:

System	Prime Color	Auxiliary Color
347/600V	Yellow	Green
347/600V Emerg.	Yellow	Pink
120/208V	Yellow	
120/208V Emerg.	Yellow	Orange
Fire Alarm	Red	
Data	Blue	
Security	Blue	Yellow
Public Address	Dk. Green	
CCTV	Lt. Brown	

5.10.3.2 Performance Criteria

- 5.10.3.2(1) Construct separate raceways or barriered raceways to isolate systems of different voltages and prevent magnetic interference.
- 5.10.3.2(2) Design and install raceways without sharp edges or sharp bends so that cables can be pulled in or laid in and removed without damage to the cables.
- 5.10.3.2(3) Provide all cable trays with minimum 25% spare capacity for the installation of future electrical cables. Provide communications trays with 50% spare capacity. If multiple raceways are required in a group, such as a duct bank or tray system interconnecting two or more major areas, provide matching empty raceway equal to a minimum of 25% of the capacity of the total installed group.
- 5.10.3.2(4) Provide a minimum of two spare 103 mm conduits from the main electrical room to each sub-distribution room. Provide 2 x 103 mm spare EMT risers/sleeves between a stack off communication room.
- 5.10.3.2(5) Install all conduits in finished areas within finished walls and above finished ceilings.
- 5.10.3.2(6) Provide bonding conductor within the metallic raceways and bond raceways continuously.

5.10.4 Electrical Utilities (Underground Distribution)

5.10.4.1 Basic Requirements

- 5.10.4.1(1) Design and provide switchgear and substations for incoming services (12/25KV).
- 5.10.4.1(2) The capacity and design of services will anticipate the need for future flexibility. Include spare conduits from the Authority's junction boxes to the Facility's service transformer location.
- 5.10.4.1(3) Provide metering for normal and emergency power services for the Facility at the main electrical room.
- 5.10.4.1(4) The main electrical service will consist of a transformer, sized on the maximum anticipated demand load plus 25% spare capacity. Within 3 months after the Effective Date, notify the Authority of the anticipated power requirements for the Facility.

5.10.4.2 Performance Criteria

- 5.10.4.2(1) Provide a service transformer (12/25KV / 347-600V) complete with switchgear in the Facility's main electrical room for the Facility's normal power needs.
- 5.10.4.2(2) Provide complete fault current and overcurrent coordination study prior to connection of services.
- 5.10.4.2(3) Provide concrete encased PVC conduit duct banks for service conduits and major feeders outside the footprint of the Facility.
- 5.10.4.2(4) Identify the location of existing underground service lines in the area to avoid interference with proposed routing of new services and future services for known expansions. Use latest techniques (ground penetration radar test) to verify and confirm all existing underground services in the direction of service lines to the Facility.
- 5.10.4.2(5) Prepare and submit to the Authority a detailed Arc Flash study signed and sealed by a professional engineer registered in British Columbia and provide equipment labelling indicating available energy levels and level of PPE required when servicing the equipment.
- 5.10.4.2(6) Prepare and submit to the Authority a detailed distribution coordination study signed and sealed by a professional engineer registered in British Columbia that:
 - 5.10.4.2(6)(a) indicates all new and relevant existing service equipment from the point of utility supply and standby generators; and
 - 5.10.4.2(6)(b) includes all transformers, distribution equipment and panel boards.

5.10.5 Emergency Power

5.10.5.1 Performance Criteria

- 5.10.5.1(1) Provide a complete essential electrical system including tie breakers between life safety and normal distribution and life safety and standby distribution, equipment and transformers to back up life safety systems for 24 hours.
- 5.10.5.1(2) The generator plant will provide emergency power to serve essential loads and as required to meet the Functional Program, including:

- 5.10.5.1(2)(a) Life safety branch loads:
- (a).1 path of egress lighting;
 - (a).2 exit signs;
 - (a).3 stair and ramp lights;
 - (a).4 receptacles and lights at service rooms for emergency distribution;
 - (a).5 elevator cab and machine room lighting; and
 - (a).6 fire alarm system.
- 5.10.5.1(2)(b) Standby branch loads:
- (b).1 sump pumps and sewage ejector pumps;
 - (b).2 fire pump and jockey pump if provided. (via integral transfer switch);
 - (b).3 fume hoods and exhaust systems dealing with fumes;
 - (b).4 one elevator in each elevator bank;
 - (b).5 essential heating, ventilation and plumbing systems;
 - (b).6 coolers (rough in) and refrigerators;
 - (b).7 communications systems plus mechanical/ electrical support systems;
 - (b).8 public address systems;
 - (b).9 security systems;
 - (b).10 equipment indicated on Equipment List;
 - (b).11 BMS equipment;

5.10.5.1(3) The BMS will monitor and record emergency loads.

5.10.5.1(4) Elevator indication while the Facility is on emergency power:

- 5.10.5.1(4)(a) Provide 4 dry contacts to indicate the following:
- (a).1 automatic transfer switch (ATS) connected to utility;
 - (a).2 ATS connected to generator;
 - (a).3 ATS pre-transfer to generator; and

(a).4 ATS pre-transfer to utility.

5.10.6 Uninterruptible Power Supply (UPS) Systems

5.10.6.1 Basic Requirements

5.10.6.1(1) Provide common / centralized N +1 Redundant UPS systems for Network Equipment in Main Equipment/Server Room.

5.10.6.2 Performance Criteria

5.10.6.2(1) UPS units for single isolated small loads of one kilowatt or less may be freestanding units located adjacent to the supplied equipment and rated for the connected load plus a minimum 25% spare capacity.

5.10.6.2(2) UPS units for loads greater than one kilowatt will be circuited from a UPS distribution panel and will be rated for the connected load plus a minimum 25% spare capacity.

5.10.6.2(3) Connect UPS units to an emergency generator circuit and provide adequate batteries rated for a minimum of 15 minutes at full UPS capacity.

5.10.6.2(4) UPS systems rated larger than 1.5 KW will have:

5.10.6.2(4)(a) N + 1 modules;

5.10.6.2(4)(b) external maintenance bypass switch for servicing;

5.10.6.2(4)(c) internal static bypass switch to bypass UPS in the event of UPS failure; and

5.10.6.2(4)(d) two battery strings (full redundant batteries).

5.10.7 Transmission and Distribution (Service Switchgear – Over 600 Volts)

5.10.7.1 Basic Requirements

5.10.7.1(1) Provide electrical equipment for the primary service switchgear system for normal and emergency power distribution for the Facility.

5.10.7.1(2) Utilize transmissions and distribution equipment that are robust, reliable, easily operated and maintained. Design with additional capacity to accommodate load growth and equipment additions.

5.10.7.2 Performance Criteria

5.10.7.2(1) Install service transformers indoors and coordinate with the Authority and BC Hydro. Service transformers will be cast coil, sub-station dry type transformer(s) with integral primary switch, expulsion fuses and integral intermediate class lightning arrestors.

5.10.7.2(2) Switchgear will be fused switch load interrupter type and will use HRC current limiting fuses.

5.10.8 Transmission and Distribution (Distribution Equipment – 600 Volts and below)

5.10.8.1 Basic Requirements

5.10.8.1(1) Provide electrical power transmission and distribution from the main sources of supply to meet all requirements of the Facility and the Functional Program.

5.10.8.1(2) Design and install (life safety and standby) main service transformers complete with tie breakers so that if one transformer or distribution equipment fails, the other transformer (by manual switching) will continue servicing all loads connected to the failed transformer.

5.10.8.2 Performance Criteria

5.10.8.2(1) Design and construct the Facility with a minimum of 25% spare capacity. Include provisions for fans that can be added to transformers in the future to serve the future growth needs in such a way as to prevent a major shutdown of the Facility.

5.10.8.2(2) Locate the main electrical room separate from plumbing and mechanical equipment. Design the electrical room to be readily accessible, well ventilated and free of corrosive or explosive fumes, gases or any flammable material.

5.10.8.2(3) Locate major electrical equipment to minimize run length of feeders and branch circuits, and locate within the Facility so as to provide a clean, dry, safe, accessible installation protected from unauthorized access.

5.10.8.2(4) Locate and design electrical equipment for ease of maintenance and with due regard for future expansion and renovation.

5.10.8.2(5) The secondary main normal, life safety and standby distribution equipment will consist of circuit breakers, not fuses. Provide all circuit breakers 400 amp and larger with electronic tripping

and LSIg field adjustable settings. Draw-out breakers will not be required.

- 5.10.8.2(6) Install 120/208V dry type transformers for small equipment loads in electrical rooms on concrete pads or suspend from structure. Install transformers so that removal can be facilitated without removal of any other equipment or conduit serving the room. This excludes luminaires.
- 5.10.8.2(7) Rate all distribution devices to handle available fault duty at line terminals. Perform a computer generated fault study to ensure that all devices are properly rated.
- 5.10.8.2(8) Design and install protection equipment so that the initial electrical installation and future additions and modifications will be fully coordinated to isolate only the faulty portion of the system.
- 5.10.8.2(9) Select, configure, locate and install all components of transmission and distribution systems to minimize the transmission of noise, vibration or unwanted heat into other parts of the Facility.
- 5.10.8.2(10) Provide a networked digital metering system to monitor electrical loads and quality of power in the Facility.
- 5.10.8.2(11) Provide power factor correction equipment within the Facility to ensure the power factor does not fall below 0.95 PF. Coordinate capacitors with adjustable frequency drives and other harmonic generating equipment to avoid resonance conditions.
- 5.10.8.2(12) Provide circuit breaker type panel boards fully rated to handle calculated fault current level. Series rating of breakers and panel boards are not acceptable.
- 5.10.8.2(13) Oversize neutral(s) for panel boards, feeders and branch circuiting where significant non-linear load(s) are anticipated, such as in open office and other areas with a high density of personal computers.
- 5.10.8.2(14) Construct flush mounted panel boards with two spare 53mm and two spare 25mm conduits stubbed into ceiling space above and into ceiling space below.
- 5.10.8.2(15) Provide electronic grade panel boards to serve electronic equipment susceptible to electrical transients.

- 5.10.8.2(16) Install panel boards on the same floor as the loads they serve in designated electrical closets or rooms.
- 5.10.8.2(17) Components of the transmission and distribution systems in all areas will have long life expectancy without perceptible deterioration and a good appearance. Design and install so as to permit easy and complete cleaning.
- 5.10.8.2(18) Provide individual enclosed motor starters for individual motors. Utilize motor control centers for groups of four or more motors that require individual motor starters.
- 5.10.8.2(19) Motor starters will be combination of magnetic MCP (Motor Circuit Protector) type with integral control power transformers, Hand-Off-Auto (HOA) or start/stop control and at least two auxiliary contacts in addition to seal-in contacts.
- 5.10.8.2(20) Provide combination starters for all motors 1/2 HP and larger that are not already controlled by adjustable frequency drive or include an integral control package. All motors of 1/2 HP or more will be 600 volt 3 phase.
- 5.10.8.2(21) Provide voltage transient / surge protection for the main 600V and 120/208V switchgear loads and all other panels serving sensitive electrical loads including data centre, communication rooms and adjustable frequency drives.

5.10.9 Metering

5.10.9.1 Basic Requirements

- 5.10.9.1(1) Meter normal and emergency power services for the Facility.
- 5.10.9.1(2) Supply networked digital pulse metering to provide detailed information about power quality and power consumption at key points throughout the Facility. Key points include: CDP's, motor control centres, panel boards feeding mechanical equipment and power consumed by elevators. Ensure that metering is provided to record total energy consumed by lighting fixtures and equipment. Integrate information from all meters on a common software platform residing on a dedicated electrical metering server.
- 5.10.9.1(3) Ensure that sufficient metering is provided to record the energy consumed by all major mechanical equipment including chillers, Neighbourhood Energy Utility (hot water) consumption, fan and pump motors. Refer to Section 5.10.14 (Energy Management).

5.10.9.1(4) Implement a networked metering system with terminals for maintenance and plant administration, and data transfer to the BMS.

5.10.9.1(5) Connect electrical demand and consumption meters to the BMS.

5.10.9.1(6) Include trend logging equipment sensors to comply with and fulfill energy measurement and verification requirements. Logged information will not be overwritten and will be archived.

5.10.9.1(7) Metering intervals will be one hour or less.

5.10.9.2 Performance Criteria

5.10.9.2(1) Include display components for easily read local information for all distribution at primary voltage and for each secondary distribution switchboard.

5.10.9.2(2) Design the metering system network to store historical data and with the capability to generate user configurable electronic and printed reports on demand.

5.10.9.2(3) Support the metering system by a backup power source(s), which ensures operation when the metered circuit is de-energized. The metering system will not be dependent on power from the metered circuit for its operation.

5.10.9.2(4) The metering system will, at a minimum, provide the following information about each metered circuit: Phase-to-Phase Voltage (all phases), Line-to-Neutral Voltage (all phases), Phase Current (all phases and neutral), KW, KVA, Power Factor, KWH, VAR hours.

5.10.9.2(5) Utilize power quality type meters for monitoring harmonics and surges / sags. Provide power quality meters capable of monitoring harmonics on the normal, life safety and standby switchboards.

5.10.10 Grounding and Bonding

5.10.10.1 Basic Requirements

5.10.10.1(1) Provide grounding and bonding for all electrical equipment and systems in the Facility for the safety of people and for protection against damage to equipment or property in the case of a fault occurring in any of the equipment or systems. Install grounding as required by all applicable standards,

including EIA/TIA standards for communications and security equipment and systems.

5.10.10.2 Performance Criteria

- 5.10.10.2(1) Utilize non-alloyed copper for all conductors and all conducting components of electrical equipment which form part of the grounding and bonding systems in the Facility.
- 5.10.10.2(2) Provide solid or low resistance system grounding including conductors and bussing.

5.10.11 Seismic Requirements for Electrical Systems

5.10.11.1 Basic Requirements

- 5.10.11.1(1) Provide seismic restraint for all electrical equipment and components of electrical systems which are part of the building electrical systems designed to meet the standards of a normal importance building as defined in the City of Vancouver Building By-Law.
- 5.10.11.1(2) Provide seismic restraint systems and methods that facilitate ease of maintenance and ease of replacement and reconfiguration of electrical equipment and systems and other equipment and building components.
- 5.10.11.1(3) Provide seismic restraint systems and methods that coordinate with the Facility's architecture and finishes. Where possible, conceal components of seismic restraints from public view. Where concealment is not practicable, provide systems that blend into the Facility's architecture and finishes.

5.10.11.2 Performance Criteria

- 5.10.11.2(1) Provide seismic support for all electrical equipment and components of electrical systems that have the potential to cause injury or damage during or following a seismic event.
- 5.10.11.2(2) Use seismic restraint systems that are designed by a professional engineer, registered in British Columbia, or, where an identified pre-designed standard restraint device or system exists for a particular item, that equipment may be used provided that written confirmation of its acceptability for the installation is provided by a professional engineer registered in British Columbia. Provide signed and sealed drawings as well as typewritten field reports from a professional structural engineer, registered in British

Columbia. Obtain certification of the main electrical distribution equipment for “seismic withstand capability” and, to maintain the certification, anchor such equipment according to the manufacturer’s instructions.

5.10.12 Power Quality

5.10.12.1 Basic Requirements

- 5.10.12.1(1) Establish and maintain an overall power quality which assures suitable conditions for operation of all electrical and electronic equipment throughout the Facility.
- 5.10.12.1(2) Provide equipment and systems which assure that electrical equipment and systems will not be harmed or impaired either by external events or conditions, such as lightning and disturbances on the utility service, or by internal events or conditions generated within the Facility.
- 5.10.12.1(3) Meet or exceed relevant standards for power quality where deemed necessary by the Authority and IEEE.
- 5.10.12.1(4) Provide harmonic mitigation equipment, as necessary, to ensure that power quality meets or exceeds recommendations in IEEE, including standard 519. For the purposes of measuring the harmonic distortion, the “Point of Common Coupling” will be the main transformer. As part of commissioning, confirm compliance to tables 10-2 and 10-3 of IEEE 519 by field measurements after building occupancy and under normal operating conditions.
- 5.10.12.1(5) Provide individual harmonic filters ahead of and coordinated with variable speed drive for every motor greater than 7.5 HP.

5.10.12.2 Performance Criteria

- 5.10.12.2(1) Provide equipment, such as filters, TVSS (Transient Voltage Surge Suppression), etc., specifically designed to control and remove all adverse power quality conditions that could damage or impair function of sensitive electronic equipment used in the Facility. Adverse power quality conditions include voltage spikes, dips and droops, transients, harmonics, power factor and radio frequency interference.
- 5.10.12.2(2) Provide the ability to demonstrate to the Authority at any time that there are no potentially harmful power conditions present and that equipment intended to guard against such conditions is in proper working order.

5.10.13 Lighting

5.10.13.1 Basic Requirements

- 5.10.13.1(1) Provide interior lighting that will create a safe, secure and healthy environment that approximates natural lighting with illumination levels to allow staff and students to perform required tasks in a visually comfortable environment.
- 5.10.13.1(2) Design lighting with the objective of creating a comfortable working environment and an environment conducive to art and design education.
- 5.10.13.1(3) Utilize specification grade quality luminaires with emphasis on the ability to render colour accurately. Colour rendition will be minimum 82CRI in general use areas and a high colour rendition minimum 90 CRI in studios and display areas. Provide colour balance full spectrum lighting where required by Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.13.1(4) Utilize energy efficient specification grade quality luminaires with high efficiency lamps and associated ballasts applicable to the lamp, including LED lamps and ballasts. Efficiency of the lighting in each room shall comply with the standard and City requirements noted in these specifications.
- 5.10.13.1(5) Luminaires will have UV filtering where required by Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.13.1(6) Utilize a combination of natural light, luminaries and controls to optimize beneficial daylight and minimize energy use. The design of the lighting and associated control systems will be thoroughly coordinated with the Architect using computer generated daylight simulation models.
- 5.10.13.1(7) Provide lighting controls with flexibility to adjust lighting to suit functions and activities and permit simple and integrated control of lighting. Design controls to be easily operated and conveniently and appropriately located for each area and function.
- 5.10.13.1(8) Lighting controls will comprise a significant part both of the energy management of the Facility and of the flexibility required to adjust lighting to suit functions and activities.

- 5.10.13.1(9) Lighting power density levels will comply with ASHRAE Standard 90.1 2010 and the lighting installed will meet the requirements of Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.13.1(10) Illumination levels and lighting designs will comply with the Illuminating Engineering Society Lighting Handbook 10th edition and all related Recommended Practices.
- 5.10.13.1(11) Lighting system design will meet LEED requirements.
- 5.10.13.1(12) Illumination levels and contrast ratios will be in compliance with WorkSafe BC regulations.
- 5.10.13.1(13) An electrically powered "In Use" sign will be located outside broadcast studios and photographic developing rooms and darkrooms. The sign will be connected to an internally illuminated switch inside the room label "In Use".
- 5.10.13.1(14) Provide backup strobe lights in broadcast studios and photographic developing rooms for emergency use.
- 5.10.13.1(15) Provide backlighting for sinks in washout room. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.13.1(16) Provide a suspended lighting mounting grid with flexibility to adjust lighting locations up to 1.2 metres in all directions without the need for an electrician in studios, display areas and as defined in the Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.13.1(17) All solid state lighting will comply with IESNA LM-79 Approved method: Electrical and Photometric Measurements of Solid-State lighting products and LM-80 Approved Method: Measuring Lumen Maintenance of LED light sources. The sources will have a minimum life of 50,000 hours at 70% lumen output, L70.
- 5.10.13.1(18) Provide specific lighting as noted in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] (such as colour balance full spectrum lighting, track lighting, lighting grid).

5.10.13.2 Performance Criteria

- 5.10.13.2(1) Project Co will work with a specialty professional electrical engineer lighting designer to prepare a lighting concept and design for the Facility.
- 5.10.13.2(2) Provide luminaires that require minimal cleaning and permit practical and easy access and disassembly.
- 5.10.13.2(3) All linear fluorescent lamps will be T5 or T5HO with colour temperature from 2900K to 5600K as appropriate for the use of the space. Similar spaces will always have the same colour temperature lamps. LED fixtures may be used in areas requiring CRI>90 and/or >5000K or when approved by the Authority.
- 5.10.13.2(4) All plug-in compact fluorescent lamps will be quad-pin type.
- 5.10.13.2(5) The use of self-ballasted screw-in compact fluorescent lamps will not be permitted.
- 5.10.13.2(6) The use of high intensity discharge lamps will not be permitted.
- 5.10.13.2(7) The use of incandescent lamps will not be permitted except where integral to equipment such as indicator lamps or as necessary by specific application where the use of other light sources is not possible or as otherwise indicated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.10.13.2(8) Utilize programmed start electronic ballasts for fluorescent lamps with a THD of 10% and no more than 8% for third harmonic. Power factor will be .98 or greater and efficiency will be 90% or higher.
- 5.10.13.2(9) Dimmable fluorescent ballasts will be 100 – 5%, 0-10 volt type.
- 5.10.13.2(10) Dimmable solid state drivers will be 0-10 volt type.
- 5.10.13.2(11) Limit the use of battery-operated unit emergency lighting to the generator room, transfer switches room and UPS room. These will run for no less than 2 hours.
- 5.10.13.2(12) Utilize low glare, direct or direct/indirect fluorescent luminaires specifically designed to eliminate indirect glare in classrooms, offices, reception areas and other areas where computer terminals are used or intensive visual tasks are undertaken.

- 5.10.13.2(13) Design lighting in technology conference rooms and video conferencing facilities to maximize viewing of monitors and screens and provide suitable illumination of people being viewed. Selection and location of all luminaires will be closely co-ordinated with the A/V system to avoid “wash-out” of video images. Ensure proper illumination levels are maintained to permit video capture from the A/V system.
- 5.10.13.2(14) Provide special task lighting designed for the types of procedures conducted for rooms and areas where specialized visual tasks are undertaken to highlight artwork.
- 5.10.13.2(15) As architectural features, design lighting in main lobbies, waiting areas and the main entrance with high quality products aesthetically pleasing to the public and staff, as viewed from within and from outside the building.
- 5.10.13.2(16) Utilize LED pictogram type exit signs.
- 5.10.13.2(17) Utilize lighting controls that comprise of a networked low voltage relay switching system with programmed ON/OFF operation and local manual override capabilities.
- 5.10.13.2(18) Protect lighting controls from unauthorized operation when required to be located in areas accessible to the public.
- 5.10.13.2(19) Design all lighting in public and administration areas to be capable of being switched from a central location.
- 5.10.13.2(20) In open areas and common areas, zone and subdivide lighting to permit energy management and appropriate control and variation of light levels.
- 5.10.13.2(21) Provide local lighting control for each room. Each room, except for storage rooms and washrooms, will have 2 or more levels of illumination in addition to the off position unless specified otherwise.
- 5.10.13.2(22) Dimmable lighting and controls will be provided but not limited to all classrooms, gallery, lecture theatre, conference rooms and meeting rooms.
- 5.10.13.2(23) Integrate controls in classrooms, lecture theatres, conference rooms, studios and meeting rooms with equipment controls and control stations in the room to permit the room operator to vary the lighting as required for different activities. Refer to Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].

- 5.10.13.2(24) Utilize occupancy and vacancy sensors and daylight control systems to maintain light levels at appropriate levels based upon the occupancy of the room and the quantity of daylight. This will include occupancy sensors in all spaces and daylight control systems at perimeter rooms where daylight contribution is significant.
- 5.10.13.2(25) Provide a time clock, photocell and contactors with HOA switch for control of site lighting. Submit a control plan to the Authority for approval.
- 5.10.13.2(26) Interface the lighting control system with the BMS.
- 5.10.13.2(27) Light levels in means of egress routes required to be on 24/7 will automatically dim to minimum code levels when un-occupied.

5.10.14 Energy Management

5.10.14.1 Basic Requirements

- 5.10.14.1(1) Provide an integrated energy management system to monitor, record, analyze report on and control energy consumption from all sources that supply energy to the Facility. This system may be connected to the BMS. Refer to Section 5.10.9 [Metering] of this Schedule.
- 5.10.14.1(2) Design the system to provide sufficient information to enable the Authority to make “demand-side management” decisions relating to overall energy demand, with the intent of reducing overall energy consumption and demand throughout the building. Incorporate data from the digital meters required by Section 5.10.9 [Metering] of this Schedule.
- 5.10.14.1(3) Provide a system and equipment that is flexible, controllable, and will form an integral part of the Facility.

5.10.14.2 Performance Criteria

- 5.10.14.2(1) Design the energy management system to be accessible from any networked computer using appropriate software.
- 5.10.14.2(2) Provide a minimum of two site software licenses if licensing is required.

5.10.15 Mechanical Equipment Connections

5.10.15.1 Basic Requirements

- 5.10.15.1(1) Provide electrical power control and monitoring connections to all mechanical equipment as required for proper operation, protection and maintenance of the equipment. Materials and installation methods will result in safe, reliable and serviceable mechanical equipment and systems in the Facility.

5.10.15.2 Performance Criteria

- 5.10.15.2(1) Utilize institutional or industrial quality cables, connectors, conduit systems, fittings and hardware used to make connection to mechanical equipment so as to provide for high levels of reliability, durability and ease of maintenance of the equipment.
- 5.10.15.2(2) Design connections made to motors and/or motor driven equipment or equipment with noticeable levels of vibration to accommodate the vibration.
- 5.10.15.2(3) Design connections to mechanical equipment to easily permit removal and replacement of the equipment.
- 5.10.15.2(4) Size motor control centres, main feeders to motor control centres, and mechanical distribution centres to accommodate the current mechanical equipment with an additional 25% spare capacity.
- 5.10.15.2(5) Utilize motor control centres when three 3-phase motors that require a starter are located within 50 metres of each other.

5.10.16 Specialty Systems

5.10.16.1 Basic Requirements

- 5.10.16.1(1) Special electrical and communications systems are required in the Facility (as described in this Schedule) and form essential parts of the Facility. Provide power supply, specially conditioned power and communication conduits and other electrical operational support equipment to meet all requirements of these special electrical and electronic systems.

5.10.16.2 Performance Criteria

- 5.10.16.2(1) Utilize institutional or industrial quality cables, connectors, conduit systems, fittings and hardware to make connection to special equipment and to provide for high levels of reliability, durability and ease of maintenance of the equipment.

- 5.10.16.2(2) Provide connections to special equipment that easily permit removal and replacement of the equipment.

5.11 Communications (Division 27)

5.11.1 General

5.11.1.1 Principles and Guidelines

- 5.11.1.1(1) The Authority has an information management directional plan consisting of 3 core deliverables: provision and management of the technology, management and delivery of information and management and support for the core business. Project Co will support this plan using technology that seamlessly integrates with the Authority.

5.11.1.2 Basic Requirements

- 5.11.1.2(1) The communications systems will be proven technology for use in facilities similar to the Facility.

- 5.11.1.2(2) All communications systems infrastructure and equipment provided by Project Co will be the latest proven version of the equipment at the time of procurement.

- 5.11.1.2(3) The communications systems will be easy to operate, easy to maintain and adaptable to change, and expandable to accommodate growth.

- 5.11.1.2(4) Project Co will be responsible for all physical network design and installation.

- 5.11.1.2(5) The data centre will meet all TIA-942 and ANSI/BICSI-002 requirements for a Class F1 data centre including all optional items and recommended items, except where noted otherwise to exceed this rating. These requirements will apply to all divisions (Architectural/ Structural/ Mechanical/ Electrical Communications).

- 5.11.1.2(6) Physical network design and installation will:

- 5.11.1.2(6)(a) accommodate multiple separate networks and VLANs administered by multiple Facility Users; and

- 5.11.1.2(6)(b) have high availability and security that meets or exceeds the industry standard for use in educational applications.

5.11.1.2(7) The Authority anticipates that the Authority network will be comprised of the following:

- 5.11.1.2(7)(a) an administrative network for staff users, including the Authority's local area network, will include the following applications:
- 5.11.1.2(7)(b) financial information systems;
- 5.11.1.2(7)(c) human resource information systems;
- 5.11.1.2(7)(d) electronic communications systems including e-mail, video conferencing and VoIP phones and end-user resources including home drives and shared enterprise resources;
- 5.11.1.2(7)(e) educational material; and
- 5.11.1.2(7)(f) student information.

5.11.1.2(8) The administrative servers will be supplied by the Project Co as stated in the Equipment List.

5.11.1.2(9) The building systems network will include:

- 5.11.1.2(9)(a) the BMS (refer to Section 5.9 of this Schedule);
- 5.11.1.2(9)(b) security systems;
- 5.11.1.2(9)(c) alarm management systems; and
- 5.11.1.2(9)(d) internal/external overhead paging type communications systems.
- 5.11.1.2(9)(e) CCTV (refer to Section 5.12.3.5 of this Schedule);
- 5.11.1.2(9)(f) The above list is indicative only and does not limit Project Co.'s obligation to provide all physical networks required for the Facility.
- 5.11.1.2(9)(g) RFID (active and passive)

5.11.1.2(10) Provide systems which promote operational efficiency and integrate systems where this integration provides efficiency and operational and cost advantages.

- 5.11.1.2(11) Provide a common pathway for all communications systems wiring referenced herein, including the BMS, and coordinate the requirements of the individual communications systems as established by the vendors of such systems.
- 5.11.1.2(12) The communications systems will accommodate all media types, including data, voice, video and overhead paging.
- 5.11.1.2(13) Train the Authority's IT representatives on configuration/setup and testing of the communication systems equipment in the Facility.
- 5.11.1.2(14) The building will have a main data centre where the core applications, communications services and storage facilities will exist. This data centre will house the majority of server and storage infrastructure including Security Network Servers and Storage.

5.11.1.3 Performance Criteria

- 5.11.1.3(1) IP Protocol will be used for data network based equipment. Telecom equipment will be a mix of VoIP, TDM and analog equipment.
- 5.11.1.3(2) All network protocols will be IPV4 compatible.
- 5.11.1.3(3) Project Co will maintain the manufacturer's warranties on all communications systems equipment and ensure that the warranties are assignable to the Authority.
- 5.11.1.3(4) All communications systems equipment provided by Project Co will support all applications run generally by the Authority, which include windows compliant software.
- 5.11.1.3(5) All applications, software modules and any related software installed, operated or used by Project Co will not interfere with the operation or performance of, or reduce the security or privacy of, any Authority applications or equipment.
- 5.11.1.3(6) Project Co to provide market-leading products (Tier 1) that offer flexibility, security, investment protection with superior performance.

- Acceptable Manufacturers of Servers and SAN Equipment are HP and DELL.

5.11.1.4 Quality Requirements

- 5.11.1.4(1) Project Co will comply with all applicable standards and will:

- 5.11.1.4(1)(a) use the latest technology for transferring, securing, and storing information available at the date of procurement of the communications system for the Facility;
- 5.11.1.4(1)(b) comply with all applicable IEEE, CSA, TIA / EIA, and BICSI standards, including CSA C22.2.
- 5.11.1.4(1)(c) use equipment and materials that are certified and clearly sealed by CSA or ULC or other testing agency approved and accepted by the Safety Engineering Services (SES);
- 5.11.1.4(1)(d) comply with Appendix 3E [Communications Specifications];
- 5.11.1.4(1)(e) comply with Appendix 3B [Audio Visual Requirements]; and
- 5.11.1.4(1)(f) obtain any required network and communications systems equipment (including software and hardware) that will be utilized by or directly interface with the Authority's network environment.

5.11.1.4(2) In the event of a conflict between applicable standards, the more stringent standard will apply.

5.11.2 Structured Cabling

5.11.2.1 Basic Requirements

5.11.2.1(1) Provide and install a complete structured cabling solution for the Facility in accordance with Appendix 3E [Communications Specifications].

5.11.2.1(2) In addition to the communications cables required by the Functional Program, Project Co will provide the following in consultation with the end users:

- 5.11.2.1(2)(a) any additional cables necessary to support all of the networks, systems and equipment (including the equipment) to be installed or used in the Facility;
- 5.11.2.1(2)(b) all cables required by other provisions of this Agreement; and

- 5.11.2.1(2)(c) A minimum of 1100 communications outlets (3 data drops per communications outlet), of which 65% of the total number of data drops have activated connectivity (i.e. connected to active network equipment);
- 5.11.2.1(2)(d) One communications outlet containing 2 data drops per communication outlet, every 18.3 metre grid to support Wireless Access Points;
- 5.11.2.1(2)(e) Included in the total activated data drop count, all Wireless Access Points are to be connected to the 10G-BASE-T network switches;
- 5.11.2.1(2)(f) Addition to the 10G-BASE-T requirements for the Wireless Access Points, provide the following 10G-BASE-T switches:
- (f).1 Two (2) 24 port 10G-BASE-T switches to be located in a communication room servicing the Research area (B12);
 - (f).2 Two (2) 24 port 10G-BASE-T switches to be located in a communication room servicing the Learning Commons (A3);
 - (f).3 One (1) 24 port 10G-BASE-T switch to be located in a communication room servicing the President's Office (D7).
- 5.11.2.1(3) Project Co will co-locate, at each communications outlet location, a duplex receptacle except the indoor wireless AP outlets and indoor CCTV outlets.
- 5.11.2.1(4) The cabling infrastructure will be an end to end solution that will conform to this standard, including all patch cables, jumper wires and equipment cords.
- 5.11.2.1(5) Provide separate physical networks, in accordance with Good Industry Practice or equipment vendor specifications and in consultation with the Authority, as required for the communications systems and equipment installed or used in the Facility. At a minimum, provide a separate physical network for each of the networks identified in this Schedule.

5.11.2.1(6) The cabling infrastructure will be universal and able to support the networks and systems required in the Facility, including voice, data, video, CCTV and security systems and to allow all forms of end-use equipment, including computers, telephones, video conferencing equipment and other digital end-use equipment to access to the various IT, telecommunication, and digital video networks.

5.11.2.1(7) Project Co will:

5.11.2.1(7)(a) Cause the cabling infrastructure to be designed by an RCDD or Professional Engineer with proven experience and expertise in designing structured cabling systems as approved by the Authority;

5.11.2.1(7)(b) complete the physical network design in consultation with the Authority; and

5.11.2.1(7)(c) without limiting this Section 5.11.2.1(7)(c), provide, as necessary, preliminary conceptual drawings of proposed communications outlet locations in advance of the first detailed room review meetings with the Authority.

5.11.2.1(8) The structured cabling system will be a complete end-to-end solution, and will be installed and tested by a vendor certified contractor.

5.11.2.1(9) A manufacturer's extended product, performance, application, and labour warranty that will warrant all passive components used in the technology infrastructure. Additionally, this warranty will cover components not manufactured by the technology infrastructure manufacturer, but approved by the technology infrastructure manufacturer for use in the technology infrastructure.

5.11.2.1(10) The structured cabling will be neatly organised and clearly labelled for ease of use by the Authority and Facility Users.

5.11.2.1(11) Create, in consultation with the Authority, an operational plan for the cable infrastructure, including a management strategy and resource requirements for maintenance.

5.11.2.2 Performance Criteria

5.11.2.2(1) Utilize a star wired cabling approach to wire all communications outlet locations back to the floor communication rooms and all

communication rooms back to the main communications room.

- 5.11.2.2(2) Project Co will cross-connect and test all cable infrastructure in consultation with the Authority.
- 5.11.2.2(3) Terminate all cables in telecommunication rooms in accordance with this Section 5.11 [Communications] of this Schedule and Appendix 3E [Communications Specifications].
- 5.11.2.2(4) Minimum size requirements for telecommunications rooms are included in Appendix 3E [Communications Specifications]. Provide and size a main telecommunications room and local telecommunications rooms to accommodate the telecommunications requirements of the Facility, including all cabling systems and all active and passive network equipment.
- 5.11.2.2(5) As part of the design process described in Section 5.3 [Design Process] of Schedule 2 [Design and Construction Protocols], provide rack, equipment and wall layouts for telecommunications rooms.
- 5.11.2.2(6) [Intentionally deleted]
- 5.11.2.2(7) Provide fibre, copper and voice backbone cabling between the server room, communications rooms and entrance facility pursuant to Appendix 3D [Communications Specifications]
- 5.11.2.2(8) Locate communications rooms to:
- 5.11.2.2(8)(a) serve the floor they are on and a maximum of one other floor above or below,
 - 5.11.2.2(8)(b) maximize the area they serve; and
 - 5.11.2.2(8)(c) minimize the distances for cable runs, to provide easy access for equipment modifications and to avoid interference with other services and systems.
- 5.11.2.2(9) Cable types are stated in Appendix 3E [Communications Specifications]. The bandwidth requirements and distance limitations will determine the type of cable installed.
- 5.11.2.2(10) All rooms including corridors that have or are anticipated to have data, phone, video, or other end-use equipment will have

cable system drops run back to the communication rooms. Storage, janitor and washrooms will not have cable drops.

- 5.11.2.2(11) Provide a 2-strand fibre optic cable and outlet directly from MOCAP studio and S3D Lab.
- 5.11.2.2(12) All conduit pathways will have spare capacity at least as per Schedule 3 requirements, and all communications rooms will have physical floor and wall space to accommodate such expansion. For each BIX wall, provide adequate space to accommodate 50% expansion on the same wall. Provide adequate floor space to facilitate at least 1 expansion rack to be located adjacent to required racks.
- 5.11.2.2(13) All cabling will be run in conduit and cable tray. Cable trays are being used as the primary horizontal backbone pathway.
- 5.11.2.2(14) All ceiling spaces that require wireless network access points,, information display systems and other ceiling mounted digital devices will have cable drops.
- 5.11.2.2(15) Terminate all cable drops at both ends. Provide the proper flame spread rating for the cabling system.
- 5.11.2.2(16) Provide equipment cables for all end-use equipment in sufficient quantity to make each device operational plus 10% spare. Cross-connect cables, harness cables and equipment cords will allow complete connection from end to end. Channel Link testing performance and procedures to TIA/EIA-568-C standard will be used to certify the cabling system (from harness cable to patch cord).
- 5.11.2.2(17) Develop the labelling approach in consultation with the Authority prior to labelling.
- 5.11.2.2(18) Implement a cable management labelling software and electronic drawing system (AutoCAD / BIM) to be approved by the Authority) to track and manage the cable plant. Record documents to show serving communications room ID, conduit sleeves and openings in the room, ceiling pathway route, work area cable IDs with associated serving room ID and boundary lines of the serving room. Test results, cable information records, warranty certification and - record documents should be submitted to Authority in a timely manner and at a time mutually agreed to facilitate placement of end-use equipment. Turn over the cable management system along with all data to the Authority as part of the cable plant acceptance process.

- 5.11.2.2(19) Provide floor communications outlets and floor power to connect floor mounted classroom podiums, as approved by the Authority.
- 5.11.2.2(20) Provide floor communications outlets and floor power in such spaces as (but not limited to) classrooms with lecterns, meeting rooms, conference rooms and the gallery, as approved by the Authority and indicated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)].
- 5.11.2.2(21) Provide stainless steel floor plugs for floor communication outlets flush with the finished floor. Provide sample floor outlet/plug to the Authority for review and approval.
- 5.11.2.2(22) Project Co to provide high capacity fibre data link for 3D editing as noted in the Appendix 3A ([Functional Program (including Pre-Design Room Data Sheets)]).
- 5.11.2.2(23) Specialized systems requiring multiple drops will have sufficient drops at each location to ensure system operation.
- 5.11.2.2(24) Provide a dedicated outlet for all Authority end-use fixed equipment. In no case will a personal computer be wired through an IP telephone.
- 5.11.2.2(25) At a minimum the following locations will have a communications outlet:
 - 5.11.2.2(25)(a) workstations;
 - 5.11.2.2(25)(b) fax machines, printers, photocopiers;
 - 5.11.2.2(25)(c) media displays;
 - 5.11.2.2(25)(d) meeting room tables;
 - 5.11.2.2(25)(e) meeting room white board locations;
 - 5.11.2.2(25)(f) podiums/ lecterns;
 - 5.11.2.2(25)(g) white board locations;
 - 5.11.2.2(25)(h) wireless access points;
 - 5.11.2.2(25)(i) security panels;
 - 5.11.2.2(25)(j) BMS panels;

- 5.11.2.2(25)(k) metering panels;
- 5.11.2.2(25)(l) study tables;
- 5.11.2.2(25)(m) projectors;
- 5.11.2.2(25)(n) UPS;
- 5.11.2.2(25)(o) library book check out
- 5.11.2.2(25)(p) library security gate; and
- 5.11.2.2(25)(q) Interactive light tables.

5.11.3 Network Equipment

5.11.3.1 Basic Requirements

5.11.3.1(1) Provide a complete and fully operational “Traditional Copper LAN” or “GPON network”, both complete with wireless LAN as required herein and pursuant to Appendix 3E [Communications Specifications].

5.11.3.1(2) Provide redundant core switches, regardless of employing a Traditional Copper LAN or GPON:

5.11.3.1(2)(a) Where GPON network is employed: provide redundant OLTs located in the data centre; ONTs located in-wall and in consolidation points connected back to the communications room servicing that floor; and redundant 10Gb connectivity from each communications room to the redundant OLTs (connect one fibre uplink to each OLT). Connect redundant OLTs to redundant core switches via minimum 40Gb uplinks.

5.11.3.1(2)(b) Where Traditional Copper LAN is employed, provide access/edge layer Ethernet switches located in the communications rooms with redundant 10Gb uplinks from each switch stack to the core switches (connect one 10Gb uplink to each core).

5.11.3.1(3) Acceptable Manufacturers for the Authority Network Switching Equipment are CISCO and HP.

5.11.3.1(4) Acceptable Manufacturers of Authority WiFi Network are CISCO, and ARUBA, and HP.

5.11.3.1(5) Refer to Appendix 3G [System Responsibility Matrix] for the responsibilities of each piece of network equipment. The following is a list of the responsibility sections and their descriptions:

- 5.11.3.1(5)(a) Analysis– establishing the intent and performance of the equipment
- 5.11.3.1(5)(b) Design– establishing specifications of a working system
- 5.11.3.1(5)(c) Design– establishing drawings and specifications of a working infrastructure
- 5.11.3.1(5)(d) Infrastructure – installation of all mechanical/electrical and communications required to operate the equipment
- 5.11.3.1(5)(e) Equipment procurement – purchase and receive equipment and all accessories
- 5.11.3.1(5)(f) Installation – mounting and connection of equipment
- 5.11.3.1(5)(g) Programming – installation and configuration of software
- 5.11.3.1(5)(h) Connection to the network – cabling and connection required to place the equipment onto the network
- 5.11.3.1(5)(i) Operation – day to day use of the equipment
- 5.11.3.1(5)(j) Maintenance – repair of equipment
- 5.11.3.1(5)(k) Life cycle replacement – replacement of equipment based on manufacturer recommended schedule.

5.11.3.1(6) Network equipment will support converged communications, a combination of the three media types of voice, video and data and all equipment will support the prioritization of traffic. The systems will include the main telephone system, video conferencing, CCTV, fax and all information systems.

5.11.3.1(7) Network equipment will function as part of the existing global network management system and will conform to standards and methods used by the Authority across its various sites.

5.11.3.1(8) Redundancy and security will be taken into account in all network designs.

5.11.3.2 Performance Criteria

5.11.3.2(1) End-use equipment will be connected to the Traditional Copper LAN edge communications room layer 2/3 switch or GPON active equipment (located in communications rooms or consolidation points) supporting, 10/100/1000/10G Base-T Ethernet 802.3 protocol.

5.11.3.2(2) The edge communication rooms and consolidation points will also support the 802.11a/b/g/n/ac/ad wireless access points, which require PoE functionality and standards based QoS (Quality of Service) traffic prioritization.

5.11.3.2(3) All racks/cabinets requiring electrical power will be provided with a minimum of:

5.11.3.2(3)(a) 3.3 KW redundant power per rack for telecommunication racks; and

5.11.3.2(3)(b) 8.6 KW A-B redundant power per cabinet for server cabinets within the data centre; and

5.11.3.2(3)(c) 3.3 KW A-B redundant power per rack for communication racks within the main communication room.

5.11.3.2(3)(d) Include these power supplies for the future rack and cabinet spaces.

5.11.3.2(4) Refer to Section 5.10.6 Uninterruptable Power Supply (UPS) Systems of this Schedule for the UPS power requirements for communications rooms and systems.

5.11.3.2(5) In consultation with the Authority, prepare a network plan showing:

5.11.3.2(5)(a) the edge communication devices;

5.11.3.2(5)(b) the applications; and

5.11.3.2(5)(c) all connecting end-use equipment.

5.11.3.2(6) All network ports with network devices attached will be activated. A small percentage of ports, to be used for portable equipment or on an as required basis, will be designated as active. These ports will be designated by the Authority.

5.11.3.2(7) Network infrastructures will support multiple VLAN functionality and multiple subnets per VLAN.

5.11.4 Authority's End-Use Equipment

5.11.4.1 Basic Requirements

5.11.4.1(1) Refer to Appendix 2E [Equipment and Furniture]. The Authority will provide some of its own end-use equipment including:

5.11.4.1(1)(a) personal computers;

5.11.4.1(1)(b) laptop computers;

5.11.4.1(1)(c) tablet PCs;

5.11.4.1(1)(d) printers;

5.11.4.1(1)(e) 3D printer indicated in the Functional Program

5.11.4.1(1)(f) photocopiers;

5.11.4.1(1)(g) facsimile machines;

5.11.4.1(1)(h) kiosks other than those identified for Project Co procurement under Section 3.5.7 [Signage].

5.11.4.1(2) Project Co will:

5.11.4.1(2)(a) include the installation of the Authority Supplied End-Use Equipment as part of the Move-in Schedule;

5.11.4.1(2)(b) assist the Authority to define locations for the Authority Supplied End-Use Equipment;

5.11.4.1(2)(c) provide adequate power and wired network drops for the Authority Supplied End-Use Equipment; and

5.11.4.1(2)(d) provide jack number information (on the Authority's cable information Excel spreadsheet) to the Authority to facilitate placement of the Authority Supplied End-Use Equipment.

5.11.4.1(2)(e) Passive RFID System –

- (e).1 The Authority will provide Passive RFID Equipment (RFID vendor will install equipment) for site specific areas, such as the library, incorporating self-check in & check out kiosks including RFID readers placed at the exits and around the library to decipher these RFID signals and collect tangible data in real time.
- (e).2 Project Co to provide 120 volt power, Cat 6A network outlet and empty conduit rough-in requirements to eleven(11) locations.
- (e).3 Project Co to provide 120vp and a Cat 6A network drops at eleven (11) locations,
- (e).4 Project Co to provide rough in to concrete floor for two (2) security gates (entry/exit point) are included in the 11 rough in locations unless more are required by the design to achieve perimeter security.
- (e).5 Project Co to provide rough in to concrete floor to cover the perimeter entry/exit point for the Learning Commons area (if two security gates are required by the design to achieve perimeter security then Project Co to add a gate),
- (e).6 Project Co to provide rough in to concrete floor to cover the perimeter entry/exit point for the library area,
- (e).7 Project Co to provide rough in for deposit/drop box location into Library staff workroom (24/7 access)

complete with concrete floor rough in,

- (e).8 Project Co to provide two (2) rough in locations for RFID staff workstations at the service counter,
- (e).9 Project Co to provide area for three (3) self-check out stations in the Library Commons area complete with concrete floor rough in,
- (e).10 Project Co to provide area for three(3) self-check out stations in the Library area complete with concrete floor rough in.

5.11.4.1(2)(f) Active RFID System (RTLS – Real Time Locating System)

- (f).1 Project Co. will supply and install the Active RFID system; software and hardware. (The Active RFID (RTLS) system will use the Wireless Access Points being installed by Project Co).
- (f).2 Acceptable Manufacturer: equal or better than Ekahau using the Ekahau Vision™ RTLS Software Platform.
- (f).3 WiFi asset tags for tracking; Ekahau A4 and A4+ Asset Tags. One hundred (100) A4 tags and batteries; One hundred (100) A4+ tags and chargers.
- (f).4 Project Co. will include the server and any additional hardware, software and labour required to fully deploy the Ekahau System (or acceptable equivalent system) throughout the entire Facility.

- (f).5 The Authority will manage and maintain the system after Service Commencement.

5.11.5 Project Co.'s Own Equipment

5.11.5.1 Basic Requirements

- 5.11.5.1(1) Provide end-use equipment and communications equipment to provide a fully operational Facility and that Project Co may require for its own use for the performance of its obligations under this Agreement (Project Co.'s End-Use Equipment).
- 5.11.5.1(2) Do not connect any of Project Co.'s End-Use Equipment to the Authority's network, both wired and wireless, without prior approval from the Authority. Project Co is responsible for paying any additional cost incurred by the Authority for Project Co.'s use of Project Co.'s End-Use Equipment on the Authority's network.
- 5.11.5.1(3) The Authority may elect to install any of Project Co.'s End-Use Equipment that has been approved for connection to the Authority's network.
- 5.11.5.1(4) Servers and related equipment for Project Co.'s End-Use Equipment are to be located in a separate Project Co equipment room (or communications rooms but only if specifically approved by the Authority in advance). They are not to be located in edge closets.
- 5.11.5.1(5) Any wireless infrastructure or devices used by Project Co will not interfere with the Authority's wireless infrastructure or devices.
- 5.11.5.1(6) The Authority wishes to have a single communications infrastructure but where required this infrastructure may be physically separated with approval of the Authority.
- 5.11.5.1(7) If Project Co elects to reside on the Authority's network, Project Co will conform to all Authority network and end-use standards.

5.11.6 Wireless Infrastructure

5.11.6.1 Basic Requirements

5.11.6.1(1) Subject to Section 5.11.6.1(2) of this Schedule, design and install a complete wireless network solution for the Facility in accordance with 802.11 standards. Cabling in accordance to TSB-162. Include testing and confirmation of signal strength. Provide all documentation.

5.11.6.1(2) Project Co. will:

5.11.6.1(2)(a) procure and install, all required network equipment for the wireless solution, including network switches and access points; and

5.11.6.1(3) the Authority will:

5.11.6.1(3)(a) program and be responsible for all logical network design and network equipment configuration.

5.11.6.1(4) Project Co will install all network switches and patch cords test all network equipment and cable infrastructure for the wireless network in consultation with the Authority. Install all network equipment in accordance with all applicable standards, including the following IEEE and EIA/TIA standards: 802.1, 802.11 and 802.3.

5.11.6.1(5) The wireless infrastructure will service 802.11a, b, g, n, ac wireless communications and data transfer requirements for access by wireless devices to data and voice services RTLS within the Facility and across the Authority via the Authority WAN.

5.11.6.1(6) Provide a complete structured cabling infrastructure that will allow the installation of the complete wireless network, including PoE wireless access points. Project Co will locate data drops and access points in consultation with the Authority.

5.11.6.1(7) Setup and test all aspects of the wireless network and provide heat maps for the Facility indicating the channel coverage, signal level, data rate and noise floor for 802.11a,b,g,n,ac wireless networks.

5.11.6.1(8) Ensure wireless management tools include access point locations mapped to a floor plan with RF characteristics defined for building layers including glass, concrete, wood, drywall and metal permanently mounted RF obstacles

5.11.6.1(9) Provide the wireless network management tool configuration file to the Authority at the completion of the wireless network testing.

5.11.6.2 Design Requirements

5.11.6.2(1) Work with the Authority in creating an operational plan for the wireless network complete with management strategy alerts notification and resource requirements for maintenance.

5.11.6.2(2) Retain a certified network engineer with expertise and experience in working with the Authority approved equipment to design the wireless network.

5.11.6.2(3) Provide all required modular components in each switch to support all protocols and functionality as designed.

5.11.6.2(4) The Access Points will be part of a wireless switch infrastructure and will be serviced by 10/100/1000/10G Base-T Ethernet ports. The edge room switch backbone to the core network room will provide enough bandwidth to allow wireless services to function as designed. The wireless controller will reside in the core communications room and be serviced by 10G Base-T Ethernet services as required by the wireless switches. The wireless switches will be deployed in a redundant fashion, with redundant power supplies, Ethernet feeds and switches.

5.11.6.2(4)(a) Where a Traditional Copper LAN is employed, access layer switches supporting wireless APs will be deployed in a redundant manner, complete with redundant power supplies and uplinks to the core switches.

5.11.6.2(5) The access points will support redundant PoE connections and be connected to two physically separate PoE switches or ONTs.

5.11.6.2(6) Deploy the wireless switches or ONTs such that there is at a minimum 5% spare access point licenses per switch or ONT and an overall minimum of 15% spare access point licenses.

5.11.6.2(7) Include the active ports required by the wireless network access points in the total port count for the Facility (refer to 5.11.2.1(2)(c)). The list of layer 2/3 switch or ONT ports will be provided indicating the ports connected to a given access point, and the power load on the switch with the remaining

available PoE power on the switch. The wireless network documentation will include a list of access points with the switch identification and port number indicated in a spreadsheet.

5.11.6.2(8) Provide access points throughout the Facility where wireless connectivity is required, installed in a 18.3M grid pattern. See Appendix 3E [Communications Specifications].

5.11.6.3 Performance Criteria

5.11.6.3(1) The wireless network will support the four main services which will be active in the Facility:

5.11.6.3(1)(a) the Authority's administrative data services. These services do not require prioritization and will be on the default VLAN;

5.11.6.3(1)(b) staff wireless devices which consist of all handheld or mobile wireless will be on a separate VLAN;

5.11.6.3(1)(c) RTLS equipment location systems which use a triangulation method to locate devices that beacon a signal at regular intervals; and

5.11.6.3(1)(d) non-Authority equipment.

5.11.6.3(2) Wireless network equipment will function as part of the existing network management tools and methods within the Authority.

5.11.6.3(3) Provide data rates consistent with the strictest specifications provided by the wireless end-use equipment.

5.11.6.3(4) Provide channel dB separation consistent with the strictest specifications provided by the wireless end-use equipment.

5.11.6.3(5) Provide an RF environment consistent with the noise floor and signal strength requirements (SNR) and consistent with the strictest specifications provided by the wireless end-use equipment.

5.11.6.3(6) Provide a minimum signal strength of 67dbm RSSI at the boundaries of the Site including outdoor areas.

5.11.7 Public Address System

5.11.7.1 Basic Requirements

5.11.7.1(1) Provide cable infrastructure and equipment for a paging system in the Facility.

5.11.7.1(2) The public address system will be separate from and act independently of the fire alarm system to ensure it is usable during a fire alarm. Provide interconnects between the systems as required by all applicable regulatory standards or codes.

5.11.7.1(3) Provide, in consultation with the Authority, seamlessly functioning with the telephone system.

5.11.7.1(4) Provide for paging at each phone by authorized Authority staff only. Paging will be done via a telephone interface to the phone system.

5.11.7.2 Operational Requirements

5.11.7.2(1) Provide complete speaker coverage of the Facility so that emergency pages can be heard everywhere in the Facility with high intelligibility and low loss of articulation of consonants.

5.11.7.2(1)(a) Paging sound levels will be at least 10 dB above ambient noise levels.

5.11.7.2(2) Provide all equipment necessary for a fully operational public address system, including:

5.11.7.2(2)(a) paging amplifiers.

5.11.7.2(2)(b) flush ceiling speakers in finished areas in a material and finish in keeping with the Authority approved interior design concept.

5.11.7.2(2)(c) trumpet type speakers in mechanical and other high ambient locations.

5.11.7.2(2)(d) microphone(s);

5.11.7.2(2)(e) mixers; and

5.11.7.2(2)(f) interface of the VoIP phone system.

5.11.7.2(3) Size amplifiers to handle total load plus 25% spare capacity.

5.11.7.2(4) Provide telephone access for paging with a maximum delay of 1 second between accessing system and ability to transmit page.

5.11.8 Audio Visual

5.11.8.1 Basic Requirements

5.11.8.1(1) Refer to Appendix 2C Design Review for submittal and review procedures.

5.11.8.1(2) Schedule 3 Design and Construction Specifications Audio Visual section will be referenced together with Appendix 3B Audio Visual Specifications and Schedule 2 E Equipment and Furniture. Project Co will furnish, install and test all AV systems in conformance with this section 5.11.8.

5.11.8.1(3) Submittals. Prior to fabrication, Project Co. will submit all design engineering pertaining to the audiovisual system. This engineering includes, but is not limited to, the following:

5.11.8.1(3)(a) all panels, plates and designation strips, including details relating to terminology, engraving, finish and colour;

5.11.8.1(3)(b) remote control panel design (to include "live" interactive electronics format);

5.11.8.1(3)(c) all equipment racks, cabinets, consoles, tables, carts, lecterns, support bases and shelves;

5.11.8.1(3)(d) schematic drawings (AV and control signal flows);

5.11.8.1(3)(e) all non-factory equipment modifications;

5.11.8.1(3)(f) front mechanical drawings of each equipment rack;

5.11.8.1(3)(g) equipment location drawings;

5.11.8.1(3)(h) systems functional block drawings, including those for audio and video subsystems;

5.11.8.1(3)(i) Cable labelling plan;

5.11.8.1(3)(j) Manufacturer supplied owner's manual;

- 5.11.8.1(3)(k) EASE 3-D, or equivalent approved by the Authority, Acoustic modelling report to simulate the sound system being proposed for each room.

5.11.8.1(4) Documents.

- 5.11.8.1(4)(a) Project Co will provide a narrative description of the system. The use of technical literature statements and/or extracts is not acceptable.

- 5.11.8.1(4)(b) Provide the following:
- (b).1 a list of the equipment including the quantity, make and model number of each;
 - (b).2 cabinet layout and elevation drawings, as they are expected to be installed complete with the location of rack mount equipment;
 - (b).3 equipment technical literature detailing the electrical and technical characteristics of each item of equipment;
 - (b).4 drawings prepared by the professional engineer of record for each system, with information to determine compliance with contract drawings and specifications;
 - (b).5 list of test equipment used to verify AV installation.

5.11.8.1(5) Test Equipment List.

- 5.11.8.1(5)(a) Project Co will furnish all test equipment required to test the system in accordance with the parameters specified. Unless otherwise stated, the test equipment will not be considered part of the system.
- 5.11.8.1(5)(b) The test equipment will have a calibration tag of a factory calibration service dated not more than twelve (12) months prior to the test. As part of the submittal package,

a test equipment list will be furnished that includes the make and model number of the following type of equipment as a minimum:

- (b).1 oscilloscope;
- (b).2 spectrum analyzer;
- (b).3 signal level meter;
- (b).4 volt-ohm meter;
- (b).5 SPL meter;
- (b).6 SPL calibrator;
- (b).7 sine wave and random noise generator, and;
- (b).8 audio amplifier with external speaker.

5.11.8.1(6) Certifications.

5.11.8.1(6)(a) After the system has been provided, pretested to meet the requirements of this specification, Project Co will submit a letter to the Authority certifying that the system is ready for the formal proof of performance test to be accomplished in the presence of the Authority.

- (a).1 in the interim, the system will be left on;
- (a).2 a copy of each recorded system pretest measurements will be submitted to the Authority

5.11.8.1(7) Equipment Manuals

5.11.8.1(7)(a) After the scheduled proof of performance test Project Co will deliver to the Authority complete sets of commercial operation and maintenance manuals for each item of equipment furnished as part of the systems. The manuals will detail the theory of operation and will include narrative descriptions, pictorial illustrations, block and schematic diagrams, and parts list.

5.11.8.1(8) As-installed Wiring Diagrams

5.11.8.1(8)(a) Project Co will deliver to the Authority complete sets of as-installed wiring diagrams of the system. The diagrams will show all

inputs and outputs of electronic and passive equipment correctly identified according to the markers installed on the interconnecting cables, equipment and room/area locations.

- (a).1 The as-installed wiring diagrams will be a hard copy and soft copies in a format acceptable to the Authority.

5.11.8.1(9) System Operational Manuals.

- 5.11.8.1(9)(a) Project Co will produce this manual specifically for the system detailed herein. The manual will describe all procedures necessary to activate the system to provide for the functional requirements, except as specifically excluded by the Authority. This section will provide a non-technical graphic and narrative “how-to” users guide for the procedures needed to operate the system. The document will contain a section on operating the system’s equipment in the event of control system failure. Control system touch panel layouts will be accompanied by narrative text describing step-by-step function engagement.

5.11.8.1(10) Testing Plan

- 5.11.8.1(10)(a) Prior to system testing, Project Co will provide a detailed system testing plan for the system to meet this specification’s performance standards indicated in section 5.11.8.3 Performance Criteria. The test plan will be subject to requirements of Schedule 2 Section 12 Commissioning and Operation Readiness before system testing.

- 5.11.8.1(11) Design and provide all audio and visual equipment for a complete working system based on systems indicated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] and the following requirements:

- 5.11.8.1(11)(a) for rooms identified requiring a sound system provide:

- 5.11.8.1(11)(b) a speaker system to suite the type of space and ambient sound levels in order to produce a clear audible sound in all parts of the space;
- 5.11.8.1(11)(c) an amplifier sized to a minimum of 1.6 times the total speaker capacity;
- 5.11.8.1(11)(d) audio inputs for a player;
- 5.11.8.1(11)(e) a microphone where lecterns are installed;
- 5.11.8.1(11)(f) a mixer where multiple audio inputs are present; and
- 5.11.8.1(11)(g) amplifiers and mixers will be contained within a lockable cabinet.
- 5.11.8.1(11)(h) for rooms identified as requiring a lectern provide:
- 5.11.8.1(11)(i) a microphone connected to the sound system
- 5.11.8.1(11)(j) a touch screen audio/visual/lighting control system in the lecture theatres
- 5.11.8.1(11)(k) for rooms identified as requiring a projector provide:
- 5.11.8.1(11)(l) ceiling mounting for the projector
- 5.11.8.1(11)(m) power and control to the projector screen
- 5.11.8.1(11)(n) DVI and HDMI visual inputs to the projector from a floor box if a main table is present, wall mounted next to the whiteboard where present and within the lectern where present;
- 5.11.8.1(11)(o) the projector will be chosen based on the distance to the screen, ratio 16:9, and resolution required in order for the farther viewing persons clear view based on 20/20 vision.
- 5.11.8.1(11)(p) for rooms identified as requiring a display provide:
 - (p).1 DVI and HDMI visual inputs to the display from a convenient location audio inputs to the display from a convenient location.

5.11.8.2 Quality Requirements

5.11.8.2(1) Project Co's AV contractor's Qualifications:

- 5.11.8.2(1)(a) Project Co will ensure the AV contractor meets the minimum requirements identified herein.
- 5.11.8.2(1)(b) Project Co's AV contractor will have at least five(5) years of experience in the programming, fabrication, assembly and installation of audiovisual presentation, conferencing, and remote control systems of comparable size, magnitude and quality in regards to coordinating, engineering, testing, certifying, supervising, training and documentation as set out in these specifications.
- 5.11.8.2(1)(c) The firm will be an authorized sales and service centre for all listed components, or approved comparable product offerings in the specification.

5.11.8.2(2) References:

- 5.11.8.2(2)(a) Project Co's AV contractor will provide no less than three (3) references for installations of similar size and scope, performed throughout the lower mainland and Vancouver Island areas within the past eighteen (18) months.
- 5.11.8.2(2)(b) Project Co's AV contractor will provide written proof of contractual relationship or technical certification by the respective equipment manufacturers and will be authorized by that equipment manufacturer to pass on the manufacturer's certification and equipment warranty to the Authority. Additionally, the equipment manufacturer and Project Co will accept complete responsibility for the design, installation, certification, operation and physical support for the system. Project Co, including all subcontractors (if any), will have a minimum proven five (5) year track record for

audiovisual projects and cabling systems of this complexity. This record, along with Project Co's and equipment manufacturer's certifications, must be provided in writing, as part of Project Co's technical submittal.

5.11.8.2(2)(c) Project Co's AV contractor's Audiovisual technicians will be fully trained, qualified, and carry valid and current industry certifications regarding the engineering, installation, operation, and testing of audiovisual technologies. The AV contractor will provide written evidence of current original equipment manufacturer's certification(s) for the installer(s) as part of the submittal under the design review process pursuant to Schedule 2.

5.11.8.2(2)(d) An Infocomm CTS (Certified Technology Specialist) will supervise and approve all on-site work as a recognized member of Project Co's installation team. All installation team members will demonstrate knowledge and compliance with all Infocomm, TIA and CEC methods, standards and codes. Project Co's installation team will provide team resumes and demonstration of completed training courses and certifications.

5.11.8.2(2)(e) Project Co's AV contractor will have local in-house engineering and project management capability consistent with the requirements of this Project.

5.11.8.3 Performance Criteria

5.11.8.3(1) Performance Standards.

5.11.8.3(1)(a) Unless restricted by the published specification of a particular piece of equipment, or unless otherwise required, the following minimum performance standards will be met by the audiovisual system.

5.11.8.3(1)(b) Audio
 (b).1 S/N(including crosstalk and hum): 75dB minimum,

- (b).2 Total harmonic distortion:
0.5% maximum from 30 Hz
to 15,000Hz,
 - (b).3 Frequency response: flat
within +1.0 dB to 15,000Hz.
- 5.11.8.3(1)(c) Display
- (c).1 Minimum 15:1 contrast
ratio.
- 5.11.8.3(1)(d) Analogue Video:
- (d).1 S/N (peak to RMS),
unweighted DC to 4.2 MHz:
45 dB minimum,
 - (d).2 crosstalk, unweighted DC to
4.2 MHz: 45 dB minimum,
 - (d).3 frequency response
(RGBHV): within +0.5 dB to
300 MHz,
 - (d).4 line and field tilt: 2 %
maximum,
 - (d).5 differential gain:3%
maximum,
 - (d).6 differential phase: 2
degrees maximum.
- 5.11.8.3(1)(e) Digital Video:
- (e).1 standard cable will deliver a
signal of 17 MHz;
 - (e).2 high speed will deliver a
signal of 340 MHz;
 - (e).3 gain loss for digital video
transported over fibre optics
will not exceed 3 db.

5.11.8.3(2) Performance Test signal paths.

- 5.11.8.3(2)(a) The signal paths for the above
performance standards will be as follows:
- (a).1 Audio: from any and all
source inputs (microphones,
audiotape units, videotape
units and similar devices)
through all audio mixers,
switchers, distribution
amplifiers, codecs, and

similar devices, to all signal destinations.

- (a).2 Video: from all source inputs (cameras, computers, and similar devices) through all switchers, processors, distribution amplifiers, and similar devices to all signal destinations.

5.11.8.3(3) Design Requirements

5.11.8.3(3)(a) Baseline audiovisual requirements within this system specification will be maximized to the greatest extent possible in order to support future growth in an effective manner. Therefore, part of the installer's development efforts for successfully implementing the audiovisual system should include:

- (a).1 Installing the system in a manner that allows for future audiovisual equipment to integrate easily into the overall desired system design, properly routing all audio, video, control and structured cabling elements of the final design in an industry acceptable manner.
- (a).2 Except when plenum rated cabling is used above finished ceiling or below raised accessible floors, it is required that cabling for microphone and line inputs, wideband RGBHV, video, control and other audiovisual related cabling be routed inside the comprehensive system of conduit indicated on the drawings and installed by others. Floor and wall

boxes will serve as the primary interface points to the audiovisual system.

- (a).3 No wiremold or surface mounted raceway unless otherwise agreed to by the Authority.

5.11.8.3(3)(b) Design and construct rooms containing A/V equipment and locate microphones, video cameras, video monitors, lighting systems and sound attenuation structures/materials to optimize the performance of the video conferencing systems.

5.11.8.3(3)(c) Design and construct rooms to meet the requirements set out in Appendix 3B [Audio Visual Requirements].

5.11.8.3(4) Operational Requirements

5.11.8.3(4)(a) Remote control and digital signal process standards:

- (a).1 at minimum, the remote control system for the audiovisual system will be programmed to include the following;
- (a).2 full function control of all source components, display units, processing devices, and switching electronics;
- (a).3 per function status feedback indicating active/passive modes of operation;
- (a).4 separate program and microphone audio level control with mute function;
- (a).5 70% audio level default;
- (a).6 panel layout to include user screens as well as password protected technician pages;
- (a).7 raised and lower projection screens;

- (a).8 at least four (4) lighting presets with independent control for the separate lighting zones;
- (a).9 full audio and videoconferencing functions with dialing;
- (a).10 a minimum of three (3) presets for each installed remote controllable video camera;
- (a).11 assignment of dedicated OS room computer as default;
- (a).12 authority logo on first page;
- (a).13 automatic system shutdown driven by server;
- (a).14 am/pm clock settings;
- (a).15 intellectual property release for installing editable, uncompiled source code for the entire remote control system and associated panel layouts on OS computer(s). Editable, uncompiled source code is intended for the Authority to make additions, modifications, and changes to the remote control system after the warranty period has expired. Provide and load onto Authority's dedicated computer, editable versions of all configuration files for any digital signal processing, as well as the associated software required for editing those files. Provide editable and uncompiled versions of all master source code for the control system on CD-ROM.

5.11.8.3(5) Testing and Commissioning

5.11.8.3(5)(a) Notwithstanding the requirements of Schedule 2 Section 12 Commissioning and Operational Readiness procedure, Project Co will provide the following:

5.11.8.3(5)(b) Pretesting.

- (b).1 Upon completing installation of each system, Project Co will align, balance and completely pretest each entire system under full operating conditions.
- (b).2 Pre-testing Procedure. During the system pretest, Project Co will verify (utilizing an approved oscilloscope, spectrum analyzer and test equipment) that the systems are fully operational and that they meet the performance requirements for each system set out in these Specifications.
- (b).3 Project Co will pretest and verify that each system's equipment functions and specification requirements are met and operational allowing no undesirable visual effects such as keystoneing, banding, and shimmering, as well as, no undesirable aural effects such as signal distortion, noise pulses, glitches, audio hum, poling noise, are present.
- (b).4 Project Co will provide recorded system pretest measurements and the written certification that the system is ready for the formal acceptance test will be submitted to the Authority.

- 5.11.8.3(5)(c) Acceptance Testing
- (c).1 After each system has been pre-tested and Project Co has submitted the pretest results and certification to the Authority, then Project Co will schedule an acceptance test date with the Authority.
 - (c).2 The system will be tested in the presence of the Authority's representative and original equipment manufacturers certified representative. The system will be tested utilizing the approved test equipment to certify each system's proof-of-performance. Each system test will verify that total system meets all the requirements of this specification under full operating conditions.
 - (c).3 The acceptance test will be performed on a "go-no-go" basis. Only those operator adjustments required to show proof-of-performance will be allowed. The tests will demonstrate and verify that the provide systems comply with all requirements of this specification under operating conditions. The systems will be rated as either acceptable or unacceptable at the conclusion of the test. Failure of any part of the systems that precludes completion of that system's testing, which cannot be repaired in one hour, will be cause for terminating the

acceptance test of that system. Repeated failures, which result in a cumulative time of four hours to effect repairs will cause the entire system to be declared unacceptable. Retesting of that entire system will be rescheduled at a time agreed by the Authority.

- 5.11.8.3(5)(d) Acceptance Test Procedure.
- (d).1 Physical and Mechanical Inspection:
 - (d).2 The Authority's representative will physically tour all areas where each system is installed to review that all sub-systems are compliant with these specifications. A system inventory including required spare parts will be reviewed at this time. Each item of installed equipment will be checked to review appropriate certification labels are affixed
 - (d).3 Each system's diagrams, as-installed drawings, equipment manuals, AutoCAD, editable versions of all configuration files for any digital signal processing as well as the associated software required for editing these files, editable and uncompiled versions of all master source code for the control system on soft copy and pretest results will be formally reviewed.
 - (d).4 Failure of any system to meet the installation requirements of this

specification will be grounds for terminating the testing.

- 5.11.8.3(5)(e) Operational Test
- (e).1 After the physical and mechanical review, each head end, terminating, distribution, and remote control equipment will be checked by Project Co to verify that it meets all performance requirements outlined herein. An oscilloscope, spectrum analyzer and sound level meter may be additionally utilized to accomplish this requirement.
 - (e).2 Following the head end, terminating, distribution, and remote control equipment test, test equipment, Project Co connect to each equipment's output tap to ensure there are no signal distortions such as visual, inter-modulation, data noise, popping sounds, erratic system functions on any function.
 - (e).3 Each system will be checked at each interface, junction, and distribution point, first, middle, and last intersectional, room and outlet, in each leg to verify that the system meets all system performance standards.
 - (e).4 Once these tests have been completed, each installed sub-system function will be tested as a unified, functioning and fully operating system. Also, minimum of ten minutes of

UPS operation and memory saving

5.11.8.3(5)(f) Individual Item Test.

- (f).1 The Authority's representative will select individual equipment items for detailed proof-of-performance testing until 100% of each system has been tested and found to meet the contents of this specification. Each item will meet or exceed the minimum requirements of this document.

5.11.8.3(5)(g) Test Conclusion:

- (g).1 At the conclusion of the Acceptance Test, using the generated deficiency list, the Authority and Project Co will agree to the results of the test and reschedule testing on deficiencies and shortages, if any. Any retests that are needed to reach agreement on the results of these tests or to later establish compliance with these specifications will be done at Project Co's expense.
- (g).2 Training of the Authorities operation and maintenance personnel is required in cooperation with the Authority's representative. Project Co to provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation and troubleshooting of the

installed systems. The instruction will be scheduled in coordination with the Authority's representative after submission and approval of formal training plans.

5.11.8.3(5)(h)

Training:

- (h).1 AVS training will be provided for the operator/user and technical staff. Operator/user training will minimally consist of eight (8) each one(1) hour sessions. Technical operation and maintenance training session will minimally consist of eight (8) each one (1) hour sessions. Training sessions to be coordinated with the Authority and schedule throughout year one. All training must be video recorded by Project Co and a copy provided to the Authority.
- (h).2 A complete operation and maintenance manual and preliminary record drawings package will be delivered to the Authority two (2) weeks prior to the trainingsessions.
- (h).3 Operator/user training will minimally consist of:
- (h).4 Provide custom system specific printed reference material for each trainee that documents and explains in layman's terms:
- (h).5 System block diagrams,
- (h).6 Normal day-to-day operation,
- (h).7 Operator selectable features,

- (h).8 Provide a hands-on training with question and answer session.
- (h).9 Provide and review a custom, system, specific, quick reference guide for the inexperienced operator.

5.11.8.3(5)(i) Technical Operations and Maintenance training will consist of:

- (i).1 The technical explanation will be sufficiently thorough that: staff personnel will be able to make any programming changes required, analyze malfunctions and make equipment substitutions or bypasses necessary to maintain system operation except for the malfunctioning equipment or circuits.
- (i).2 Provide printed reference material for each trainee that documents and explains in technical terms:
- (i).3 System block diagram with technical features,
- (i).4 Technical operation, adjustments and programming,
- (i).5 System features and programming,
- (i).6 Review of record drawings,
- (i).7 Provide a hands-on training with question and answer session.

5.11.8.3(5)(j) Codes, Standards and Guidelines

- (j).1 Telecommunications Industry Association Electronic Industries Alliance (TIA/EIA). "TIA/EIA Wiring Standards" (includes TIA/EIA-568-1, TIA/EIA-

568-2, TIA/EIA-568-3,
TIA/EIA-569, TIA/EIA-606,
TIA/EIA 607, TIA-758, 526-
7 & TIA 526-14)

- (j).2 AV Design Reference Manual, BICS! and InfoComm International.
- (j).3 AV Installation Handbook, The Best Practices for Quality Audiovisual Systems, InfoComm International.
- (j).4 ANSI/INFOCOMM 3M-2011 Projected Image System Contrast Ratio,
- (j).5 ANSI/INFOCOMM 2M-2010, Standard Guide for Audiovisual Systems Design and Coordination Processes,
- (j).6 ANSI/INFOCOMM 1M-2009, Audio Coverage Uniformity in Enclosed Listener Areas (ACU),
- (j).7 All related Infocomm supported white papers and recommended practice documents.
- (j).8 Canadian Electric Code (CEC).

5.11.9 Intercommunication System

5.11.9.1 Basic Requirements

5.11.9.1(1) Local Intercom systems are required at locked entrance doors that delivery personnel or the public will need access through.

5.11.9.2 Quality Requirements

5.11.9.2(1) The local intercom systems will be manufactured by recognized industry leaders in the intercom business.

5.11.9.2(2) All wiring for the intercom system will be part of the structured cabling system.

5.11.9.3 Performance Criteria

5.11.9.3(1) Provide local intercom systems at all locations requiring public or delivery access that may be locked. These systems will connect to the telephone system to allow the intercom to dial up the telephone at the nearest manned reception area. The telephone system will be able to remotely unlock the door.

5.11.9.3(2) Provide a programmable all-master intercom system with the following capabilities:

- 5.11.9.3(2)(a) loud-speaking full-duplex, hands-free operation with video capability at select building entry points;
- 5.11.9.3(2)(b) colour video, in location(s) determined with the Authority;
- 5.11.9.3(2)(c) two or three-digit number series;
- 5.11.9.3(2)(d) line lockout: a fault on line blocks only extension line concerned;
- 5.11.9.3(2)(e) camp-on busy: automatic recall when busy extension becomes free;
- 5.11.9.3(2)(f) priority feature: incoming calls prevented from being connected "direct-in" and are announced by repeated call tone and flashing pilot lamp until manually accepted;
- 5.11.9.3(2)(g) all-call: all extensions can initiate or receive all-call;
- 5.11.9.3(2)(h) three-way conference call capability;
- 5.11.9.3(2)(i) ability to create multiple groups on the same system with blocked access as required by users; and
- 5.11.9.3(2)(j) minimum of 8 channels or more to ensure no busy signals based on the number of stations in the system. Provide additional channels after the Facility is occupied if staff experience busy signals.

5.12 Electronic Safety and Security (Division 28)

5.12.1 General

5.12.1.1 Ensure a safe environment for staff, students and visitors by proper utilization of electronic access control, video monitoring and intrusion detection systems.

5.12.2 Fire Alarm System

5.12.2.1 Basic Requirements

5.12.2.1(1) Provide a Simplex, Edwards or equal fire alarm system as approved by the Authority for the Facility and ensure that the system meets or exceeds the requirements in this Section 5.12.2.

5.12.2.1(2) Provide a complete two stage (general and evacuation), supervised, 24 VDC fire detection and alarm system that includes addressable, intelligent, automatic and manual initiation devices and audio/visual alarm devices with voice evacuation capabilities. Alarm activation will be initiated by manual pull stations, smoke / heat detection, and fire sprinkler water flow devices. Alarm indication will consist of visual and combination visual/audible devices.

5.12.2.1(3) The fire alarm system will comply with all applicable standards, including:

5.12.2.1(3)(a) Can/UL S524 Standard for Installation of Fire Alarm Systems;

5.12.2.1(3)(b) Can/UL S537 Standard for Verification of Fire Alarm Systems;

5.12.2.1(3)(c) applicable NFPA Codes; and

5.12.2.1(3)(d) Elevator Code CAN3-B44.

5.12.2.1(4) The fire alarm system will meet the City of Vancouver Building By-Law and the fire inspector's requirements.

5.12.2.1(5) Provide, in consultation with the Authority, seamlessly functioning with the telephone system.

5.12.2.1(6) Provide for paging at each phone by authorized Authority staff only. Paging will be done via a telephone interface to the phone system.

5.12.2.2 Performance Criteria

- 5.12.2.2(1) Install all fire alarm wiring in conduit. Provide two hour rated cable where required to meet survivability requirements of NFPA 72.
- 5.12.2.2(2) Provide addressable smoke detectors as required, self-correcting analog type to maintain consistent sensitivity.
- 5.12.2.2(3) Provide manual pull stations at all exit doors and entrances to exit stairs as required.
- 5.12.2.2(4) Provide visual notification devices at all corridors, public spaces, toilets, common use spaces and spaces containing high ambient sound levels.
- 5.12.2.2(5) Provide fire alarm speakers throughout the Facility as required. Speaker system will be available to announce alarm conditions and for use as public address announcements. Provide microphone at main reception desk, with telephone interface, for use of the speaker system. Pre-programmed messages will be transmitted over overhead paging system to announce origin of alarm. Any program sources on paging system will be muted while alarm messages are transmitted.
- 5.12.2.2(6) Use combination audible alarm and visual notification devices where applicable.
- 5.12.2.2(7) Include control devices and connection to close fire and smoke doors on activation of alarm condition.
- 5.12.2.2(8) Incorporate smoke control systems with control fans and dampers.
- 5.12.2.2(9) Provide a minimum of 2 isolation modules per floor for alarm circuits to isolate wire to wire shorts.
- 5.12.2.2(10) Provide a touch screen computer graphic annunciator complete with LCD display for the Facility, at a location required and approved by the local fire department.
- 5.12.2.2(11) Provide LED type indicators for remote indication that duct sensors that are not readily visible (located on ceiling or at visible location nearest to sensor installation).
- 5.12.2.2(12) Provide a computer work station in Facilities department as per Project Co.'s requirements for Facilities area.
- 5.12.2.2(13) The fire alarm control panel (FACP), remote annunciators and printers will indicate general alarm and trouble conditions.

- 5.12.2.2(14) Provide gel electrolyte type batteries with overcharge protection for FACP and all transponders. Provide solid state battery charger(s) with capacity to recharge entire battery system in 4 hours. Batteries will have enough capacity (with 25 percent spare time) to operate entire system (except magnetic door holders) in accordance with the City of Vancouver Building By-Law.
- 5.12.2.2(15) Include transmission of alarm signal to remote emergency response centre approved by the Authority.
- 5.12.2.2(16) Provide telephone access for paging with a maximum delay of 1 second between accessing system and ability to transmit page.
- 5.12.2.2(17)

5.12.3 Electronic Security Systems

5.12.3.1 General

- 5.12.3.1(1) Design, provide and install a security system to meet the Authority's security programs within a campus environment.
- 5.12.3.1(2) Provide fully networked integrated security systems to protect staff, students, visitors and property. As part of this security management program, at a minimum, provide a closed circuit television system to view and record events, an access control system to restrict access to secure areas to authorized personnel only, intrusion alarm detection systems to detect and report unauthorized entry into protected spaces, and a Facility wide panic duress system (wired and wireless) to protect staff.
- 5.12.3.1(3) Develop the Facility design based on the Facility Threat and Risk Assessment (refer to Sections 4.9 of Schedule 2 [Design and Construction Protocols]).
- 5.12.3.1(4) All security systems will reside on a VLAN as part of the Authority's information technology infrastructure connected via the Passive Optical Network system and network devices to allow the Authority the opportunity to review events and monitor the status of security systems from off-site locations. The system will be fully accessible through the Authority's network. Enterprise Class Security Management System. Fully integrated (intrusion/Access/CCTV & Panic Duress).

5.12.3.1(5) Security system will be scalable to allow for interconnections of many devices and subsystems from different manufacturers.

5.12.3.1(6) The security system will incorporate commercial off-the-shelf equipment and proven designs from manufacturers regularly engaged in the production of models and types of equipment used in the security industry. Products will be quality control tested and verified for the intended operation prior to installation at site.

5.12.3.1(7) All materials, including hardware and software provided will be new and most current version or production model.

5.12.3.1(8) Electronic security systems will maintain dependability and reliability under all operational environmental conditions, capable of 24 hours per day, seven days per week continuous operation.

5.12.3.1(9) Interconnect security systems to the fire alarm system as required by applicable Laws or standards.

5.12.3.1(10) Train Authority staff on the use and operation of security systems and location of all security devices. Coordinate and schedule training with the Authority.

5.12.3.2 Access Control

5.12.3.2(1) Basic Requirements

5.12.3.2(1)(a) Provide an access control system for the building that is PC based, able to lock and unlock doors via time schedule and card readers utilizing proximity field effect technology to grant or restrict access to users via a programmable classification system with sufficient capacity to handle at minimum 10,000 users down to the field panel level and operate over a standard TCP / IP Ethernet network.

5.12.3.2(1)(b) Coordination of electronic security with hardware shall be the responsibility of Project Co's hardware professional.

5.12.3.2(2) Performance Criteria

5.12.3.2(2)(a) Card access system will utilize a file server and allow multiple workstations to access this file server for control and annunciation purposes. All

alarms will be annunciated at the building security call centre / alarm management centre (located off-site), but will allow concurrent remote monitoring capability both on and off-site.

- 5.12.3.2(2)(b) The access control system will be complete with mapping capability, which will be implemented.
- 5.12.3.2(2)(c) Each access controlled door will have a local sounder to enunciate door held open and door forced open alarms.
- 5.12.3.2(2)(d) The access control system will function at the field controller level without connection to the PC Host or gateway. All field controllers will be connected by TCP/IP using the Passive Optical Network System.
- 5.12.3.2(2)(e) Provide five thousand (5000) blank HID Mifare EVI/HID proximity cards for Authority staff. Cards will be compatible with other diverse systems (such as Compass, transit, high security, including access control and biometric identification, and cashless vending). Consult with the Authority on card numbering sequence and format and encryption requirements before finalizing system design or ordering cards to ensure compatibility with existing cards and equipment.
- 5.12.3.2(2)(f) Confirm, in consultation with the Authority, the location of access control doors and door alarms within the Facility. Refer to Appendix 3H [Room Components].
- 5.12.3.2(2)(g) Provide card readers, locking hardware, request-to-exit devices, door position/alarm contacts with all associated mechanical and electric hardware and field devices, including power supplies for a fully operational system. Areas requiring access control doors and door alarms include:
 - (g).1 main entrances, select exterior doors and departmental main entrances;

- (g).2 entrances to end journey shower/locker change rooms, staff lounge, wood shop, studio entrances and labs;
 - (g).3 telecom equipment/server rooms & equipment rooms;
 - (g).4 computer rooms;
 - (g).5 elevators (public & service);
 - (g).6 stairwell doors exiting onto a floor; and
 - (g).7 areas designated in Appendix 3A [Functional Program (including Pre-Design Room Data Sheets)] Authority and indicated in Appendix 3H [Room Components].
- 5.12.3.2(2)(h) Provide delayed egress operation and alarms at emergency exit doors; alarms to annunciate both locally and via the integrated access system.
- 5.12.3.2(2)(i) Electronic hardware security coordination with hardware shall be responsibility of Project Co. hardware professional.
- 5.12.3.2(2)(j) Interconnect and interface all electronically controlled doors for remote “lock & unlock” capability through the access control system on a door-by-door or global command basis.
- 5.12.3.2(2)(k) Provide clear signage indicating entry procedures. Consult with the Authority for appropriate and acceptable wording.
- 5.12.3.2(2)(l) All security alarms will be logged for a minimum period of 30 days. Logging system will be capable of external archiving/backup in order to extend the event info storage duration.
- 5.12.3.2(2)(m) Security recording will provide, as a minimum, the following information for each alarm:
- (m).1 date;
 - (m).2 time;
 - (m).3 device identification;

- (m).4 descriptive code;
- (m).5 user/cardholder ID (when applicable); and
- (m).6 acknowledgement and action taken (when applicable).

5.12.3.2(3) Provide a maintenance/administration workstation (MAW) PC complete with operating & application software, monitor, keyboard, mouse and interconnection to the security system network. Locate main MAW in a secure space, accessible to authorized personnel and Authority staff.

5.12.3.3 Panic Duress System

5.12.3.3(1) Basic Requirements

5.12.3.3(1)(a) Provide wired duress systems to operate in tandem in appropriate areas of the Facility in accordance with the level of security risk in each location as determined by CPTED.

5.12.3.3(2) Performance Criteria

5.12.3.3(2)(a) Provide wired panic duress system for staff with buttons to initiate emergency assistance calls in areas of the Facility as determined in consultation with the Authority, including:

- (a).1 main lobby
reception/security kiosk;
- (a).2 locker rooms and showers,
and
- (a).3 parking including off site.

5.12.3.3(2)(b) Duress buttons will be strategically located, suitably sized and identified/clearly labelled for "security emergency".

5.12.3.3(2)(c) The panic duress system will report the alarm location to the security desk, reception desk and simultaneously enunciate a local audible and visual alarm sufficient so that it may be seen and heard by all staff throughout all areas of the applicable Authority department.

5.12.3.4 Intrusion Detection

5.12.3.4(1) Basic Requirements

5.12.3.4(1)(a) Intrusion detection systems will be installed in all areas where protection of physical assets is critical. This will be coordinated with the Authority.

5.12.3.4(2) Performance Criteria

5.12.3.4(2)(a) The intrusion detection system(s) will utilize industry proven devices for intrusion alarm detection and reporting capable of 24 hours per day, seven days per week continuous operation, with battery backup operation in the event of power outages.

5.12.3.4(2)(b) Provide intrusion detection system(s) including alarm controllers, local keypads, motion sensors, shock sensors, glass break sensors, door contacts, strobes, sirens and other alarm initiating devices as needed for a reliable and fully operational system(s).

5.12.3.4(2)(c) Install intrusion detection systems in all areas where protection of physical assets is critical including:

- (c).1 all exterior entrances
- (c).2 office suites (human resources administration, etc.);
- (c).3 stores (shipping/receiving);
- (c).4 videoconference Rooms (refer to Appendix 3B [Audio Visual Requirements];
- (c).5 videoconference rooms;
- (c).6 data centers (server, telecom equipment & computer rooms);
- (c).7 cash offices; and
- (c).8 5 (five) high risk areas, in addition to those noted in bullets 1-7 above, locations to be determined through review of the design layout.

5.12.3.4(2)(d) Duress alarm points will inter-connect to intrusion alarm system and separately report duress/panic alarms to the Authority's contracted service provider's central station to

allow security monitoring staff to individually identify the location point and origin of the alarm.

5.12.3.5 CCTV

5.12.3.5(1) Basic Requirements

- 5.12.3.5(1)(a) Provide CCTV cameras throughout the Facility and exterior areas for the purpose of viewing and recording video to enhance the level of security and assist Authority staff in providing a safe environment for students, staff, visitors and the general public while protecting the physical assets.
- 5.12.3.5(1)(b) Refer to the Authority's policy on CCTV cameras attached as Appendix 3K [Closed Circuit Camera Policy].
- 5.12.3.5(1)(c) Provide a separate physical network and any required network equipment for the CCTV system.
- 5.12.3.5(1)(d) Areas which have CCTV cameras installed will have signage posted at the main entrances to the Facility. The signage will notify the public that this area is under video surveillance. CCTV processes will be governed by the Public Surveillance System Privacy Guidelines for the Province of BC as well as the Freedom of Information and Protection of Privacy Act (British Columbia).
- 5.12.3.5(1)(e) The system must be able to record clear images of individuals, which would allow distinction of gender, ethnicity and age category. The system will provide recorded images of sufficient quality to be used as court evidence in Canada.

5.12.3.5(2) Performance Criteria

- 5.12.3.5(2)(a) Provide CCTV cameras at locations determined in consultation with the Authority, including:
- 5.12.3.5(2)(b) main entrances & exits to the Facility;
- 5.12.3.5(2)(c) entrance and exit corridors to all departments;

- 5.12.3.5(2)(d) public lobbies and waiting areas;
 - 5.12.3.5(2)(e) elevator lobbies (public & service);
 - 5.12.3.5(2)(f) perimeter walkways;
 - 5.12.3.5(2)(g) public thoroughfares and walkways; and
 - 5.12.3.5(2)(h) areas designated as high risk by the Authority, such as parking.
- 5.12.3.5(3) Provide CCTV equipment to monitor and record the specific identity of all persons entering and exiting the Facility's main entrance, corridor/links and utilizing elevators cabs.
- 5.12.3.5(3)(a) System(s) will be a software-based virtual matrix using the structured cable plant for transmission and recording of images.
- 5.12.3.5(4) Provide the appropriate encoding/decoding capability to support 2 way (video and control) communications with any and all CCTV camera individually and/or in predetermined clusters via the security Ethernet infrastructure.
- 5.12.3.5(5) Provide digital CCTV system consisting of digital colour CCTV cameras, colour monitors located as needed, digital PC based video recorder (network video recorder) complete with software that controls all parameters of each individual camera, pan tilt zoom functionality, frame by frame recording, pre and post alarm recording, motion detection, sequence switching, multiplexing, adjustable frame speeds, and will record all cameras 24-hours per day, 7 days a week in real time. All cameras will be IP addressable or use protocol converters as required. At a minimum, the system will include super-dynamic, or Authority approved equivalent, digital cameras. Motion Activated recording will be acceptable.
- 5.12.3.5(6) Provide video storage capacity for minimum of 14 days at four frames per second, minimum 4CIF resolution. Provide Network Video Recorder (NVR), file servers if required by the Authority, workstations, and optical storage devices if required by the Authority and connect to network. The system will have the ability to choose recording rates and quality for each camera, have activity detection and incorporate smart search capabilities.
- 5.12.3.5(7) CCTV system will integrate with access control, intercoms and intrusion detection to allow for higher recording rates during alarm conditions.

- 5.12.3.5(8) CCTV display and review system will be network-based client application allowing for authorized users to remotely view, control and manage all aspects of the CCTV system across the network. System will have network and web access for remote monitoring, using predefined user authentication.
- 5.12.3.5(9) Display and review for all the cameras will be accessible through dual screen workstations located in the security office, the security office located in the Facility's main lobby. Provide CCTV workstations with all required operating and application software, monitors, keyboard, mouse with interconnection to security system network.
- 5.12.3.5(10) Provide color high-resolution, high sensitivity (day/night) fixed dome type cameras with concealing liner. Mounting will be appropriate for the environment, unobtrusive, matching colour with hidden cabling. Fixed cameras will be vandal resistant wall mounted and / or mounted at protective locations and heights.
- 5.12.3.5(11) Exterior domes will mount on poles, parapets and walls located to provide optimum unobstructed viewing of the area under surveillance. PTZ cameras will have the ability to mask portions of view through software and remote programming.
- 5.12.3.5(12) Outdoor cameras will be complete with weatherproof housing and internal heater/ defroster/blower/wiper as required for suitable operation under varying environmental conditions. Mounted at a height to avoid tampering/vandalism.
- 5.12.3.5(13) Cameras will not be set up in private areas such as locker rooms or washrooms. Cameras will not be placed or reviewed for the purpose of observing work performance of employees. Refer to Appendix 3K [Closed Circuit Camera Policy].

End of Section

PART 6. SITE AND INFRASTRUCTURE SUBGROUP SPECIFICATIONS

6.1 Exterior Improvements (Division 32)

6.1.1 Aggregate Base Courses

6.1.1.1 Basic Requirements

6.1.1.1(1) Utilize granular sub-base for stability of surface treatment through freeze thaw cycles and for its ability to store rainwater.

6.1.1.2 Performance Criteria

6.1.1.2(1) Exceed limits defined by regional average freeze thaw cycles averaged over a twenty year period.

6.1.2 Asphalt Paving

6.1.2.1 Basic Requirements

6.1.2.1(1) If used, Asphalt paving will be porous paving. For the 160 off-site stalls, shared with additional parking for GNWT, a commercial-grade asphalt finished surface is required. For any parking stalls within the Authority's lot, porous paving will be required; subject to the Authority's written approval, an exception may be made for the commercial loading/servicing bay area.

6.1.2.1(2) If used, utilize asphalt paving in areas where vehicle traffic and snow clearing equipment require a smooth surface for travel.

6.1.2.2 Performance Criteria

6.1.2.2(1) Asphalt mix is to be suitable for use in climatic conditions found at the Site.

6.1.3 Unit Paving

6.1.3.1 Basic Requirements

6.1.3.1(1) Utilize unit pavers in areas where a high level of finish is desired and/or a requirement for removal and replacement of paved surface in the future. Provide suitable base in accordance with geotechnical requirements to eliminate settlement of pavers.

6.1.4 Concrete Paving

6.1.4.1 Basic Requirements

- 6.1.4.1(1) Utilize concrete paving in areas that require firm, long lasting hard surfaces for activities such as pedestrian pathways, loading docks and Building entrances. Provide suitable base in accordance with geotechnical requirements to eliminate settlement of pavers.
- 6.1.5 Exterior Site Furnishings
 - 6.1.5.1 Basic Requirements
 - 6.1.5.1(1) Provide the following exterior furnishings: benches, garbage containers, bicycle racks and formed concrete curbs. Prepare and present the design concept and cut sheets for review by Authority.
 - 6.1.5.2 Performance Criteria
 - 6.1.5.2(1) Select products for their suitability and durability in the climatic conditions found at the Site.
- 6.1.6 Growing Medium
 - 6.1.6.1 Basic Requirements
 - 6.1.6.1(1) Provide a growing medium with a mixture of mineral particulates, microorganisms and organic matter which will provide a suitable medium for supporting plant growth.
 - 6.1.6.2 Performance Criteria
 - 6.1.6.2(1) Seed mix will have demonstrated suitability to the climatic and soil conditions found at the Site.
- 6.1.7 Sodding
 - 6.1.7.1 Basic Requirements
 - 6.1.7.1(1) Provide landscaping near Building entrances, and outdoor patio spaces to provide a usable surface.
 - 6.1.7.2 Performance Criteria
 - 6.1.7.2(1) Use number one turf grass nursery sod that has been sown and cultivated in nursery fields as turf grass crop in climatic zone comparable to the Site.
- 6.1.8 Trees, Shrubs and Ground Cover Planting
 - 6.1.8.1 Basic Requirements

6.1.8.1(1) Provide landscaping and plantings to support the design by reinforcing spatial relationships and way-finding. Consider sustainable methods of watering until landscaping has matured in the first few years.

6.1.8.1(2) The plant selection and placement will follow the principles of CPTED, address micro-climates surrounding the Facility and mitigation of heating and cooling loads.

6.1.8.2 Performance Criteria

6.1.8.2(1) Select and place trees, shrubs and ground covers to mitigate temperature fluctuations and winds.

6.1.8.2(2) Engage an arborist to evaluate existing trees.

6.1.8.2(3) Select trees, shrubs and ground covers from species that are indigenous or adapted to the region.

6.1.8.2(4) Plants will comply with the current edition of the BC Landscape Standard, published by the BC Society of Landscape Architects and the BC Landscape and Nursery Association. Plant material will be grown in Zone 5 in accordance with Plant Hardiness Zones in Canada.

6.1.9 Integration of Roofscape

6.1.9.1 Project Co will design and construct the Facility:

6.1.9.1(1) to be attractive as seen from above such that the roofscape becomes integrated with the neighbourhood contributing to the beautification of the area;

6.1.9.1(2) to visually shield or integrate rooftop mechanical and electrical equipment into the roof architectural treatment and to orient them so the long dimension is in the north south direction to minimize view impacts;

6.1.9.1(3) to avoid large monotonous expanses of roof;

6.1.9.1(4) to consider the roof as an additional canvas for the potential display of art and design that could reach a broader audience; and

6.1.9.1(5) to consider the opportunity for a green roof, or similar approved alternate, as a sustainable strategy and to double as an opportunity to integrate land art installations with the Facility.

6.1.10 Green Roof, or similar approved alternate

6.1.10.1 If provided, the green roof type, or similar approved alternate, design will;

6.1.10.1(1) be vetted through the Authority;

6.1.10.1(2) incorporate required structural systems and all other services;
and

6.1.10.1(3) be aesthetically pleasing all year round.

6.1.10.2 Alternative uses of the green roof for horticulture, art installations or other innovations will require approval by the Authority.

6.2 Utilities (Division 33) – Not used

End of Section