THE NEW ST. PAUL'S PHASE 1A

Schedule 3 - Design and Construction Specifications

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Appendices

PART 1. INTERPRETATION

1.1 Definitions and Interpretation

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

1.1.1.1 "Access Provider" means an organization that will provide a wide range of telecommunication services to individuals or other organizations;

1.1.1.2 "Acoustic and Vibration Consultant" means a Professional Engineer with demonstrated experience in providing recommendations and analysis for acoustic and vibration performance of buildings;

1.1.1.3 "Advanced Digital Hospital" means a framework of hardware, software, partner point solutions, and consulting services that lay the foundation for the digital transformation of health care service delivery. A digital hospital is one that has implemented a comprehensive, pervasive IT infrastructure to enable clinical and administrative workflow and communications as well as process and quality improvements and has begun to expand those process improvements beyond the hospital's four walls. In a digital hospital, various advanced technologies, such as critical medical devices, intelligent information systems, Facility control systems, sensors, and digital communication tools, are fully integrated to improve Staff productivity, hospital operations, process quality, Patient safety, and the overall Patient experience;

1.1.1.4 "Airborne Isolation Room" means a space designed, constructed and ventilated to limit the spread of microorganisms from an infected occupant, having negative pressure ventilation conforming to CSA Z8000 Canadian Healthcare Facilities and CSA Z317.2 Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Healthcare Facilities with an adjoining AIR Anteroom at the entrance that is separated by doors from both the outside and the main space in the AIR;

1.1.1.5 "AIR Anteroom" means a space at the entrance to an AIR that provides for storage and removal of PPE and provides an airlock between the adjacent space and the Patient;

1.1.1.6 "Airborne Isolation-Hybrid" means a space designed, constructed and ventilated to limit the spread of microorganisms from an infected occupant, having negative pressure ventilation conforming to the design approach described in Section 7.5.9;

1.1.1.7 "Air Turbidity Study" means a study conducted by Project Co to provide a value of the air turbulence at various locations above the Helipad, associated with the proposed design of the Future Heliport size, location and height;

1.1.1.8 "Anti-Barricade" has the meaning set out in Section 5.14.3 Mental Health Area Requirements;

1.1.1.9 “Architectural Concrete” means all concrete exposed to view, excluding the Facility underground parking area, roadworks, curb and gutter, mechanical, electrical and Communications Rooms;

1.1.1.10 “Architectural Openings Consultant” means an individual who has attained AHC, CDC and EHC professional certifications and mastered all facets of the commercial door and hardware industry;

1.1.1.11 “Asset” means an item, thing or entity that has potential or actual value to an organization;

1.1.1.12 “Asset Management” means the measure of capacity and the ability of an entity (system, person or organization) to achieve its objectives;

1.1.1.13 “Back of House” means the rooms, spaces and circulation systems, including corridors, elevators and stairs, that are not designed for use by the general public and Patients;

1.1.1.14 “Basis of Design” has the meaning set out in Section 5.5.6.2 of this Schedule;

1.1.1.15 “Borrowed Light” has the meaning set out in Section 5.6.1.6(2) of this Schedule;

1.1.1.16 “Building Envelope Consultant” means an individual whose credentials as a building envelope professional are recognized by the AIBC or the APEGBC to review and certify building envelope Design and Construction;

1.1.1.17 “Building Gross Area" or "Building Gross Square Metres” (BGSM) means the sum of all floor areas within a building measured to the outside face of exterior walls for all stories or areas having floor surfaces;

1.1.1.18 “Building Systems” means the architectural, mechanical, electrical and other systems in or servicing the Facility;

1.1.1.19 “Ceiling Height” means the minimum clear height between the finish floor and the finish ceiling where there are no obstructions or protrusions within or below the specified height;

1.1.1.20 “City” means the City of Vancouver, British Columbia;

1.1.1.21 “Clinical Spaces” means spaces that support, or are used in, the direct care of Patients, excluding storage rooms, housekeeping closets, soiled utility rooms, and corridors. At a minimum, these include spaces such as waiting rooms, medication rooms, nourishment rooms, clean supply rooms, and Care Team Stations;

1.1.1.22 “Clinical Specifications and Functional Space Requirements” means Appendix 3A [Clinical Specifications and Functional Space Requirements], and provides a description of each space, the purpose of the Facility and how the programs will be delivered at the Health Campus;

1.1.1.23 "Clinical Systems Furniture" has the meaning set out in Section 6.12.2.4(1) of this Schedule;

1.1.1.24 “Commissioning” means testing and commissioning the equipment or system in accordance with any Commissioning requirements set out in this Agreement, all applicable standards and Good Industry Practice, including to ensure that relevant systems, equipment, and assemblies have been installed, are operating in accordance with the manufacturer’s requirements and specifications, and fit for Owner Activities;

1.1.1.25 “Commissioning Authority (CxA)” means the individual or company designated to plan, organize, lead, and review the Commissioning process activities. The CxA facilitates communication between the Owner and Project Co to ensure that Commissioning scope and schedule are in accordance with the Project Agreement;

1.1.1.26 “Communications Room” means an enclosed environmentally controlled centralized architectural space that houses telecommunication and data processing equipment, connecting hardware, cables, pathways, splice closures, grounding and bonding facilities and appropriate protection apparatus. This room may also provide any or all the functions of a Telecommunications Room and house equipment and horizontal terminations for a portion of the Facility; refer to Section 7.9.2.2(1)(b) for applicable room types;

1.1.1.27 “Component or Functional Component” means a cohesive grouping of activities or spaces related by service or physical arrangement. A planning component may or may not be a department or platform since the term ”Department” or “Platform” means an administrative organization rather than a functional organization of space and activities;

1.1.1.28 “Contained Use Area” has the meaning set out in the VBBL;

1.1.1.29 “Convenient Access” means access between rooms, spaces, areas or Components that are located at a minimal distance from each other and linked by horizontal circulation and as determined in agreement with the Owner on a case-by-case basis, linked by vertical circulation, such that the location of these items is optimized for efficiency of flow and the path between them minimizes corners, jogs or obstructions such as columns that create interference;

1.1.1.30 “Core Network Equipment” means equipment classified as a backbone device that is central to the network’s successful operation. Core Network Equipment is used to connect to servers, Internet service providers and to aggregate all switches that are used to connect end-use equipment and other devices. This equipment is typically located in the MER;

1.1.1.31 “CPTED” means Crime Prevention through Environmental Design. CPTED is a multi-disciplinary approach to deterring undesirable and criminal activity and behaviour through environmental design;

1.1.1.32 “CSA” means Canadian Standards Association or CSA Group, a standards development organization accredited by the Standards Council of Canada, that develops standards in multiple areas including climate change, business management and safety and performance, including those for electrical and electronic equipment, industrial equipment, boilers and pressure vessels, compressed gas handling appliances, environmental protection, and construction materials;

1.1.1.33 “Data Drop” means the complete Category 6A structured cabling connection or permanent link between the RJ45 connector in a telecommunication outlet and the horizontal cross connect in a Communications Room;

1.1.1.34 “dBA” means the unit of sound pressure level in the typical case where sound is measured using the A-weighting feature of a sound level meter. The A-weighting replicates the frequency sensitivity of the human ear to sound at moderate intensities;

1.1.1.35 “Design Life” means the period of time during which an item is expected by its designers to work within its specified parameters; in other words, the anticipated life expectancy of the item;

1.1.1.36 “Design Objectives” has the meaning set out in Section 3.2 of this Schedule;

1.1.1.37 “Direct Access” means access between rooms, spaces, areas or Components that are horizontally contiguous such that the path between them involves no movement through other circulation systems or spaces. Vertically contiguous by means of an elevator or internal stairs may be acceptable on a case-by-case basis as reviewed by the Owner;

1.1.1.38 “Direct Natural Light” has the meaning set out in Section 5.6.1.6(1) of this Schedule;

1.1.1.39 “Donor Recognition” has the meaning of material Assets that are explicitly designed and constructed for the purposes of acknowledging the contributions, financial or otherwise, to the Facility or programs housed therein;

1.1.1.40 “Electrical Room” means a service room dedicated only to housing electrical power distribution equipment and associated ancillary systems;

1.1.1.41 “Energy Centre” has the meaning set out in Section 5.4.1 of this Schedule;

1.1.1.42 “Entrance Facility Room” or "EF Room" means an enclosed environmentally controlled architectural space, consisting of the pathways, cables, connecting hardware, protection devices and other passive and active equipment that support the Access Provider;

1.1.1.43 “Evidence-Based Design” or “EBD” has the meaning set out in Section 3.3.1 of this Schedule;

1.1.1.44 “Facility Management” means the organizational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the healthcare business;

1.1.1.45 “Flood Construction Level” has the meaning set out in the City of Vancouver Flood Plain Standards and Requirements. The Flood Construction Level for the Facility is fixed at the elevation determined in City of Vancouver Bylaw CD-1;

1.1.1.46 “FMO” means Facilities Maintenance and Operations or Plant Services Staff at the Facility;

1.1.1.47 “Front of House” means the rooms, spaces and circulation systems, including corridors, elevators and stairs, that are designed for use by the general public;

1.1.1.48 “Functional Space Requirements” means the list of required spaces to be included in the Design of the Facility. The Functional Space Requirements document is located in the Appendix 3A [Clinical Specifications and Functional Space Requirements];

1.1.1.49 "Furniture" has the meaning set out in Section 6.12.2.3(1) of this Schedule;

1.1.1.50 “Future Expansion” means space that will not be built now but which Project Co will include in the planning and Design of the Facility and Site;

1.1.1.51 “Future Heliport” means the future aerodrome installed at a later date by the Owner in respect of which a Heliport certificate will be issued under Subpart 5 of CARs Part III in force;

1.1.1.52 “General Circulation” means movement between rooms, spaces, areas or Components by means of horizontal and/or vertical circulation corridors, stairs or elevators that are for use by the general public, visitors and Staff;

1.1.1.53 “Health Campus” means all of the lands included in Work Area A as shown in Appendix 2H [Site Plan];

1.1.1.54 “Indigenous Consultation Advisor” means a Person qualified, by education and experience, to facilitate Indigenous consultation processes and sessions as a neutral, informative resource and to provide advising to any of the parties involved;

1.1.1.55 “IEEE-SA” means Institute of Electrical and Electronics Engineers Standards Association, the organization for the development of industrial standards in a broad range of disciplines, including electric power and energy, biomedical technology and health care, Information Technology, information assurance, telecommunications, consumer electronics, transportation, aerospace, and nanotechnology;

1.1.1.56 “IM/IT” means Information Management and Information Technology;

1.1.1.57 “IM/IT Infrastructure” means everything required to support an IM/IT system except for the required Software, network equipment and Server(s);

1.1.1.58 “Information Technology” means the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data;

1.1.1.59 “Infection Control Practitioner” means an individual qualified in infection prevention and control as referred to in CSA Z8000;

1.1.1.60 “Integrate” and “Integration” means the combining of software or hardware components or both into an overall system that must be able to physically connect via a standards-based interface to Owner systems if required to pass information, status, or extend system functionality;

1.1.1.61 “Interface” means the physical infrastructure, system components, software application development, configuration, messaging standards, commissioning and testing necessary to perform data interchange between separate systems. Interfacing of systems will be provided to achieve the integration of systems which supports the overall clinical, operational and technical functional requirements;

1.1.1.62 “Internal Circulation” means movement between rooms, spaces, areas or Components internally by means of horizontal connections such as doors or openings without passage through other circulation systems;

1.1.1.63 “Lean Health Care” has the meaning set out in Section 3.4.1 of this Schedule;

1.1.1.64 “Life Cycle” means the stages involved in management of an Asset;

1.1.1.65 “Life Cycle Cost” means Total Cost of Ownership;

1.1.1.66 “Life Safety System” means any equipment or infrastructure that either provides, monitors or supports life safety or is designed to protect and evacuate the Health Campus in emergencies, including Patient vital signs, fire alarm, medical gases and nurse call systems;

1.1.1.67 "Ligature Resistant" means elimination of all points where a cord, rope, bed sheet or similar cordlike material can be looped or tied to an item in order to create a point of ligature;

1.1.1.68 “Line of Sight” has the meaning set out in Section 5.6.10.1 of this Schedule;

1.1.1.69 “Lockdown” means a circumstance whereby the Patients are confined to their rooms in response to a declared emergency, riot, outbreak, pandemic, labour disruption or other major disaster;

1.1.1.70 “Mental Health Area” has the meaning set out in Section 5.14.2.1 of this Schedule;

1.1.1.71 “Make Good” means preparing adjoining surfaces to be identical, with construction and finishing completed in such a manner that there are no visible traces, at a minimum distance of 600 mm, between the Work and the existing condition. Making Good therefore includes the construction and re-finishing of existing areas and surface as necessary to junction points or inside or outside corners of roofs, exterior walls, partitions, ceilings and landscaping or paving;

1.1.1.72 “Master Site Plan” has the meaning set out in Section 4.3 of this Schedule;

1.1.1.73 “Medical Device Reprocessing Department" or "MDRD” means the department that processes and provides supplies of sterile instruments, linen packs, dressings and other sterile items used in Patient care;

1.1.1.74 “Millwork” means fixed, e.g. non-movable, site-built architectural woodwork for casework, counters, walls, ceiling, doors, paneling, trim and partitions;

1.1.1.75 "Modular Casework" has the meaning set out in Section 6.6.3.7(1) Modular Casework Requirements;

1.1.1.76 “Move In” has the meaning set out in Section 2.9 of this Schedule;

1.1.1.77 “Net Area" or "Net Square Metres" or "NSM” means the horizontal area of space assignable to a specific function. The Net Area of rooms is measured to the inside face of wall surfaces;

1.1.1.78 “Opening Day Layout” means the layout of all rooms and areas that will be equipped and put into service as of the Service Commencement. Refer to Appendix 2E [Equipment and Furniture] for the quantity of rooms that will be equipped at Service Commencement;

1.1.1.79 "Outbreak Control Zone" means a collection of rooms and spaces that, in the event of an infectious disease outbreak, can be isolated as a self-contained zone and negatively pressurized by the HVAC system relative to the surrounding areas to mitigate the spread of airborne infections;

1.1.1.80 “Owner’s Project Requirements” has the meaning set out in Section 5.5.6.1 of this Schedule;

1.1.1.81 “Owner’s Quantity Surveyor” means a Quantity Surveyor hired by the Owner;

1.1.1.82 “PAR” means Periodic Automatic Replenishment. This is one method of inventory replenishment used by logistic operations within a hospital;

1.1.1.83 “Patient” means an inpatient or outpatient who is waiting for or undergoing medical investigation, care or treatment at the Facility;

1.1.1.84 “Patient Care Area” has the meaning set out in CSA Z8000 and Z32;

1.1.1.85 “Person- and Family-Centred Care” means a standard of care that emphasizes the individual needs of each Patient and treats them with respect and dignity, enabling them to participate integrally in their own care process within an environment that recognizes and respects the essential role of the Patient’s family or supporters;

1.1.1.86 “Persons with Disabilities” has the meaning set out in the VBBL;

1.1.1.87 "Quality Daylight" means that the daylight in a space within 4.5 m of the exterior perimeter wall will have at least 75% coverage with natural light levels between 300 and 3000 lux as set out under the Daylight credit for LEED BD+C: Healthcare v4, Option 3: Measurement;

1.1.1.88 “Rain Screen” has the meaning set out in Section 5.6.2.2 of this Schedule;

1.1.1.89 “Recurrent Room” means spaces or rooms that are of the same type and function, have the same required NSM and are repeated or listed as multiple units in the Appendix 3A [Clinical Specifications and Functional Space Requirements];

1.1.1.90 “Restricted Circulation” means movement between rooms, spaces, areas or Components by means of horizontal and/or vertical circulation corridors, stairs or elevators that are for use by Staff, registered Patients and services and not for use by the general public;

1.1.1.91 “RTLS” has the meaning set out in Section 7.9.13.1 of this Schedule;

1.1.1.92 "Shelled Space" means space that is constructed to meet the Owner’s future needs and is enclosed within the building envelope of the Facility. Shelled Space includes all electrical, communications, plumbing, heating, ventilation and air conditioning services that support the future needs. Shelled Space includes emergency lighting, insulation and GWB that is taped but otherwise unfinished;

1.1.1.93 “STC” has the meaning set out in Appendix 3C [Acoustic and Noise Control Measures];

1.1.1.94 “Staff” means a Person or group of Persons carrying out work within the Health Campus, including volunteers, learners, couriers, vendors, even if not directly employed by the Owner;

1.1.1.95 “Statement of Requirements” means the provisions of Schedule 3 [Design and Construction Specifications];

1.1.1.96 “Structural Engineer-of-Record” means a Professional Engineer registered in British Columbia who is a designated structural engineer having “Struct Eng” standing with EGBC;

1.1.1.97 “Systems Furniture” has the meaning set out in Section 6.12.2.5(1) of this Schedule;

1.1.1.98 “Tamper Resistant” means a non-electrical component resistant to being operated, accessed, compromised or removed without the use of proper, specialized tools, or an electrical receptacle designed, constructed, and marked as tamper-resistant in accordance with CSA C22.2 No. 42;

1.1.1.99 “Tanked Foundation" means a below-grade structure having a continuous waterproof barrier to the Facility’s foundation walls and raft slab below grade including all penetrations to prevent the ingress of ground water into the Facility;

1.1.1.100 “Task Lighting” means lighting by means of a luminaire that is not hard-wired to a building outlet box and is complete with integral controls and a 5-15P type corded plug that can be connected to any standard 120V, 5-15R power outlet;

1.1.1.101 “Telecommunications Room” or "TR" is an enclosed, environmentally controlled architectural space for housing telecommunication equipment, connecting hardware, terminations of horizontal and backbone cables and splice enclosures serving a portion of the Facility;

1.1.1.102 “Telemetry” means the wireless component of the patient physiological monitoring system, which is comprised of wireless access points, horizontal structured cabling, and access point enclosures;

1.1.1.103 “Total Cost of Ownership” means financial analysis that result in a complete Life Cycle value of a building, building system or component. This value includes each phase of ownership from planning, design and construction though operations, maintenance, capital or component renewal, over the life of the respective component and decommissioning or disposal;

1.1.1.104 “Universal Design” means the design of products, environments, programs and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design, by following the principles of equitable, flexible, and simple and intuitive use, perceptible communication of information, tolerance for error, and low physical effort. “Universal Design” will not exclude assistive devices for particular groups of Persons with Disabilities where these devices are needed;

1.1.1.105 “Unusable Area” means horizontal area that does not contribute to the function of the room as described in Appendix 3A [Clinical Specifications and Functional Space Requirements];

1.1.1.106 “Utility” or “Utilities” means:

1.1.1.106(1) Utility Electrical Power;

1.1.1.106(2) Steam and Chilled Water;

1.1.1.106(3) Water Main;

1.1.1.106(4) Sanitary Sewer;

1.1.1.106(5) Storm Sewer;

1.1.1.106(6) Gas, Oil and Any Other Fossil-Based Fuel;

1.1.1.106(7) Medical Gas Compounds; and

1.1.1.106(8) Telephone and Data Cabling.

1.1.1.107 “Vandal Resistant” means designed to withstand abuse and tampering without damage and includes features to resist prying, impact and shattering;

1.1.1.108 “Vancouver Building Bylaw” means the most recent version of the City of Vancouver Building Bylaw;

1.1.1.109 “Viral Hemorrhagic Fever or VHF Rooms” means a collection of conjoined spaces that include an Airborne Isolation Room, AIR Anteroom and a Patient room designed to meet the requirements of an AIR Anteroom, which together provide for one-way flow for donning and doffing of PPE;

1.1.1.110 “Void Space” means space that is trapped between walls and/or structure and is not intended to be finished or used;

1.1.1.111 “Wayfinding” refers to the spatial problem-solving process people undertake as they travel through an environment seeking a destination. Signage, landmarks and other Assets help individuals with the Wayfinding process.

1.1.2 Statement of Requirements

1.1.2.1 This Schedule is written as an output specification and defines what Project Co will 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.

1.1.2.2 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 public hospital facility who balances capital costs against maintenance, operations, clinical efficiency sustainability, energy efficiency and other non-capital costs over the life of the Facility.

1.1.2.3 Unless expressly stated otherwise, each reference to a standard or code in this document will be deemed to mean the latest version of that standard or code as of the Effective Date.

1.1.2.4 Project Co will provide a complete and fully functional Facility fit for its intended use and purpose as specified in this Agreement.

1.2 Acronym List

1.2.1 AAS – Aluminum Association Standards

1.2.2 AAMA – American Architectural Manufacturers Association

1.2.3 AAMI – Association for The Advancement of Medical Instrumentation

1.2.4 ACS - Access Control System

1.2.5 ACU - Anesthetic Care Unit

1.2.6 ADC – Automated Dispensing Cabinet

1.2.7 ADL – Activities of Daily Living

1.2.8 AECB – Atomic Energy Control Board

1.2.9 AFCI – Arc Fault Circuit Interrupter

1.2.10 AFF – Above Finished Floor Level

1.2.11 AFDDR – Automated Fault Detection, Diagnosis and reporting

1.2.12 AFUE – Annual Fuel Utilization Efficiency

1.2.13 AGSS - Anaesthetic Gas Scavenging System

1.2.14 AGV - Automated Guided Vehicle

1.2.15 AIBC – Architectural Institute of British Columbia

1.2.16 AIR – Airborne Isolation Room

1.2.17 AM – Asset Management

1.2.18 ANSI – American National Standards Institute

1.2.19 API - Application Programming Interface

1.2.20 ARGWB – Abuse-Resistant Gypsum Board

1.2.21 ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers

1.2.22 ASME – American Society of Mechanical Engineers

1.2.23 ASPE – American Society of Plumbing Engineers

1.2.24 ASTC – Apparent Sound Transmission Class

1.2.25 ASTM – American Society for Testing and Materials

1.2.26 ATS – Automatic Transfer Switch

1.2.27 AV / IT – Audio Visual / Information Technology

1.2.28 AWCC – Association of Wall and Ceiling Contractors

1.2.29 AWMA – Architectural Woodwork Manufacturers Association

1.2.30 AWWA – American Water Works Association

1.2.31 BCAS – British Columbia Ambulance Service

1.2.32 BCERMS – British Columbia Emergency Response Management System

1.2.33 BCICA – British Columbia Insulation Contractors Association

1.2.34 BCLNA – British Columbia Landscape and Nursery Association

1.2.35 BCSLA – British Columbia Society of Landscape Architects

1.2.36 BICSI – Building Industry Consulting Service International

1.2.37 BIM – Building Information Modelling

1.2.38 BMS – Building Management System

1.2.39 BOMA – Building Owner and Managers Association

1.2.40 CACF – Central Alarm and Control Facility

1.2.41 CATV – Community Access Television

1.2.42 CCD – Charge Couple Device

1.2.43 CCI/CRI – Canadian Carpet Institute/Canadian Rug Institute Program

1.2.44 CDP – Centralized Distribution Panelboard

1.2.45 CEC – Canadian Electrical Code

1.2.46 CFC – Chlorofluorocarbon

1.2.47 CFD – Computational Fluid Dynamics

1.2.48 CFL – Compact Fluorescent Lamp

1.2.49 CFP – Central Food Production

1.2.50 CFR – United States Code of Federal Regulations

1.2.51 CGA – Compressed Gas Association

1.2.52 CGSB - Canadian General Standards Board

1.2.53 CGSM – Component Gross Square Metres

1.2.54 CI – Cochlear Implant

1.2.55 CIC – Certified Irrigation Contractor – Commercial

1.2.56 CIF – Common Intermediate Format

1.2.57 CISCA – Ceiling Interior Systems Construction Association

1.2.58 CaGBC – Canada Green Building Council

1.2.59 CL – Containment Level

1.2.60 CLIA – Certified Irrigation Designer and Certified Landscape Irrigation Auditor

1.2.61 CMCA – Canadian Masonry Contractors Association

1.2.62 CMMS – Computerized Maintenance Management System

1.2.63 CNSC – Canadian Nuclear Safety Commission

1.2.64 CODEC – Coder/Decoder

1.2.65 CPPS – Campus Perimeter Pathway System

1.2.66 CPTED – Crime Prevention Through Environmental Design

1.2.67 CPU – Central Processing Unit

1.2.68 CRAC – Computer Room Air Conditioning

1.2.69 CRCA – Canadian Roofing Contractors Association

1.2.70 CRI – Colour Rendering Index

1.2.71 CRI/IAQ – Canadian Rug Institute/Indoor Air Quality Program

1.2.72 CRN - Canadian Registration Number

1.2.73 CRT – Cathode Ray Tube

1.2.74 CRTC – Canadian Radio-Television and Telecommunications Commission

1.2.75 CSA – Canadian Standards Association

1.2.76 CSDFMA – Canadian Steel Door and Frame Manufacturers Association

1.2.77 CSLA – Canadian Society of Landscape Architects

1.2.78 CSSBI – Canadian Sheet Steel Building Institute

1.2.79 CT - Computed Tomography

1.2.80 CX – Commissioning

1.2.81 DAS – Distributed Antenna System

1.2.82 DCOF – Dynamic Coefficient of Friction

1.2.83 DDC – Direct Digital Controls

1.2.84 DHI – Door and Hardware Institute

1.2.85 DI – Diagnostic Imaging

1.2.86 DID – Direct Inward Dialling

1.2.87 DiiA – Digital Illumination Interface Alliance

1.2.88 DFO – Department of Fisheries and Oceans

1.2.89 DoE – United States Department of Energy

1.2.90 DISS – Diameter Index Safety System

1.2.91 DSSS – Direct Sequence Spread Spectrum

1.2.92 DVMS – Digital Video Management System

1.2.93 EBD – Evidence-Based Design

1.2.94 EC – Energy Centre

1.2.95 ECG – Electrocardiography

1.2.96 ED – Emergency Department

1.2.97 EEG – Electroencephalogram

1.2.98 EF – Entrance Facility

1.2.99 EGBC - Engineers and Geoscientists British Columbia

1.2.100 EMR – Electronic Medical Record

1.2.101 EIA/TIA – Electronics Industry Association/Telecommunications Industry Association

1.2.102 EMI – Electromagnetic Interference

1.2.103 EMS – Elevator Management System

1.2.104 EMT – Electrical Metallic Tubing

1.2.105 EOC - Emergency Operations Centre

1.2.106 EPA – United States Environmental Protection Agency

1.2.107 EPDU – Electronic Power Distribution Unit

1.2.108 EPMS – Energy and Power Management System

1.2.109 ESA – Environmental Site Assessment

1.2.110 ESS – Electronic Safety and Security

1.2.111 ER – Equipment Room

1.2.112 EV – Electric Vehicle

1.2.113 EVAC – Emergency Voice Communications

1.2.114 EVSE – Electric Vehicle Supply Equipment

1.2.115 FACP – Fire Alarm Control Panel

1.2.116 FCC – Federal Communications Commission

1.2.117 FCL – Flood Construction Level

1.2.118 FEMA – Federal Emergency Management Agency

1.2.119 FGI – Facility Guidelines Institute

1.2.120 FM – Facilities Management

1.2.121 FM - Factory Mutual (standards)

1.2.122 FMO – Facilities Maintenance and Operations

1.2.123 FoM – Faculty of Medicine

1.2.124 FOV - Field of View

1.2.125 FPS - Frames Per Second

1.2.126 FUS – Fire Underwriters Survey

1.2.127 GAI – Gamut Area Index

1.2.128 GCABC – Glazing Contractors Association of British Columbia

1.2.129 GFCI – Ground Fault Circuit Interrupter

1.2.130 GHG – Greenhouse Gas

1.2.131 GPS – Global Positioning Satellite

1.2.132 GUI - Graphical User Interface

1.2.133 GVW – Gross Vehicle Weight

1.2.134 GWB – Gypsum Board

1.2.135 HAZMAT - Hazardous Materials

1.2.136 HCFC – Hydrochlorofluorocarbons

1.2.137 HD – High Definition

1.2.138 HE – Antenna Headend Equipment Room

1.2.139 HEPA – High Efficiency Particulate Air

1.2.140 HEX – Heat Exchangers

1.2.141 HLD – High Level Disinfectant

1.2.142 HOA – Hand/Off/Auto

1.2.143 HP – Horsepower

1.2.144 HRC – High Rupture Capacity (Fuse Type)

1.2.145 HVAC – Heating, Ventilating and Air-Conditioning

1.2.146 HVATS – High Voltage Automatic Transfer Switch

1.2.147 IAHSS - International Association for Healthcare Security and Safety

1.2.148 IBMP - Integrated Building Management Platform

1.2.149 ICU – Intensive Care Unit

1.2.150 IDA - International Dark-Sky Association

1.2.151 IDS / IPS – Intrusion Detection System / Intrusion Prevention System

1.2.152 IESMA – Illumination Engineering Society of North America

1.2.153 IEEE – Institute of Electrical and Electronic Engineers

1.2.154 IHC - ImmunoHistoChemistry

1.2.155 IIABC – Irrigation Industry Association of British Columbia

1.2.156 IGMAC – International Glazing Manufacturers Association of Canada

1.2.157 I/O – Input / Output

1.2.158 IP – Internet Protocol

1.2.159 IPS – Integrated Protection Services

1.2.160 IPU – Inpatient Unit

1.2.161 IRGWB – Impact-Resistant Gypsum Board

1.2.162 IM/IT – Information Management Information Technology

1.2.163 IRMP - Integrated Rainwater Management Plan

1.2.164 ISO – International Organization for Standardization

1.2.165 IT – Information Technology

1.2.166 ITIL – Information Technology / Telecommunication and Infrastructure Library

1.2.167 IV – Intravenous

1.2.168 JOHSC – Joint Occupational Health and Safety Committee

1.2.169 KPI – Key Performance Indicator

1.2.170 LAN – Local Area Network

1.2.171 LCD – Liquid Crystal Display

1.2.172 LED – Light Emitting Diode

1.2.173 LEED – LEED® Leadership In Energy and Environmental Design

1.2.174 LEED V4 BD+C: Healthcare – LEED Version 4 Building Design + Construction: Healthcare

1.2.175 LEED V4.1 BD+C: – LEED Version 4.1 Building Design + Construction

1.2.176 LMFM - Lower Mainland Facilities Management

1.2.177 LOD – Level of Detail

1.2.178 LRV - Light Reflectance Values

1.2.179 M&V – Measurement and Verification

1.2.180 MCC – Motor Control Centre

1.2.181 MCP – Motor Circuit Protector

1.2.182 MDRD – Medical Device Reprocessing Department

1.2.183 MER – Main Equipment Room

1.2.184 MIBC – Masonry Institute of British Columbia

1.2.185 MMCD – Master Municipal Construction Documents

1.2.186 MMRGWB – Moisture and Mould-Resistant Gypsum Board

1.2.187 MMU - Mobile Medical Unit

1.2.188 MOC – Model of Care

1.2.189 MPI – Master Painters Institute

1.2.190 MPR – Multi-Purpose Room

1.2.191 MRI – Magnetic Resonance Imaging

1.2.192 MSE – Mobility Service Engines

1.2.193 NAPRA – National Association of Pharmacy Regulatory Authorities

1.2.194 NC – Noise Criteria

1.2.195 NCRP – National Council on Radiation Protection and Measurement

1.2.196 NEMA – National Electrical Manufacturers Association

1.2.197 NEU – Neighbourhood Energy Utility

1.2.198 NFCA – National Floor Covering Association

1.2.199 NFPA – National Fire Protection Association

1.2.200 NIC – Noise Insulation Class

1.2.201 NICU – Neonatal Intensive Care Unit

1.2.202 NRC – National Research Council

1.2.203 NRC – Noise Reduction Coefficient (acoustic parameter)

1.2.204 NSM – Net Square Metres

1.2.205 NTSC – National Television Standards Committee

1.2.206 NWNA – National Woodwork Manufacturers Association

1.2.207 OA – Outdoor Air

1.2.208 OFDM – Orthogonal Frequency Division Multiplexing

1.2.209 OHSAH – Occupational Health and Safety Agency for Healthcare

1.2.210 OLT – Optical Line Terminal

1.2.211 O&M – Operations and Maintenance

1.2.212 ONT – Optical Network Terminal

1.2.213 OR – Operating Room

1.2.214 OSDP – Open Supervised Device Protocol

1.2.215 OS&Y – Open Stem and Yoke

1.2.216 OT – Occupational Therapy/Therapist

1.2.217 PACS – Picture Archiving and Communication System

1.2.218 PAR - Periodic Automatic Replenishment

1.2.219 PBX – Private Branch Exchange

1.2.220 PC – Personal Computer

1.2.221 PCB – Polychlorinated Biphenyls

1.2.222 PCIC – Pacific Climate Impacts Consortium

1.2.223 PCR – Polymerase Chain Reaction

1.2.224 PDA – Personal Digital Assistant

1.2.225 PDU – Power Distribution Unit

1.2.226 PHC – Providence Health Care Society

1.2.227 PHSA – Provincial Health Services Authority

1.2.228 POC – Point of Care

1.2.229 POCT – Point of Care Testing

1.2.230 PoE – Power over Ethernet

1.2.231 POS - Point of Sale

1.2.232 PPE – Personal Protective Equipment

1.2.233 PRV – Pressure Reducing Valve

1.2.234 PTS - Pneumatic Tube System

1.2.235 PTZ – Pan Tilt Zoom

1.2.236 PV – Photovoltaic

1.2.237 RF – Radio Frequency

1.2.238 RFI – Radio Frequency Interference

1.2.239 RFID – Radio Frequency Identification

1.2.240 RCABC – Roofing Contractors Association of British Columbia

1.2.241 RCDD – Registered Communications Distribution Designer

1.2.242 RGS – Rigid Galvanized Steel Conduit

1.2.243 RO – Reverse Osmosis

1.2.244 RoHS – Restriction of Hazardous Substances

1.2.245 REST – Representational State Transfer

1.2.246 RPA – Radiation Protection Adviser

1.2.247 RSSI - Received Signal Strength Indication

1.2.248 RT – Respiratory Therapy/Therapist

1.2.249 RT_{60} – Reverberation Time

1.2.250 RTLS – Real Time Location System

1.2.251 SACT – Suspended Acoustic Ceiling Tile

1.2.252 SAGA – System of Approach Azimuthal Guidance

1.2.253 SEFA - Science Equipment and Furniture Association

1.2.254 SES – Safety Engineering Society

1.2.255 SDK – Software Developer Kit

1.2.256 SIP – Session Initiated Protocol

1.2.257 SPD – Surge Protective Device

1.2.258 SMACNA – Sheet Metal and Air Conditioning National Contractors Association

1.2.259 SMDR – Station Message Detail Recording

1.2.260 SNR – Signal to Noise Ratio

1.2.261 SQLI – Structured Query Language

1.2.262 SRMC – Single Room Maternity Care

1.2.263 SSACT – Suspended Security Acoustic Ceiling Tile

1.2.264 STAT – Statim (“Immediately”)

1.2.265 STC – Sound Transmission Class

1.2.266 STC_C – Composite Sound Transmission Class

1.2.267 STI – Sound Transmission Index

1.2.268 TAB – Testing, Adjusting and Balancing

1.2.269 TAC – Transportation Association of Canada

1.2.270 TCO – Total Cost of Ownership

1.2.271 TCP – Transmission Control Protocol

1.2.272 TDM – Time Division Multiplexing

1.2.273 THD – Total Harmonic Distortion

1.2.274 TIA – Telecommunications Industry Association

1.2.275 TLOF – Touchdown and Lift-Off Area

1.2.276 TO - Telecommunications Outlet

1.2.277 TR – Telecommunications Room

1.2.278 TTMAC – Terrazzo and Tile Manufacturers Association of Canada

1.2.279 TVOC – Total Volatile Organic Compounds

1.2.280 UBC – University of British Columbia

1.2.281 UHF – Ultra High Frequency

1.2.282 UL – Underwriters’ Laboratories

1.2.283 ULC – Underwriters’ Laboratories of Canada

1.2.284 UNDRIP – United Nations Declaration on the Rights of Indigenous Peoples

1.2.285 UPS – Uninterruptible Power Supply

1.2.286 USGBC – U.S. Green Building Council

1.2.287 USB - Universal Serial Bus

1.2.288 USP - United States Pharmacopeia

1.2.289 VAR – Value-Added Reseller

1.2.290 VBBL – City of Vancouver Building Bylaw

1.2.291 VC - Videoconference

1.2.292 VFD – Variable Frequency Drive

1.2.293 VGH – Vancouver General Hospital

1.2.294 VLAN – Virtual Local Area Network

1.2.295 VOC – Volatile Organic Compounds

1.2.296 VoIP – Voice Over Internet Protocol

1.2.297 VSM – Vital Signs Monitor

1.2.298 WAN – Wide Area Network

1.2.299 WAP – Wireless Access Point

1.2.300 WAP2 – Wireless Application Protocol 2

1.2.301 WLC – Wireless Lan Controllers

1.2.302 WMM – Wi-Fi Multimedia

1.2.303 WSBC – WorkSafe BC

PART 2. GENERAL

2.1 Project Overview

2.1.1 Project Co is responsible for the Design and construction of the Health Campus, which will include the following:

2.1.1.1 The Facility;

2.1.1.2 All surface parking, underground parking, lay-by parking, on-site and off-site Utilities;

2.1.1.3 All roadways, sidewalks, pathways, bike lanes, and interconnections to City street network including; New High Street, New Arterial Street, New Local Street, Healthcare Boulevard and National Avenue, including as shown in Appendix 3H [Preliminary Roadway Drawings];

2.1.1.4 All Utility stub outs and knock-out panels for connections to Future Expansion including; CSRC, Health Campus to CSRC links, Health Campus to West Precinct link and Future Heliport;

2.1.1.5 All exterior plazas and amenity spaces, including the Secure Outdoor Spaces, Plaza, Healing Corridor, Wellness Walkway, Spiritual Garden and Traditional Medicine Garden;

2.1.1.6 All of the functional Components, rooms and spaces described in Appendix 3A [Clinical Specifications and Functional Space Requirements]; and

2.1.1.7 Energy Centre.

2.2 Clinical Specifications and Schedules of Accommodation

2.2.1 Project Co will perform the Design and Construction of the Facility:

2.2.1.1 So that it accommodates all of the spaces, activities, functions, design features and adjacencies described in the Appendix 3A [Clinical Specifications and Functional Space Requirements];

2.2.1.2 In accordance with the requirements of Appendix 3A [Clinical Specifications and Functional Space Requirements], subject to any adjustments or refinements made in consultation with the Owner; and

2.2.1.3 The NSM area for each room will not be more than 2% smaller or larger than the required area listed in Appendix 3A [Clinical Specifications and Functional Space Requirements]. Project Co will provide a rationale for each variation and demonstrate to the Owner's satisfaction that affected rooms retain their functionality. If, in the Owner's opinion, the room does not meet the required functionality, the full NSM will be provided as stated in Appendix 3A [Clinical Specifications and Functional Space Requirements].

2.2.2 Unusable Area Includes:

2.2.2.1 Corridor circulation space required for access;

2.2.2.2 Non-functional areas created by acute or obtuse wall angles;

2.2.2.3 Non-functional L-shaped rooms; and

2.2.2.4 All other space where the functionality is encumbered by structure, columns, shafts or projections.

2.2.3 The NSM Area for all rooms required per Appendix 3A [Clinical Specifications and Functional Space Requirements] will exclude Unusable Area.

2.2.4 The term Patient Room in this Schedule is used to describe all rooms with the term "Patient Room" appearing in the "Room Type" column of the Schedule of Accommodations in Appendix 3A [Clinical Specifications and Functional Space Requirements]. Unless noted otherwise, when a clause describes the requirements of a "Patient Room", they will apply to all rooms with "Patient Room" appearing in the title; for example, Patient Room-Critical Care or Patient Room-C4HA.

2.3 Additional Rooms and Spaces

2.3.1 Notwithstanding anything in Appendix 3A [Clinical Specifications and Functional Space Requirements], the Design and Construction of the Facility will include all rooms and spaces as required to comply with the terms of the Agreement.

2.3.2 The following appendices are intended to represent the minimum requirements for the Facility and include additional civil, architectural, mechanical, electrical and communications criteria:

2.3.2.1 Appendix 3A [Clinical Specifications and Functional Space Requirements]

2.3.2.2 Appendix 3B [Wood First Appropriate Use Matrix]

2.3.2.3 Appendix 3C [Acoustic and Noise Control Measures]

2.3.2.4 Appendix 3D [Site Services Diagram]

2.3.2.5 Appendix 3E [Systems Responsibility Matrix]

2.3.2.6 Appendix 3F [Food Services Equipment List]

2.3.2.7 Appendix 3G [Wayfinding and Signage]

2.3.2.8 Appendix 3H [Preliminary Roadway Drawings]

2.3.2.9 Appendix 3I [Commissioning Roles and Responsibilities]

2.3.2.10 Appendix 3J [Sinks Matrix]

2.3.2.11 Appendix 3K [Medical Gas Matrix]

2.3.2.12 Appendix 3L [Millwork and Modular Casework Matrix]

2.3.2.13 Appendix 3M [Door Requirements Matrix]

2.3.2.14 Appendix 3N [Safety and Risk Reduction Matrix]

2.3.2.15 Appendix 3O [Electrical IM/IT Matrix]

2.3.2.16 Appendix 3P [Security Operation Matrix]

2.3.2.17 Appendix 3Q [Metering Matrix]

2.3.2.18 Appendix 3R [AGV Cart Matrix]

2.3.2.19 Appendix 3S [Acceptable Manufacturers and Vendors List]

2.3.2.20 In addition to the requirements listed within the Appendices above, Project Co will provide all appropriate services and connections to ensure full functionality of all Equipment listed in Appendix 2E [Equipment and Furniture] and Appendix 3F [Food Services Equipment List]. Notwithstanding anything in Appendices above, the Design and Construction of the Facility will include all requirements described in this Schedule.

2.4 Standards and Guidelines

2.4.1 Project Co will undertake the Design and Construction:

2.4.1.1 in accordance with the VBBL, BC Fire Code, BC Plumbing Code, National Fire Code and all applicable laws and City of Vancouver bylaws, policies and guidelines, including:

2.4.1.1(1) Vancouver Building Bylaw (VBBL);

2.4.1.1(2) Bylaw CD-1;

2.4.1.1(3) Zoning and Development Bylaw 3575;

2.4.1.1(4) Water Works Bylaw 4848;

2.4.1.1(5) Zoning and Development Fee Bylaw 5585;

2.4.1.1(6) Noise Control Bylaw 6520;

2.4.1.1(7) Noise Control Bylaw No. 6555;

2.4.1.1(8) Rezoning Policy for Sustainable Large Developments Bylaw;

2.4.1.1(9) Energy Utility System Bylaw 9552;

2.4.1.1(10) Erosion and Sediment Control for Large Lots Bulletin;

2.4.1.1(11) Flood Plain Standards and Requirements;

2.4.1.1(12) Green Buildings Policy for Rezonings;

2.4.1.1(13) Rainwater Management Bulletin;

2.4.1.1(14) Rezoning Policy for Sustainable Large Developments;

2.4.1.1(15) CD-1 (-) Bylaw (City of Vancouver Rezoning Conditions);

2.4.1.1(16) City of Vancouver Neighbourhood Energy Connectivity Standards;

2.4.1.1(17) City of Vancouver Energy Modelling Guidelines;

2.4.1.1(18) City of Vancouver Climate Change Adaptation Strategy;

2.4.1.1(19) City of Vancouver Integrated Rainwater Management Plan.

2.4.1.2 having regard for the concerns, needs and interests of

2.4.1.2(1) all Persons who will be Facility Users;

2.4.1.2(2) all Governmental Authorities;

2.4.1.2(3) the community; and

2.4.1.2(4) the City;

2.4.1.3 in accordance with Good Industry Practice;

2.4.1.4 such that every product is installed in accordance with the manufacturer's installation instructions; and

2.4.1.5 to the same standard that an experienced, prudent and knowledgeable long-term Owner of a high-quality health care Facility in North America operated publicly would employ.

2.4.2 If more than one standard is applicable, the highest such standard will apply.

2.4.3 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 Owner's satisfaction that such code or standard meets or exceeds the requirements of this Schedule.

2.4.4 The most recent version of any standard or guideline listed in Schedule 3, excluding any Codes and bylaws, which is in effect at the time of the Effective Date will govern.

2.4.5 CSA Z8000: Canadian Healthcare Facilities

2.4.5.1 CSA Z8000 complements the standards and codes specified in Schedule 3 by providing overarching design principles and referencing specific standards and codes that are appropriate for health care facility design.

2.4.5.2 Project Co will:

2.4.5.2(1) Refer to CSA Z8000 for Design Guidance to resolve issues not otherwise addressed in this Schedule; and

2.4.5.2(2) Use CSA Z8000 as a guideline, together with:

2.4.5.2(2)(a) Any minimum standards and codes referenced in CSA Z8000 (except for any minimum space requirements that may be required by those standards and codes);

2.4.5.2(2)(b) All infection control provisions set out in CSA Z8000; and

2.4.5.2(2)(c) Accommodation of Bariatric Persons section of CSA Z8000.

2.4.6 Without limiting Section 2.4.1 of this Schedule, Project Co will undertake the Design and Construction in compliance with all applicable standards and guidelines, including:

2.4.6.1 The standards set out in this Schedule;

2.4.6.2 The following health authority guidelines:

2.4.6.2(1) Fraser Health Chemical Storage Design Requirements;

2.4.6.2(2) Fraser Health Ergonomic Standard for Workstations;

2.4.6.2(3) Fraser Health Standard: Emergency Department – Patient Check-in Station;

2.4.6.2(4) Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving and Racks;

2.4.6.2(5) Fraser Health Fall Protection Requirements for Facility Design;

2.4.6.2(6) Fraser Health Fume Hoods/LEV Enclosures Design Requirements;

2.4.6.2(7) Fraser Health Laser Room Safety Design Considerations;

2.4.6.2(8) Fraser Health Transportation Demand Management and Commuter Services Design Guidelines – Bicycle Parking Facilities;

2.4.6.2(9) Interior Health Facility Design Considerations to Increase Patient and Staff Safety in Mental Health Facilities;

2.4.6.2(10) Interior Health Seclusion Room Specifications;

2.4.6.2(11) Interior Health Standard: Optimizing Staff and Patient Safety through the Environmental Design of Psychiatric and Emergency Department Seclusion Rooms and External Courtyards;

2.4.6.2(12) LMFM Elevator Design Guidelines;

2.4.6.2(13) LMFM Energy and Environmental Sustainability Design Guidelines – New Construction and Major Renovations.

2.4.6.2(14) LMFM Moving Towards Climate Resilient Health Facilities for Vancouver Coastal Health;

2.4.6.2(15) LMFM Potable Water Systems Sanitation Procedures & Documentation Requirements;

2.4.6.2(16) LMFM Sinks and Drains Technical Manual;

2.4.6.2(17) LMFM Waste Management Space Design Guidelines;

2.4.6.2(18) New St Paul's Hospital & Health Campus Policy Statement, June 2017 (NSPH&HC Policy Statement);

2.4.6.2(19) PHSA Communications Infrastructure Standards and Specifications; and

2.4.6.2(20) Staff Safety Guidelines for Interior Health / Northern Health Facility Design Projects;

2.4.6.3 AIA Guidelines for Design and Construction of Healthcare Facilities;

2.4.6.4 AAMI TIR 34; Water for Reprocessing of Medical Devices;

2.4.6.5 Ambulance Station Design Standards, BCAS, BC Emergency and Health Services;

2.4.6.6 American Conference of Governmental Hygienists, Industrial Ventilation: A Manual of Recommended Practice;

2.4.6.7 BCSLA and BCLBA - BC Landscape Standard – Current Edition;

2.4.6.8 Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs, Ministry of Health, Province of British Columbia (design/installation sections);

2.4.6.9 Best Practices for Hand Hygiene in All Healthcare Settings and Programs, Ministry of Health, Province of British Columbia (design/installation sections);

2.4.6.10 Biosafety in Microbiological & Biomedical Laboratories;

2.4.6.11 British Columbia Insulation Contractors Association (BCICA) Quality Standards Manual for Mechanical Insulation;

2.4.6.12 Canadian Biosafety Standards and Guidelines, Government of Canada;

2.4.6.13 Design Guide for the Built Environment of Behavioral Health Facilities, National Association of Psychiatric Health Systems;

2.4.6.14 Fire Underwriter Survey – Water Supply for Public Fire Protection;

2.4.6.15 Guidelines for Design and Construction of Hospitals and Outpatient Facilities, FGI;

2.4.6.16 Laboratory Biosafety Guidelines, Health Canada, Government of Canada;

2.4.6.17 Mental Health Facilities Design Guide, Department of Veteran Affairs;

2.4.6.18 Patient Safety Standards, New York State Office of Mental Health;

2.4.6.19 Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the B.C. Mental Health Act, Ministry of Health, Province of British Columbia;

2.4.6.20 Security Design Guidelines for Health Care Facilities, IAHSS, including the following:

2.4.6.20(1) Behavioral/Mental Health; and

2.4.6.20(2) Emergency Departments;

2.4.6.21 Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA) Manuals;

2.4.6.22 NAPRA Practice and Regulatory Standards, including the following:

2.4.6.22(1) NAPRA Model Standards for Pharmacy Compounding of Non Hazardous Sterile Preparations; and

2.4.6.22(2) NAPRA Model Standards for Pharmacy Compounding of Hazardous Sterile Preparations;

2.4.6.23 ANSI / ASHRAE standards and guidelines, including the following:

2.4.6.23(1) Standard 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size;

2.4.6.23(2) Standard 55: Thermal Environmental Conditions for Human Occupancy;

2.4.6.23(3) Standard 62.1: Ventilation for Acceptable Indoor Air Quality;

2.4.6.23(4) Standard 90.1: Energy Standard for Buildings Except Low Rise Residential Buildings;

2.4.6.23(5) Standard 110: Method of Testing Performance of Laboratory

2.4.6.23(6) Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC Systems;

2.4.6.23(7) Standard 129: Measuring Air Change Effectiveness;

2.4.6.23(8) Standard 135: BACnet™A Data Communication Protocol for Building Automation and Control Networks; and

2.4.6.23(9) Standard 170: Ventilation of Healthcare Facilities.

2.4.6.24 ASHRAE standards and guidelines, including the following:

2.4.6.24(1) Advanced ENERGY Guide for Hospitals and Healthcare Facilities;

2.4.6.24(2) Handbooks: Fundamentals, Refrigeration, HVAC Applications, Design of Smoke Control Systems;

2.4.6.24(3) Guideline 0-2019: The Commissioning Process;

2.4.6.24(4) Guideline 1.1: HVAC and R Technical Requirements for the Commissioning process;

2.4.6.24(5) Guideline 12-2000: Minimizing the Risk of Legionellosis Associated with Building Water Systems;

2.4.6.24(6) Handbooks: Fundamentals, Refrigeration, HVAC Applications, HVAC Systems and Equipment;

2.4.6.24(7) Standard 180: Methods of Testing for Rating Ducted Air Terminal Units; and

2.4.6.24(8) System Design Manual for Hospitals and Clinics.

2.4.6.25 ANSI / AHRI standards and guidelines, including the following:

2.4.6.25(1) Standard 530: Method of measuring sound and vibration of refrigeration compressors;

2.4.6.25(2) Standard 550/590: Performance Rating Of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle;

2.4.6.25(3) Standard 575: Method of Measuring Machinery Sound within an Equipment Space;

2.4.6.25(4) Standard 880: Standard for Air Terminals; and

2.4.6.25(5) Standard 885: Standard for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets;

2.4.6.26 ANSI / AIHI standards and guidelines, including the following:

2.4.6.26(1) Z9.5-2012 Laboratory Ventilation;

2.4.6.27 ANSI/ASA standards and guidelines, including the following:

2.4.6.27(1) S3.1 Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms;

2.4.6.28 ANSI-ASC A14.3-2008 Standards for Ladders – Fixed – Safety Requirements;

2.4.6.29 ANSI/ASME Standards and Guidelines, including the following:

2.4.6.29(1) A13.1 – Visibility Standard (Pipe Labeling);

2.4.6.29(2) B16 – Piping Component Standards;

2.4.6.29(3) B16.1 – Cast Iron Pipe Flanges and Flanged Fittings;

2.4.6.29(4) B31.1 – Power Piping;

2.4.6.29(5) B31.9 – Building Services Piping;

2.4.6.29(6) B36 – Piping Standards; and

2.4.6.29(7) Boiler and Pressure Vessel Code:

2.4.6.29(7)(a) Section VIII: Pressure Vessels;

2.4.6.29(7)(b) Section IX: Welding Qualifications; and

2.4.6.29(7)(c) Unfired pressure vessels;

2.4.6.30 ANSI/AWWA standards and guidelines, including the following:

2.4.6.30(1) C104 – Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings;

2.4.6.30(2) C110 – Ductile-Iron and Gray-Iron Fittings;

2.4.6.30(3) C151 – Ductile-Iron Pipe, Centrifugally Cast;

2.4.6.30(4) C153 – Ductile Iron Compact Fittings for Water Service;

2.4.6.30(5) C-606 – Standard for Grooved and Shouldered Joints; and

2.4.6.30(6) C651 – Disinfecting Water Mains;

2.4.6.31 ANSI/BIFMA X6.1 - 2018 Educational Seating;

2.4.6.32 ANSI/NEMA LD 3-05: High-Pressure Decorative Laminates

2.4.6.33 ANSI/NEMA LD 3.1-95: Application, Fabrication, and Decorative Laminates

2.4.6.34 ANSI Standards and Guidelines, including the following:

2.4.6.34(1) A21.11 – Rubber Gasket joints for Ductile-Iron Pressure Pipe and Fittings;

2.4.6.34(2) A137.1 – American National Standard Specifications for Ceramic Tile;

2.4.6.34(3) A326.3 – American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials;

2.4.6.34(4) A1264.2 – Provision of Slip Resistance on Walking/Working Surfaces;

2.4.6.34(5) Z97.1-1984 – Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test ANSI C37.121, Unit Substations Requirements;

2.4.6.34(6) Z358.1 – Emergency Eyewash and Shower Equipment; and

2.4.6.34(7) Z535.4 – American National Standard for Product Safety Signs and Labels;

2.4.6.35 ASME standards and guidelines, including the following:

2.4.6.35(1) ASME A112.3.1 – Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above-ground and Below Ground;

2.4.6.35(2) ASME A112.6.3 – Floor and Trench Drains;

2.4.6.35(3) ASME A112.36.2M – Cleanouts;

2.4.6.35(4) ASME B1.20.1 – Pipe Threads, General Purpose (inch);

2.4.6.35(5) ASME B16.3 – Malleable Iron Threaded Fittings;

2.4.6.35(6) ASME B16.5 – Pipe Flanges and Flanged Fittings;

2.4.6.35(7) ASME B16.9 – Factory Made Wrought Steel Buttwelding Fittings;

2.4.6.35(8) ASME B16.10 – Face-to-Face and End-to-End Dimensions of Valves;

2.4.6.35(9) ASME B16.11 – Forged Fittings, Socket-Welding and Threaded;

2.4.6.35(10) ASME B16.15 – Cast Bronze Threaded Fittings, Classes 125 and 250;

2.4.6.35(11) ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings;

2.4.6.35(12) ASME B16.20 – Metallic Gaskets for Pipe Flanges; Ring-Joint, Spiral-Wound, and Jacketed;

2.4.6.35(13) ASME B16.21 – Non-metallic Flat Gaskets for Pipe Flanges;

2.4.6.35(14) ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings;

2.4.6.35(15) ASME B16.23 – Cast Copper Alloy Solder Joint Drainage Fittings: DWV;

2.4.6.35(16) ASME B16.24 – Cast Copper Alloy Pipe Flanges and Flanged Fittings; Class 150, 300, 400, 600, 900, 1500, and 2500;

2.4.6.35(17) ASME B16.29 – Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings-DWV;

2.4.6.35(18) ASME B16.34 – Valves Flanged, Threaded and Welding Ends;

2.4.6.35(19) ASME B16.47 – Large Diameter Steel Flanges: NPS 26 Through NPS 60;

2.4.6.35(20) ASME B16.50 – Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings;

2.4.6.35(21) ASME B16.39 – Malleable Iron Threaded Pipe Unions: Classes 150, 250 and 300;

2.4.6.35(22) ASME B18.2.1 – Square and Hex Bolts and Screws;

2.4.6.35(23) ASME B18.2.2 – Square and Hex Nuts;

2.4.6.35(24) ASME B31.3 – Process Piping;

2.4.6.35(25) ASME BPE – Bioprocessing Equipment; and

2.4.6.35(26) ASME PTC 19.3 TW – Thermowells;

2.4.6.36 AWS standards and guidelines, including the following:

2.4.6.36(1) A5.8 – Specification for Filler Metals for Brazing and Braze Welding; AWS A5.31 – Specification for Fluxes for Brazing and Braze Welding;

2.4.6.36(2) C3.4 – Specification for Torch Brazing;

2.4.6.36(3) D1.3-98 - Structural Welding Code - Sheet Steel; and

2.4.6.36(4) D18.2 – Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube;

2.4.6.37 ASPE Plumbing Engineering Design Handbook, Volumes 1-4;

2.4.6.38 ASTM standards and guidelines, including the following:

2.4.6.38(1) A36 A36M-12 – Standard Specification for Carbon Structural Steel;

2.4.6.38(2) A47 / A47M – Standard Specification for Ferritic Malleable Iron castings;

2.4.6.38(3) A53 – Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless;

2.4.6.38(4) A90/M – Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings;

2.4.6.38(5) A105 – Standard Specification for Carbon Steel Forgings for Piping Applications;

2.4.6.38(6) A106 – Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service;

2.4.6.38(7) A126 – Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings;

2.4.6.38(8) A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip;

2.4.6.38(9) A182 – Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service;

2.4.6.38(10) A193 / A193M-14 – Standard Specification for Alloy –Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications;

2.4.6.38(11) A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both;

2.4.6.38(12) A240/M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications;

2.4.6.38(13) A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service;

2.4.6.38(14) A270 – Specification for seamless and welded austenitic stainless steel sanitary tubing;

2.4.6.38(15) A276 – Standard Specification for Stainless Steel Bars and Shapes;

2.4.6.38(16) A278 – Standard Specification for Gray Iron Castings for Pressure Containing Parts for Temperatures up to 650°F (350°C);

2.4.6.38(17) A283/M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates;

2.4.6.38(18) A285 – Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate Tensile Strength;

2.4.6.38(19) A307-12 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength;

2.4.6.38(20) A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes;

2.4.6.38(21) A326M-13 – Standard Specification for Structural Bolts, Steel, Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric);

2.4.6.38(22) A351 – Standard Specification for Castings, Austenitic, for Pressure Containing Parts;

2.4.6.38(23) A403 – Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings;

2.4.6.38(24) A463/M – Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process;

2.4.6.38(25) A480/M – Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip;

2.4.6.38(26) A490-12 – Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Steel Strength; and

2.4.6.38(27) A490M-12 – Standard Specification for High Strength Structural Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel joints (Metric);

2.4.6.38(28) A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes;

2.4.6.38(29) A516 – Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service;

2.4.6.38(30) A536 – Standard Specification for Ductile Iron Castings;

2.4.6.38(31) A563 – Standard Specification for Carbon and Alloy Steel Nuts;

2.4.6.38(32) A564 – Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes;

2.4.6.38(33) A653 / A653M-13 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process;

2.4.6.38(34) A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar;

2.4.6.38(35) A792 / A792M-10 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process;

2.4.6.38(36) A955 / A955M-17 – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement;

2.4.6.38(37) A924/M – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process;

2.4.6.38(38) A1011/M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength;

2.4.6.38(39) B32 – Specification for Solder Metal;

2.4.6.38(40) B62 – Standard Specification for Composition Bronze or Ounce Metal Castings;

2.4.6.38(41) B88 – Standard Specification for Seamless Copper Water Tube;

2.4.6.38(42) B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;

2.4.6.38(43) B306 – Standard Specification for Copper Drainage Tube (DWV);

2.4.6.38(44) B749 – Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate;

2.4.6.38(45) B819 – Standard Specification for Seamless Copper Tube for Medical Gas Systems;

2.4.6.38(46) B828 – Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings;

2.4.6.38(47) C260 / C260M-10a – Standard Specification for Air-Entraining Admixtures for Concrete;

2.4.6.38(48) C411 – Standard Test Method for Hot Surface Performance of High Temperature Thermal Insulation;

2.4.6.38(49) C494 / C494M – 13 – Standard Specification for Chemical Admixtures for Concrete;

2.4.6.38(50) C503-05 – Standard Specification for Marble Dimension Stone;

2.4.6.38(51) C518 – Standard Test Method for Steady State Thermal Transmission Properties by Means of Heat Flo Meter Apparatus;

2.4.6.38(52) C533 – Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation;

2.4.6.38(53) C534 – Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form;

2.4.6.38(54) C547 – Standard Specification for Mineral Fiber Pipe Insulation;

2.4.6.38(55) C552 – Standard Specification for Cellular Glass Thermal Insulation;

2.4.6.38(56) C553 – Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications;

2.4.6.38(57) C564 – Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings;

2.4.6.38(58) C568-03 – Standard Specification for Limestone Dimension Stone;

2.4.6.38(59) C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation;

2.4.6.38(60) C615-03 – Standard Specification for Granite Dimension Stone;

2.4.6.38(61) C616-03 – Standard Specification for Quartz-Based Dimension Stone;

2.4.6.38(62) C635/C635M-17 – Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings;

2.4.6.38(63) C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels;

2.4.6.38(64) C645-18 – Standard Specification for Nonstructural Steel Framing Members;

2.4.6.38(65) C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products;

2.4.6.38(66) C795 – Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel;

2.4.6.38(67) C840-18 Standard Specification for Application and Finishing of Gypsum Board;

2.4.6.38(68) C919 – Standard Practice for Use of Sealants in Acoustical Applications;

2.4.6.38(69) C1048-04 – Standard Specification for Heat-Treated Flat Glass;

2.4.6.38(70) C1036-06 – Standard Specification for Flat Glass;

2.4.6.38(71) C1053 – Borosilicate Glass Pipe and Fittings for Drain Waste and Vent (DWV) Applications;

2.4.6.38(72) C1126 (Gr.1) – Standard Specification for Faced and Unfaced Rigid Cellular Phenolic Thermal Insulation;

2.4.6.38(73) C1349-04 – Standard Specification for Architectural Flat Glass Clad Polycarbonate;

2.4.6.38(74) C1396 / C1396M – Standard Specification for Gypsum Board;

2.4.6.38(75) C1540 – Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings;

2.4.6.38(76) C1629 / C1629M – Standard Classification for Abuse-Resistant Non-decorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels;

2.4.6.38(77) D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes;

2.4.6.38(78) D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds;

2.4.6.38(79) D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120;

2.4.6.38(80) D2047 – Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring ;

2.4.6.38(81) D 2467 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80;

2.4.6.38(82) D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings;

2.4.6.38(83) D3222 – Unmodified Poly(Vinylidene Fluoride) (PVDF) Moulding, Extrusion and Coating Materials;

2.4.6.38(84) D3450 – Test Method for Washability Properties of Interior Architectural Coatings;

2.4.6.38(85) D4101 – Specification for Polypropylene Injection and Extrusion Materials;

2.4.6.38(86) D4828 – Standard Test Methods for Practical Washability of Organic Coatings;

2.4.6.38(87) D543 / D543 – 14 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents;

2.4.6.38(88) D790-10 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials;

2.4.6.38(89) E84-12c – Standard Test Method for Surface Burning Characteristics of Building Materials;

2.4.6.38(90) ASTM E90-09: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements;

2.4.6.38(91) E1300-04e1 – Standard Practice for Determining Load Resistance of Glass in Buildings;

2.4.6.38(92) ASTM E2074-00: Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies;

2.4.6.38(93) F441 – Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedule 40 and 80;

2.4.6.38(94) F1120 – Standard Specification for Circular Metallic Bellows Type Expansion Joints for Piping Applications;

2.4.6.38(95) F1412 – Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems;

2.4.6.38(96) F1673 – Polyvinylidene Fluoride (PVDF) Corrosive Waste Drainage Systems; and

2.4.6.38(97) G21-09 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi;

2.4.6.38(98) S325-10e1 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength;

2.4.6.39 CAN/ULC standards and guidelines, including:

2.4.6.39(1) C536 – Flexible Metallic Hose;

2.4.6.39(2) C842 – Guide for the investigation of valves for flammable and combustible liquids;

2.4.6.39(3) S102.2 – Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies;

2.4.6.39(4) S104 – Standard Method for Fire Tests of Door Assemblies;

2.4.6.39(5) S107 – Methods of Fire Tests of Roof Coverings;

2.4.6.39(6) S112 – Standard Method of Fire Test of Fire Damper Assemblies;

2.4.6.39(7) S115 – Fire Tests of Fire stop Systems;

2.4.6.39(8) S138 – Standard Method of Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration;

2.4.6.39(9) S524 – Standard for the Installation of Fire Alarm Systems;

2.4.6.39(10) S536 – Inspection and Testing of Fire Alarm Systems;

2.4.6.39(11) S537 – Standard for Verification of Fire Alarm Systems;

2.4.6.39(12) S560 – Standard for Category 3 Aqueous Film-Forming Foam (AFFF) Liquid Concentrates;

2.4.6.39(13) S561 – Installation and Services for Fire Signal Receiving Centres and Systems;

2.4.6.39(14) S576 – Standard for Mass Notification System Equipment and Accessories;

2.4.6.39(15) S631 – Isolation Bushings for Steel Underground Tanks Protected with External Corrosion Protection System;

2.4.6.39(16) S661 – Standard for Overfill Protection Devices for Flammable and Combustible Liquid Storage;

2.4.6.39(17) S663 – Standard for Spill Containment Devices for Flammable and Combustible Liquid Aboveground Storage Tanks;

2.4.6.39(18) S701 – Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering;

2.4.6.39(19) S702 – Standard for Mineral Fibre Thermal Insulation for Buildings;

2.4.6.39(20) S704 – Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced;

2.4.6.39(21) S1001 – Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems;

2.4.6.40 CAN/CGSB standards and guidelines, including the following:

2.4.6.40(1) 12.20-M – Structural Design of Glass for Buildings;

2.4.6.40(2) 19.13-M87 – Sealing Compound, One Component, Elastomeric, Chemical Curing;

2.4.6.40(3) 19.24-M90 – Multi-Component, Chemical Curing Sealing Compound;

2.4.6.40(4) 37-GP-56M – Membrane Modified Bitinous, Prefabricated, and Reinforced for Roofing; and

2.4.6.40(5) 51.34-M86 – Vapour Barrier, Polyethylene Sheet for Use in Building Construction;

2.4.6.41 CNSC regulatory and guidance documents, including the following:

2.4.6.41(1) GD-52 – Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms; and

2.4.6.41(2) REGDOC-2.12.3 – Security of Nuclear Substances: Sealed Sources;

2.4.6.42 CSA standards and guidelines, including the following:

2.4.6.42(1) A23.1 – Concrete Materials and Methods of Concrete Construction;

2.4.6.42(2) A23.1-09/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete;

2.4.6.42(3) A23.3 – Design of Concrete Structures;

2.4.6.42(4) A23.4 – Precast Concrete – Materials and Construction;

2.4.6.42(5) A82.27 – Gypsum Board;

2.4.6.42(6) A123.21 – Standard Test Method for the dynamic wind uplift resistance of membrane roofing systems, Includes Update No. 1

2.4.6.42(7) A231.1/A231.2 – Precast Concrete Paving Slabs/Precast Concrete Pavers;

2.4.6.42(8) A370-04 – Connectors for Masonry;

2.4.6.42(9) A371 – Masonry Construction for Buildings;

2.4.6.42(10) A660 – Certification of Manufacturers of Steel Building Systems;

2.4.6.42(11) B44 – Safety Code for Elevators and Escalators;

2.4.6.42(12) B44.2 – Maintenance Requirements and Intervals for Elevators, Dumbwaiters, Escalators, and Moving Walks;

2.4.6.42(13) B45 Series – 13: Plumbing Fixtures;

2.4.6.42(14) B51 – Boiler, Pressure vessel and Pressure Piping Code;

2.4.6.42(15) B52 – Mechanical Refrigeration Code;

2.4.6.42(16) B64 Series 17 – Backflow Preventers and Vacuum Breakers;

2.4.6.42(17) B64.10 Series – Backflow Preventers and Vacuum Breakers;

2.4.6.42(18) B70 – Cast Iron Soil Pipe, Fittings, and Means of Joining;

2.4.6.42(19) B72 – Installation Code for Lightning Protection Systems;

2.4.6.42(20) B79 – Commercial and Residential Drains and Cleanouts;

2.4.6.42(21) B125 – Plumbing Fittings;

2.4.6.42(22) B128.1/B128.2 – Design And Installation Of Non-Potable Water Systems / Maintenance And Field Testing Of Non-Potable Water Systems;

2.4.6.42(23) B137.5 – Cross-Linked Polyethylene (PEX) Tubing Systems for Pressure Applications;

2.4.6.42(24) B137.6 – Chlorinated polyvinylchloride (CPVC) pipe, tubing, and fittings for hot- and cold-water distribution systems;

2.4.6.42(25) B139 – Installation Code for Oil-Burning Equipment;

2.4.6.42(26) B140.12 – Oil-Fired Service Water Heaters for Domestic Hot Water and Space Heating Use;

2.4.6.42(27) B149.1 – Natural Gas and Propane Installation Code;

2.4.6.42(28) B158.1 – Cast Brass Solder Joint Drainage, Waste, and Vent Fittings;

2.4.6.42(29) B181.2 – PVC Drain Waste and Vent Pipe and Fittings from CSA B 1800 Plastic Non pressure Pipe Compendium;

2.4.6.42(30) B181.3 – Polyolefin Laboratory Drainage Systems;

2.4.6.42(31) B242 – Groove and Shoulder Type Mechanical Pipe Couplings;

2.4.6.42(32) B272 – Pre-Fabricated Self Sealing Roof Vent Flashings;

2.4.6.42(33) B481 – Grease interceptors;

2.4.6.42(34) B602 – Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe;

2.4.6.42(35) B651 – Barrier Free Design;

2.4.6.42(36) C2.1 – Single-Phase and Three-Phase Liquid-Filled Distribution Transformers;

2.4.6.42(37) C9 – Dry Type Transformers;

2.4.6.42(38) C22.1 – Canadian Electrical Code as adopted in British Columbia;

2.4.6.42(39) C235 – Preferred Voltage Levels for AC Systems, 0 to 50,000 V;

2.4.6.42(40) C282 – Emergency Electrical Power Supply for Buildings;

2.4.6.42(41) C743 – Performance Standard for Rating Packaged Water Chillers;

2.4.6.42(42) G30.18 – Carbon steel bars for concrete reinforcement;

2.4.6.42(43) G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

2.4.6.42(44) G164 – Hot Dip Galvanizing of Irregularly Shaped Articles;

2.4.6.42(45) O86 – Engineering Design in Wood;

2.4.6.42(46) O177 – Qualification Code for Manufacturers of Structural Glued-Laminated Timber;

2.4.6.42(47) S16 – Design of Steel Structures;

2.4.6.42(48) S136 – North American Specification for Design of Cold Formed Steel Structural Members;

2.4.6.42(49) S157-05/S157.1 – Strength Design in Aluminum;

2.4.6.42(50) S269.3-M92 – Concrete Formwork;

2.4.6.42(51) S304 – Design of Masonry Structures;

2.4.6.42(52) S304.1-04 – Masonry Design for Buildings;

2.4.6.42(53) S413 – Parking Structures;

2.4.6.42(54) S478 – Guideline on Durability of Buildings;

2.4.6.42(55) S832 – Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings;

2.4.6.42(56) W47.1 – Certification of Companies for Fusion Welding of Steel;

2.4.6.42(57) W48 – Filler Metals and Allied Materials for Metal Arc Welding;

2.4.6.42(58) W55.3 – Certification of Companies for Resistance Welding of Steel and Aluminum;

2.4.6.42(59) W59 – Welded Steel Construction (Metal Arc Welding);

2.4.6.42(60) W59.2M – Welded Aluminum Construction;

2.4.6.42(61) W186-M1990 (R2002) – Welding of Reinforcing Bars in Reinforced Concrete Construction;

2.4.6.42(62) Z32 – Electrical Safety and Essential Electrical Systems in Health Care Facilities;

2.4.6.42(63) Z305.12 – Safe storage, handling and use of portable oxygen systems in residential buildings and health care facilities;

2.4.6.42(64) Z305.13 – Plume Scavenging;

2.4.6.42(65) Z314.0 – MDR – General requirements;

2.4.6.42(66) Z314.7 – Steam Sterilizers for Health Care Facilities;

2.4.6.42(67) Z314.8 – Decontamination of Reusable Medical Devices;

2.4.6.42(68) Z314-18 – Canadian Medical Device Reprocessing;

2.4.6.42(69) Z314.23 – Chemical Sterilization of Reusable Medical Devices;

2.4.6.42(70) Z316.5 – Fume Hoods and Associated Exhaust Systems;

2.4.6.42(71) Z317.1 – Special Requirements for Plumbing Installations in Health Care Facilities;

2.4.6.42(72) Z317.2 – Special Requirements for HVAC Systems in Health Care Facilities;

2.4.6.42(73) Z317.5 – Illumination Design in Health Care Facilities;

2.4.6.42(74) Z317.10 – Handling of Health Care Waste Materials;

2.4.6.42(75) Z317.11 – Area requirements for Health Care Facilities;

2.4.6.42(76) Z317.13 – Infection Control During Construction, Renovation, and Maintenance of Health Care Facilities;

2.4.6.42(77) Z321 – Signs and Symbols for the Workplace;

2.4.6.42(78) Z358.1 – Emergency Eyewash and Shower Equipment;

2.4.6.42(79) Z364.2.2 – Water Treatment Equipment and Water Quality Requirements for Hemodialysis;

2.4.6.42(80) Z386 – Safe Use of Lasers in Health Care;

2.4.6.42(81) Z412 – Office Ergonomics;

2.4.6.42(82) Z431 – Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators;

2.4.6.42(83) Z462 – Workplace Electrical Safety (Harmonized with NFPA 70E);

2.4.6.42(84) Z1002 – Occupational Health and Safety;

2.4.6.42(85) Z7396.1 – Medical Gas Pipeline Systems – Part 1: Pipelines for Medical Gases, Medical Vacuum, Medical Support Gases, and Anaesthetic Gas Scavenging Systems;

2.4.6.42(86) Z7396.2 Medical Gas Pipeline Systems - Part 2: Anaesthetic Gas Scavenging Disposal Systems;

2.4.6.42(87) Z8001 – Commissioning of Health Care Facilities;

2.4.6.42(88) Z9170-1 – Terminal Units for Medical gas Pipeline;

2.4.6.42(89) Z10524-2 – Pressure regulators for use with medical gases – Part 2: Manifold and line pressure regulators;

2.4.6.42(90) Z10535.1 – Hoists for the Transfer of Disabled Persons — Requirements and Test Methods;

2.4.6.42(91) Z10535.2 – Lifts for the transfer of persons – Installation, use, and maintenance;

2.4.6.42(92) Z15190 – Medical laboratories – Requirements for Safety;

2.4.6.42(93) Z15883-2 – Washer-disinfectors Requirements and tests for washer disinfectors employing thermal disinfection for surgical instruments, anaesthetic equipment, bowls, dishes, receivers, utensils, glassware, etc.; and

2.4.6.42(94) Z15883-3 – Washer disinfectors – Part 3: Requirements and tests for washer disinfectors employing thermal disinfection for human waste containers;

2.4.6.43 CAN/CSB standards and guidelines, including the following:

2.4.6.43(1) 12.20-M89 – Structural Design of Glass for Buildings;

2.4.6.43(2) 51-GP-52MA – Vapour Barrier, Jacket and Facing Material for Pipe, Duct, and Equipment Thermal Insulation; and

2.4.6.43(3) 51.53 – Poly(Vinyl Chloride) Jacket Sheeting, for Insulated Pipes Vessels and Round Ducts;

2.4.6.44 Federal Specifications, including the following:

2.4.6.44(1) QQL-201F – Chemical Analysis - Grade C;

2.4.6.44(2) DD-G-451 – Flat Glass for Glazing, Mirrors and Other Uses;

2.4.6.44(3) QQL-201F – Chemical Analysis, Grade C; and

2.4.6.44(4) DD-G-451;

2.4.6.45 GA standards, including the following:

2.4.6.45(1) 214 Recommended Levels of Finish for Gypsum Board, Glass-Mat and Fiber-Reinforced Gypsum Panels; and

2.4.6.45(2) 216 Recommended Specifications for the Application and Finishing of Gypsum Board;

2.4.6.46 ICC-ES Standard AC-16;

2.4.6.47 IEEE standards and guidelines, including the following:

2.4.6.47(1) 299 – Standard Method for Measuring, as modified for MRI Testing Methods of Attenuation Measurements for Electromagnetic Shielding Enclosures for Electrical Test Purposes;

2.4.6.47(2) 802.1 – Series for Interworking, Security, Audio/Video Bridging and Data Centre Bridging, and Time Sensitive Networking Standards; and

2.4.6.47(3) 1584 – Guide for Performing Arc-Flash Hazard Calculations.

2.4.6.48 MIL-STD-22A – Method of Insertion – Loss Measurements for Radio Frequency Power Line Filters;

2.4.6.49 MSS standards, including the following:

2.4.6.49(1) SP-25 – Standard Marking System for Valves, Fittings, Flanges, and Unions;

2.4.6.49(2) SP-42 – Corrosion-Resistant Gate, Globe, Angle, and Check Valves with Flanged and Butt Weld Ends (Classes 150, 300, and 600);

2.4.6.49(3) SP-67 – Butterfly Valves;

2.4.6.49(4) SP-68 – High Pressure Butterfly Valves with Offset Design;

2.4.6.49(5) SP-70 – Cast Iron Gate Valves, Flanged and Threaded Ends;

2.4.6.49(6) SP-71 – Cast Iron Swing Check Valves, Flanged and Threaded Ends;

2.4.6.49(7) SP-72 – Ball valves with Flanged or Butt-Welding ends for General Service;

2.4.6.49(8) SP-78 – Cast Iron Plug Valves;

2.4.6.49(9) SP-80 – Bronze Gate, Globe Angle and Check Valves;

2.4.6.49(10) SP-85 – Cast Iron Globe and Angle Valves, Flanged and Threaded Ends;

2.4.6.49(11) SP-97 – Integrally Reinforced Forged Branch Outlet Fittings – Socket Welding, Threaded, and Buttwelding Ends;

2.4.6.49(12) SP-110 – Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends;

2.4.6.49(13) SP-125 – Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves;

2.4.6.49(14) SP-126 – In-Line, Spring-Assisted, Center-Guided Check Valves (Carbon, Alloy Steel, Stainless Steel, and Nickel Alloys);

2.4.6.49(15) SP-136 – Ductile Iron Swing Check Valves;

2.4.6.49(16) SP-139 – Copper Alloy Gate, Globe, Angle, and Check Valves for Low Pressure/Low Temperature Plumbing Applications;

2.4.6.49(17) SP-58 – Pipe Hangers and Supports - Materials Design and Manufacture;

2.4.6.49(18) SP-69 – Pipe Hangers and Supports - Selection and Application;

2.4.6.49(19) SP-77 – Guidelines for Pipe Support Contractual Relationships;

2.4.6.49(20) SP-90 – Guidelines for Terminology for Pipe Hangers and Supports;

2.4.6.49(21) SP-114 – Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000; and

2.4.6.49(22) SP-127 – Bracing for Piping Systems Seismic - Wind - Dynamic Design, Selection, Application;

2.4.6.50 NEMA standards, including the following:

2.4.6.50(1) WC7 / ICEA S-66-524 – Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy;

2.4.6.50(2) ICS 7 – Adjustable-Speed Drives;

2.4.6.50(3) VE 1 – Metal Cable Tray Systems; and

2.4.6.50(4) PB2.2 – Application Guide for Ground-Fault Protection Devices for Equipment;

2.4.6.51 NETA standards and guidelines, including the following:

2.4.6.51(1) ATS Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems; and

2.4.6.51(2) MTS Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems.

2.4.6.52 NFPA (National Fire Protection Association) standards and guidelines, including the following:

2.4.6.52(1) 3: Standard for Commissioning of Fire Protection and Life Safety Systems:

2.4.6.52(2) 4: Standard for Integrated Fire Protection and Life Safety System Training

2.4.6.52(3) 10: Standard for Portable Fire Extinguishers;

2.4.6.52(4) 11: Standard for Low, Medium and High Expansion Foam;

2.4.6.52(5) 13: Standard for Installation of Sprinkler Systems;

2.4.6.52(6) 14: Standard for Installation of Standpipe and Hose Systems;

2.4.6.52(7) 16: Standard for the Installation of Standpipe and Hose Systems;

2.4.6.52(8) 17: Standard for Dry-Chemical Extinguishing Systems;

2.4.6.52(9) 17A: Standard for Wet Chemical Extinguishing Systems

2.4.6.52(10) 20: Standard for the Installation of Stationary Pumps for Fire Protection;

2.4.6.52(11) 24: Standard for the Installation of Private Fire Service Mains and Their Appurtenances;

2.4.6.52(12) 25: Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems;

2.4.6.52(13) 30: Flammable and Combustible Liquids Code;

2.4.6.52(14) 33: Standard for Spray Application Using Flammable or Combustible Materials;

2.4.6.52(15) 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines;

2.4.6.52(16) 45: Standard on Fire Protection for Laboratories Using Chemicals;

2.4.6.52(17) 55: Compressed Gases and Cryogenic Fluids Code;

2.4.6.52(18) 56F: Non-flammable Medical Gas System;

2.4.6.52(19) 70B: Recommended Practice for Electrical Equipment Maintenance;

2.4.6.52(20) 72: National Fire Alarm and Signaling Code;

2.4.6.52(21) 75: Standard for the Fire Protection of Information Technology Equipment;

2.4.6.52(22) 82: Standard on Incinerators and Waste and Linen Handling Systems and Equipment;

2.4.6.52(23) 90A: Standard for Installation of Air Conditioning and Ventilation Systems;

2.4.6.52(24) 92A: Standard for Smoke Control Systems Utilizing Barriers and Pressure Differences;

2.4.6.52(25) 96: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations;

2.4.6.52(26) 101: Life Safety Code;

2.4.6.52(27) 141: Standard for Aircraft Rescue and Fire-Fighting Vehicles;

2.4.6.52(28) 214: Standard on Water-Cooling Towers;

2.4.6.52(29) 412: Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment; and

2.4.6.52(30) 2001: Standard on Clean Agent Fire Extinguishing Systems;

2.4.6.53 NSF/ANSI standards and guidelines, including the following:

2.4.6.53(1) 14 – Plastic Piping System Components and Related Materials;

2.4.6.53(2) 61-G – Drinking Water System Components – Health Effects; and

2.4.6.53(3) 372 – Drinking Water System Components – Lead Content;

2.4.6.54 Sustainability standards and guidelines, including the following:

2.4.6.54(1) LEED® Canada Building Design and Construction (BD+C): Healthcare, Latest Edition, Canada Green Building Council;

2.4.6.54(2) LEED® Version 4 Reference Guide for Building Design and Construction: Healthcare, US Green Building Council;

2.4.6.54(3) The Green Guide for Healthcare;

2.4.6.54(4) Green Globes – Environment Assessment for New Buildings;

2.4.6.54(5) Go Green Program, BOMA;

2.4.6.54(6) ASHRAE Green Healthcare Construction Guidance Statement, Jan 2002;

2.4.6.54(7) ASHRAE 90.1 Energy Standards for Buildings;

2.4.6.54(8) ASHRAE Standard 189.1-2017 – Standard for the Design of High-Performance Green Buildings;

2.4.6.54(9) ASHRAE Standard 189.3-2017 – Design, Construction, and Operation of Sustainable High-Performance Health Care Facilities;

2.4.6.54(10) ASTM E917.24401-1 Life Cycle Cost Assessment Methodology;

2.4.6.54(11) Building Materials for the Environmentally Hypersensitive, CMHC;

2.4.6.54(12) BC Hydro New Construction Energy Modeling Guidelines;

2.4.6.54(13) BC Hydro High Performance Building Program;

2.4.6.54(14) Canadian Building Green Hospitals Checklist, Canadian Coalition for Green Healthcare;

2.4.6.54(15) Energy Innovators Initiative, Natural Resources Canada;

2.4.6.54(16) EES Design Guidelines for New Construction and Major Renovations;

2.4.6.54(17) Healthy Built Environment (HBE) Linkages Toolkit, PHSA;

2.4.6.54(18) National Energy Code for Buildings (NECB), National Research Council;

2.4.6.54(19) Sustainable and Climate-Resilient Healthcare Facilities Toolkit; and

2.4.6.54(20) Sustainable Healthcare Architecture, Robin Guenther and Gail Vittori;

2.4.6.55 ISO standards, including the following:

2.4.6.55(1) ISO 10137:2007 Basis for design of structures – serviceability of buildings and walkways against vibration;

2.4.6.55(2) ISO 14644-1:2015: Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration;

2.4.6.55(3) ISO 14644-2: Cleanrooms and associated controlled environments - Part 2: Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration.

2.4.6.56 USP standards and guidelines, including the following:

2.4.6.56(1) 797 – Guidebook to Pharmaceutical Compounding—Sterile Preparations;

2.4.6.56(2) 800 – Hazardous Drugs—Handling in Healthcare Settings; and

2.4.6.56(3) 825 – Radiopharmaceuticals—Preparation, Compounding, Dispensing, and Repackaging;

2.4.6.57 Technical Safety BC Regulations and Guidelines.

2.4.6.58 WorkSafe BC Regulations and guidelines, including the following:

2.4.6.58(1) Illumination

2.4.6.58(1)(a) Part 4, General Conditions, Section 4.64 – 4.69.

2.4.6.58(2) HVAC

2.4.6.58(2)(a) Part 4, General Conditions, Indoor Air Quality, Sections 4.70 – 4.80;

2.4.6.58(2)(b) Part 4, General Conditions, Environmental Tobacco Smoke, Sections 4.81 – 4.82;

2.4.6.58(2)(c) Part 5, Flammable and Combustible Substances, Section 5.35; and

2.4.6.58(2)(d) Part 5, Controlling Exposure, Section 5.56.

2.4.6.58(3) Ergonomics

2.4.6.58(3)(a) Part 4, General Conditions, Ergonomics (MSI) Requirements, Sections 4.46 – 4.53; and

2.4.6.58(3)(b) Guidelines Part 4 – Ergonomics (MSI) Requirements Update 2006, G4.46 – 4.53(2).

2.4.6.58(4) Emergency Eyewash / Showers

2.4.6.58(4)(a) Part 5, Chemical Agents and Biological Agents, Definitions, Section 5.1;

2.4.6.58(4)(b) Part 5, Chemical Agents and Biological Agents, Emergency Washing Facilities, Sections 5.85 – 5.96;

2.4.6.58(4)(c) Guidelines Part 5, Emergency Washing Facilities, Issued 1999; and

2.4.6.58(4)(d) Guidelines Part 30, General Requirements, Plumbing, G30.4, Issued 1999.

2.4.6.58(5) Fall Protection

2.4.6.58(5)(a) Part 4, General Conditions, Work Areas Guards and handrails, Sections 4.54 – 4.63; and

2.4.6.58(5)(b) Part 11, Fall Protection, Section G11.1 – G11.10(0.1).

2.4.6.58(6) Emergency Response

2.4.6.58(6)(a) Part 4, General Conditions, Emergency Preparedness and Response, 4.13 – 4.18.

2.4.6.58(7) Eating Areas / Washrooms / Change Areas / Unsafe Water

2.4.6.58(7)(a) Part 4, General Conditions, Occupational Environment Requirements, Section 4.84 – 4.87.

2.4.6.58(8) Electrical Safety

2.4.6.58(8)(a) Part 4, General Conditions, Buildings, Structures, Equipment and Site Conditions, Conformity to Standards, Section 4.4; and

2.4.6.58(8)(b) Part 19, Electrical Safety.

2.4.6.58(9) Radiation Safety

2.4.6.58(9)(a) Division 3 Radiation Exposure (included ionizing and non-ionizing radiation) Section 7.18 – 7.24 Guidelines Part 7 – Division 3 Radiation Exposure G7.18 – G7.19 (4)-2;

2.4.6.58(9)(b) BCICA Quality Standards Manual for Mechanical Insulation;

2.4.6.58(9)(c) TIAC (Thermal Insulation Association of Canada) standards;

2.4.6.58(9)(d) Canadian Council on Health Services Accreditation Program, Latest Edition; and

2.4.6.58(9)(e) Health Canada Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities.

2.4.6.59 UBC FoM standards and guidelines, including the following:

2.4.6.59(1) Design Guidelines and Functional Requirements for Learning Spaces; and

2.4.6.59(2) Specifications and Requirements for UBC Clinical Education Facilities.

2.4.6.60 Communications Standards and Specifications

2.4.6.60(1) PHSA Communications Infrastructure Standards & Specifications;

2.4.6.60(2) ANSI/TIA 568-D.1-2015 Generic Telecommunications Cabling for Customer Premises standard;

2.4.6.60(3) ANSI/TIA -568-0-D-2015 Commercial Building Telecommunications Cabling Standard;

2.4.6.60(4) ANSI/TIA-568-C.2-2009 Commercial Building Telecommunications Cabling Standard – Balanced Twisted Pair Cabling Components;

2.4.6.60(5) ANSI/TIA-568-C.3-2008 Optical Fiber Cabling Components Standard;

2.4.6.60(6) ANSI/TIA-569-D-2015 Commercial Building Standard for Telecommunications Pathways and Spaces;

2.4.6.60(7) ANSI/TIA-606-B-2011 Administration Standard for Commercial Telecommunications Infrastructure;

2.4.6.60(8) ANSI/TIA -607-C-2015 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications;

2.4.6.60(9) ANSI/TIA-570-C-2012 Residential Telecommunications Cabling Standard;

2.4.6.60(10) ANSI/TIA-758-B-2012 Customer Owned Outside Plant Telecommunications Cabling Standard;

2.4.6.60(11) ANSI/TIA-1179-2010 Health Care Telecommunications Cabling Standard;

2.4.6.60(12) ANSI/TIA-942-A-2012 Telecommunications Infrastructure Standard for Data Centers;

2.4.6.60(13) ANSI/TIA-TSB-162-A-2013 Telecommunications Cabling Guidelines for wireless Access Points;

2.4.6.60(14) ASHRAE 223P Designation and Classification of Semantic Tags for Building Data;

2.4.6.60(15) IEEE 802.3 series of Ethernet Standards;

2.4.6.60(16) IEEE 802.11 series of Wireless Standards;

2.4.6.60(17) ISO 8802-3 series of Standards;

2.4.6.60(18) ISO 16745-1 Sustainability in buildings and civil engineering works - Carbon metric of an existing building during use stage - Part 1: Calculation, reporting and communication;

2.4.6.60(19) ISO 16745-2 Sustainability in buildings and civil engineering works - Carbon metric of an existing building during use stage - Part 2: Verification;

2.4.6.60(20) BICSI latest technical manuals;

2.4.6.60(21) ANSI/BICSI 002-2014, Data Centers Design and Implementation Best Practices;

2.4.6.60(22) ANSI/BICSI 004-2012, Information Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities;

2.4.6.60(23) ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices;

2.4.6.60(24) ANSI/BICSI-006-2015 Distributed Antenna System (DAS) Design and Implementation Best Practices;

2.4.6.60(25) ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling;

2.4.6.60(26) NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings; and

2.4.6.60(27) UL-1069 Hospital Signalling and Nurse Call Equipment.

2.5 Submittal Documents

2.5.1 Progressive Submittals

2.5.1.1 In accordance with Schedule 2 [Design and Construction Protocols] and Appendix 2C [User Consultation and Design Review], Project Co will make submissions of the Design and Construction Documents to the Owner for review at progressive 30%, 50%, 70%, 90%, 100% and Record Design and Construction Document phases as follows:

2.5.1.1(1) 30% Design and Construction Documents (30% Phase)

2.5.1.1(1)(a) This phase will include supplemental information included in Appendix 2G [Proposal Extracts] and development of drawings and other documents illustrating the scale and character of the Facility, architecture and all engineering systems in sufficient detail to describe how all parts of the Facility functionally relate to each other, such as the site plan, master planning, roadworks design, spatial relationship diagrams, principal floor plans, flow diagrams, Building Systems, sections, and elevations; together with a written Design Brief.

2.5.1.1(1)(b) In addition to the specific documentation required in this Section 2.5, at a minimum the following items will be addressed:

2.5.1.1.1.(b).1 Proposal for a Design vision, aesthetics, materials and building character, including Facility elevations;

2.5.1.1.1.(b).2 How the Design promotes close ties with the neighbourhood and integration with the surrounding community;

2.5.1.1.1.(b).3	How the Design considers coherent and harmonious integration of the architectural elements into the Site and future buildings;
2.5.1.1.1.(b).4	Description of the provision of Building Systems for the Facility and integration with the Site infrastructure;
2.5.1.1.1.(b).5	Overall approach to achieving the Design Objectives described in Section 3.2, including specific characteristics of the Design that reflect the Owner's Identity and Vision;
2.5.1.1.1.(b).6	Site plan, illustrating the Site boundary, provision for future buildings including North Precinct, West Precinct, and South Precinct, accesses, egresses and drop-offs (pedestrian, bicycle and all vehicular traffic including fire, ambulance and service vehicles) and surrounding buildings;
2.5.1.1.1.(b).7	Facility flexibility concepts;
2.5.1.1.1.(b).8	Plans of functional Component blocking, layouts, vertical stacking and links, internal and external flow of circulation and Component drawings and its integration into the Future Expansion areas;
2.5.1.1.1.(b).9	Plans demonstrating the flows of Patients, families, providers, equipment, supplies, medications, food and linens, and waste including flows to and from the Facility;
2.5.1.1.1.(b).10	Identification of deviations from standardization and accessibility design principles with appropriate rationale.
2.5.1.1.1.(b).11	Vertical transportation analysis demonstrating elevator locations and level of service;
2.5.1.1.1.(b).12	Description of strategy for IM/IT and security systems and how these systems will enable and enhance clinical functionality;
2.5.1.1.1.(b).13	Facility Threat and Risk Assessment Report;
2.5.1.1.1.(b).14	Preliminary maintenance strategy narrative considering siting of mechanical and storage components,
2.5.1.1.1.(b).15	Preliminary Wayfinding and signage report describing the proposed Facility and Health Campus nomenclature and symbolic language and overall approach to compliance with the Project requirements including Appendix 3G [Wayfinding and Signage].
2.5.1.1.1.(b).16	Sustainability Report and LEED project checklist;

2.5.1.1.1.(b).17 Commissioning Plan Outline;
2.5.1.1.1.(b).18 Traffic study and parking analysis;
2.5.1.1.1.(b).19 Description of strategy for compliance with the Owner's waste management plan;
2.5.1.1.1.(b).20 Transportation Management Plan;
2.5.1.1.1.(b).21 Code Report; and
2.5.1.1.1.(b).22 Demonstration of conformance to City bylaw requirements including CD-1 (-) Bylaw, zoning restrictions and City Design Guidelines.

2.5.1.1(2) Before the 50% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 30% Phase REVIEWED status or all the outstanding comments on a Submittal will be agreed by the Owner as not being material in nature.

2.5.1.1(2)(a) 50% Design and Construction Documents (50% Phase);
2.5.1.1.2.(a).1 In addition to the 30% Phase requirements and the detailed requirements of this Section 2.5, this phase will include drawings, Minimum Room Requirements and other documentation, including details of all Building Systems with outline specifications, to fully describe the size and character of the entire Facility including the architectural, landscaping, civil, structural, mechanical, electrical and IM/IT systems, materials, equipment, Furniture and other elements.
2.5.1.1.2.(a).2 At a minimum the following items will be addressed:
(a).2.1 Update of documents based on the Owner comments from the 30% Design and Construction Documents stage;
(a).2.2 Developed Design, including context plan, Phasing Plan, site plan, all floor plans and a roof plan;
(a).2.3 Integration of the requirements described in Appendix 3G [Wayfinding and Signage];
(a).2.4 Developed exterior elevations of the Facility, cross-sectional drawings, including indication of surface materials for all areas;
(a).2.5 Developed integration of exterior spaces, including courtyards, plazas and other outdoor spaces, vehicle

access/egress (including drop-off and pick-up access to parking, temporary parking, parking numbers, emergency and service vehicle parking, etc.);

(a).2.6 Developed interior concepts and key interior elevations, colours and materials;

(a).2.7 Developed landscape plans;

(a).2.8 Minimum Room Requirements;

(a).2.9 Developed Energy Model, Energy Cost Adjustment framework template and report detailing energy consumption, the Design and Construction Energy Target, Carbon Target and the target for LEED Gold Certification;

(a).2.10 Draft Commissioning Plan;

(a).2.11 Sample verification checklists and test procedures; and

(a).2.12 Draft Acoustic Report.

2.5.1.1.2.(a).3 At a minimum, the following items will be addressed for the clinical aspects of the Facility:

(a).3.1 Plans of each floor level updated based on the Owner comments from the 30% Design and Construction Documents stage and to include all Components and support space including Mechanical and Electrical services, colour coded. Rooms and spaces will be numbered according to the reference numbers in Appendix 3A [Clinical Specifications and Functional Space Requirements];

(a).3.2 A full lighting and switching layout for each room and floor plate;

(a).3.3 Developed interior finishes (flooring, walls, wall protection and ceiling finishes) for all rooms and floor plates, including three options for interior finishes' colour and materials selection boards;

(a).3.4 Efficient integration into the plans of all Equipment and Furniture;

(a).3.5 Updated Facility Wayfinding strategy and how it will be incorporated, including draft Wayfinding circulation analysis; preliminary sign and

Wayfinding Asset locations and content; updated Facility and Health Campus nomenclature and symbolic language and; preliminary sign concepts;

(a).3.6 Review and integration of all Millwork and Modular Casework details and Systems Furniture and Clinical Systems Furniture;

(a).3.7 Review of door controls and door hardware concepts/strategies;

(a).3.8 Review of security strategies, including updated security systems floor plans and equipment details and locations of all equipment, connection points and control points;

(a).3.9 Identification of all Permit requirements;

(a).3.10 Review of technology systems detailed plans and integration enabling and enhancing clinical functionality;

(a).3.11 Review of detailed plans for post disaster management;

(a).3.12 A comparison table between the required NSM based on Appendix 3A [Clinical Specifications and Functional Space Requirements] and that of the proposed Design; and

(a).3.13 Identification of all permits, certificates, accreditation and other requirements for Owner Activities, for which the Owner requires documentation, coordination and information from Project Co.

2.5.1.1.2.(a).4 At a minimum, the following items will be addressed for the technical aspects of the Facility:

(a).4.1 1:100 plans of all levels including the roof plan and penthouse;

(a).4.2 Main engineering component drawings that relate to the connection of municipal infrastructure and public services;

(a).4.3 Main engineering component drawings that relate to the clinical design;

(a).4.4 Main engineering component drawings that relate to equipment infrastructure;

(a).4.5 Main engineering component drawings that relate to the mechanical HVAC system;

(a).4.6 Indication of all fire separations and the required fire resistance rating, areas of refuge, contained use areas and Outbreak Control Zones;

(a).4.7 Main engineering component drawings that relate to the plumbing system;

(a).4.8 Main engineering component drawings that relate to the medical gas system;

(a).4.9 Main engineering component drawings that relate to the power, lighting, fire alarm, communications and electronic safety and security systems;

(a).4.10 Main engineering component drawings that relate to landscaping, exterior lighting and stormwater retention;

(a).4.11 Main engineering component drawings that relate to the structural system including allowances for future links to other precincts and Future Heliport;

(a).4.12 Main engineering component drawings that relate to the Life Safety Systems;

(a).4.13 Drawings indicating future engineering system flexibility; and

(a).4.14 Provide preliminary load redundancy and spare capacity calculations.

2.5.1.1(2)(b) Clinical and technical aspects may be combined.

2.5.1.1.2.(b).1 At a minimum the following items will be addressed for Equipment and IM/IT:

(b).1.1 Main component drawings that relate to the Equipment; and

(b).1.2 Main component drawings that relate to all IM/IT.

2.5.1.1.2.(b).2 Written reports detailing and describing the manner in which the following have been taken into account in the Design:

(b).2.1 Clinical operations and delivery including the following flows: Patients, family, Staff, equipment, medication, supplies, food, linen and waste and recycling;

(b).2.2 Interior and exterior materials selection;

(b).2.3 Constructability, Flexibility and Maintainability;

(b).2.4 The Facility Threat and Risk Assessment Report including security and post-disaster management;
(b).2.5 Building operating systems;
(b).2.6 Technology systems:
(b).2.6.1 Integrated automation systems;
(b).2.6.2 Communications systems; and
(b).2.6.3 Electronic safety and security systems.
(b).2.7 Any other report submittals the Owner reasonably requires.

2.5.1.1(3) Before the 70% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 50% Phase REVIEWED status or all the outstanding comments on a Submittal will be agreed by the Owner as not being material in nature.

2.5.1.1(3)(a) 70% Design and Construction Documents (70% Phase);
2.5.1.1.3.(a).1 In addition to the 50% Phase requirements and the detailed requirements of this Section 2.5, at a minimum the following items will be addressed:
(a).1.1 Update of documents based on the comments from the Owner on the 50% Design and Construction Documents stage;
(a).1.2 Developed room numbering plan for Owner use (public and Patient Wayfinding and FMO);
(a).1.3 Confirmed Facility, Health Campus and Component Nomenclature report for Wayfinding; and
(a).1.4 Developed Life Cycle analysis framework of expected renewals, refurbishments and replacement of building elements.

2.5.1.1(4) Before the 90% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 70% Phase REVIEWED status or all the outstanding comments on a Submittal will be agreed by the Owner as not being material in nature.

2.5.1.1(4)(a) 90% Design and Construction Documents (90% Phase);

2.5.1.1.4.(a).1 In addition to the 70% Phase requirements and the detailed requirements of this Section 2.5, at a minimum the following items will be addressed:

(a).1.1 Update of documents based on the comments from the 70% Design and Construction Documents stage.

2.5.1.1(5) Before the 100% Design and Construction Documents phase can begin, either the end of the Design phase will result in the 90% Phase REVIEWED status or all of the outstanding comments on a Submittal will be agreed by the Owner as not being material in nature.

2.5.1.1(5)(a) 100% Design and Construction Documents (IFC);

2.5.1.1.5.(a).1 This Issued for Construction documents (IFC) phase will include construction documents consisting of drawings and specifications describing in detail the requirements for the construction of all components, systems and equipment of the Facility delivered to the Owner in accordance with the Submittal Schedule, in a timely way in advance of Construction with sufficient detail to permit the Owner to understand and assess the Design of the Facility.

2.5.1.1.5.(a).2 If Project Co intends to proceed with Construction of an element of the Facility in advance of the completion of the Design of the entire Facility, then Project Co will schedule and deliver the appropriate Design and Construction Documents for that element with sufficient accompanying detail to permit the Owner to understand and assess the design of that element in advance of the Design and Construction Documents for other elements of the Facility.

2.5.1.2 In each Design and Construction Document phase, Project Co will provide to the Owner the level of detail and documentation that the Owner would customarily receive, or expect to receive, for a healthcare facility similar to the Facility in accordance with Good Industry Practice, including as applicable to a particular phase:

2.5.1.2(1) Dimensioned floor plans and elevations showing all Millwork and Modular Casework;

2.5.1.2(2) All plans will indicate equipment installation, removal and horizontal and vertical maintenance clearances;

2.5.1.2(3) Reflected ceiling plans;

2.5.1.2(4) Interior finishes;

2.5.1.2(5) Furniture, Systems Furniture, Clinical Systems Furniture and equipment and with all equipment description labels;

2.5.1.2(6) Interior elevations for all rooms and spaces, including all interior finishes, Millwork, Modular Casework, technology systems, mechanical and electrical;

2.5.1.2(7) Exterior elevations;

2.5.1.2(8) 3D computer model renderings;

2.5.1.2(9) Completed site and landscaping plans;

2.5.1.2(10) Room finish schedules;

2.5.1.2(11) Project Co will provide, at the 30% and 50% Phases, a written Design Brief, which will also address the methodology and solutions for each discipline's design in addition to the following items:

2.5.1.2(11)(a) Clinical operations and functionality, including at minimum:

- 2.5.1.2.11.(a).1 Standardization;
- 2.5.1.2.11.(a).2 Line of Sight;
- 2.5.1.2.11.(a).3 Travel Distances;
- 2.5.1.2.11.(a).4 Personal safety of Patient, Staff and visitors and risk reduction;
- 2.5.1.2.11.(a).5 Wellness, including how views, both internal and external, and images of nature in the Design support the Owner's intention to help speed healing and recovery time;
- 2.5.1.2.11.(a).6 Direct Natural Light and Borrowed Light;
- 2.5.1.2.11.(a).7 Lighting strategies including controls;
- 2.5.1.2.11.(a).8 Floor plate flexibility; and
- 2.5.1.2.11.(a).9 Accessibility for Persons with Disabilities.

2.5.1.2(11)(b) Logistics and Support Services (including clean and dirty material and equipment flows);

2.5.1.2(11)(c) Facility operations and maintainability;

2.5.1.2(11)(d) LEED Gold Certification, including energy efficiency/sustainability and the relevant LEED project checklist and points;

2.5.1.2(11)(e) Material and colour selections;

2.5.1.2(11)(f) Artwork;

2.5.1.2(11)(g) Life Cycle report demonstrating how the selection of the Building Systems has optimized upfront costs against the maintenance requirements and Life Cycle Costs over the life of the facility;

2.5.1.2(11)(h) Developed maintenance strategy including descriptions for optimizing the Life Cycle Costs of Building Systems;

2.5.1.2(11)(i) Wayfinding and Site connections;

2.5.1.2(11)(j) Spare capacity and Future Expansion;

2.5.1.2(11)(k) Functionality of the sustainability and energy savings features;

2.5.1.2(11)(l) The Facility Threat and Risk Assessment Report; and

2.5.1.2(11)(m) Clearly identifying sections for:

- 2.5.1.2.11.(m).1 Architectural design;
- 2.5.1.2.11.(m).2 Site development and landscaping;
- 2.5.1.2.11.(m).3 Structural design;
- 2.5.1.2.11.(m).4 Mechanical design;
- 2.5.1.2.11.(m).5 Electrical design;
- 2.5.1.2.11.(m).6 Integrated automation systems design;
- 2.5.1.2.11.(m).7 Communications systems design;
- 2.5.1.2.11.(m).8 Electronic safety and security systems design; and
- 2.5.1.2.11.(m).9 Sustainable design.

2.5.1.3 Each Submittal package will include a set of Design and Construction documents that is fully coordinated across all disciplines in accordance with good industry practice.

2.5.1.4 Project Co will only issue drawings and specifications for Construction purposes based on Reviewed Design and Construction Documents as described in Appendix 2C [User Consultation and Design Review].

2.5.1.5 Section 2.5 does not limit Project Co's obligation to comply with any requirements set out in Schedule 2 [Design and Construction Protocols] and this Schedule in relation to the stages and requirements for Design.

2.5.1.6 Refer to the corresponding sections and tables within this Section 2.5 for minimum lists of Design and Construction Submittal documents to be submitted at each stage.

2.5.1.7 Project Co is to make Submittals to the Owner for review, of the following, at appropriate times during Construction:

2.5.1.7(1) Shop Drawings;

2.5.1.7(2) Samples;

2.5.1.7(3) Studies;

2.5.1.7(4) Reports;

2.5.1.7(5) Certificates; and

2.5.1.7(6) Requested calculations as indicated in the applicable requirements of this Schedule.

2.5.1.8 Life Cycle Matrix and Vendor Sign Off Forms

2.5.1.8(1) At each design phase (30%, 50%, 70%, 90%, 100% and Record) Project Co will submit a Life Cycle Matrix in the original Excel format as provided by the Owner, and for the selected items noted in the Life Cycle Matrix, an executed Vendor/Manufacturer sign-off form.

2.5.1.8(2) At each submittal, Project Co will provide an updated vendors list of equipment to allow the Owner to track changes between submissions.

2.5.1.9 Management Plans

2.5.1.9(1) Within 30 days of the Effective Date, Project Co will submit to the Owner for review the following Management Plans:

2.5.1.9(1)(a) Design Management Plan, including:

- 2.5.1.9.1.(a).1 Design process including key design objectives;
- 2.5.1.9.1.(a).2 Design responsibility matrix;
- 2.5.1.9.1.(a).3 Communication and documentation process;
- 2.5.1.9.1.(a).4 Owner engagement and user consultation;
- 2.5.1.9.1.(a).5 Design quality control and reporting procedures;

2.5.1.9.1.(a).6 How the Design will adapt to emerging technologies; and

2.5.1.9.1.(a).7 Construction issues and Design change management.

2.5.1.9(1)(b) Phasing Plan in accordance with Schedule 2, including:

2.5.1.9.1.(b).1 Site access, egress and construction staging areas;

2.5.1.9.1.(b).2 Coordination details for adjacent construction site activities and the work required for future links and connections;

2.5.1.9.1.(b).3 Site prep, earthworks, soils remediation and roadworks;

2.5.1.9.1.(b).4 Overall Construction methodology and general approach;

2.5.1.9.1.(b).5 Management of technology integration;

2.5.1.9.1.(b).6 Constraints, risks and mitigation strategies;

2.5.1.9.1.(b).7 Communication plan regarding the impact to the neighbourhood and municipality;

2.5.1.9.1.(b).8 Safety, including a Health and Safety Plan; and

2.5.1.9.1.(b).9 Management of shipping, handling, and storage of Construction materials in accordance with CSA Z317.13 Infection Control During Construction, including a description of how the infection control measures will be monitored during Construction.

2.5.1.9(1)(c) Demolition Plan;

2.5.1.9(1)(d) Waste Management Plan;

2.5.1.9(1)(e) Soils Remediation Plan;

2.5.1.9(1)(f) Quality Management Plan;

2.5.1.9(1)(g) BIM Execution Plan in accordance with Section 2.5.2.2;

2.5.1.9(1)(h) Transportation Assessment and Management Study (TAMS);

2.5.1.9(1)(i) Community Benefits Plan; and

2.5.1.9(1)(j) Tree Management Plan.

2.5.1.10 Non-Conformances:

2.5.1.10(1) Project Co will provide a list of non-conformances with each progress Submittal;

2.5.1.10(2) Acceptance of any non-conformances is at the Owner's sole discretion; and

2.5.1.10(3) Review and acceptance by the Owner will not be deemed as acceptance of any non-conformance; acceptance by the Owner will be in writing only.

2.5.1.11 Project Co will deliver hardcopies of each Design and Construction Submittal (drawings, specifications, reports, etc.), including seven (7) full size hard copies of all drawings (to scale), seven (7) 11x17 reduced size hard copies of all drawings, and electronic versions on a USB device of each document. Submissions will be delivered; consult the Owner prior to printing and shipping to confirm hardcopy submission requirements and destination(s).

2.5.1.12 Project Co will deliver individual PDF sheets and compiled PDFs of all drawing Submittals by discipline.

2.5.1.13 Should the Owner deem Submittals to be incomplete; the cost of resubmission in accordance with Appendix 2C [User Consultation and Design Review] will be the responsibility of Project Co.

2.5.1.14 All drawings and specifications will be submitted in an orderly sequence and in accordance with the Project Schedule. Drawing packages for the different stages as indicated in this Section 2.5 will be submitted in accordance with the Submittal Schedule as reviewed and approved by the Owner.

2.5.2 Drawings, Models, and Visualization

2.5.2.1 Project Collaboration Software

2.5.2.1(1) Project Co will coordinate Design and Construction documentation with the Owner via a cloud-based document control software. The document control software will be provided by Project Co and determined in consultation with the Owner through the process described in Appendix 2C [User Consultation and Design Review].

2.5.2.1(2) PDF documents provided by Project Co will include features to facilitate document review by the Owner using enhanced PDF editing software, including Bluebeam Revu. When exporting PDFs from BIM software, Project Co will utilize the available Bluebeam BIM plugins to provide additional PDF metadata as described in "NSPH - Bluebeam PDF Requirements", including:

2.5.2.1(2)(a) Provide PDF drawing sets packaged by discipline;

2.5.2.1(2)(b) Label individual pages of each PDF as determined in consultation with the Owner;

2.5.2.1(2)(c) Export BIM rooms as PDF spaces; and

2.5.2.1(2)(d) Embed drawing scales into the PDFs using viewports.

2.5.2.2 Building Information Modeling Software Requirements

2.5.2.2(1) Project Co will undertake and provide the following:

2.5.2.2(1)(a) Design and utilize a three-dimensional, real-time dynamic building information modeling ("BIM") capable software solution with full data integration;

2.5.2.2.1.(a).1 Project Co will use the latest version of Autodesk Revit as the design model authoring software.

2.5.2.2(1)(b) The BIM design models will be accurate representations of the current design intent and will be continually revised and updated through feedback from the Owner to form accurate representations of the as-built conditions for the Project;

2.5.2.2.1.(b).1 Project Co will update and share the design models with the Owner during all stages of the Project to incorporate feedback and changes as the design is revised.

2.5.2.2.1.(b).2 Project Co will provide a final, complete copy of the BIM design models representing as-built conditions of the Site as part of the record documentation for the Project.

2.5.2.2(1)(c) Ensure virtual coordination technologies will facilitate low-cost and scalable cloud-computing software and software plugins to access, share and coordinate with the BIM model without requiring the Owner to purchase proprietary design software or incur licensing fees.

2.5.2.2(1)(d) Lead and manage the BIM process through the implementation stage of the Project and development of the BIM Execution Plan. The BIM process is required to provide asset management data at the end of the implementation stage of the Project.

2.5.2.2(1)(e) Provide a BIM Execution Plan including:

2.5.2.2.1.(e).1 Approach to ensure field validation of the BIM model;

2.5.2.2.1.(e).2 Handover requirements for the Owner's Work Management System;

2.5.2.2.1.(e).3 Requirements of the data collection and exchange environment;

2.5.2.2.1.(e).4 Details regarding the updating of the BIM design models to become record models of as-built conditions incorporating all post-IFC changes;

2.5.2.2.1.(e).5 Data Geometry and Specification (DGS):

(e).5.1 The process for identifying critical Asset, components and the attribute requirements for Asset types;

(e).5.2 Rationalizing Asset attribute requirements to avoid duplication;

(e).5.3 Confirming related attribute information links. For example, capture design life for Assets and components that require an install date; and

(e).5.4 Integrating the hierarchical relationships and Asset locations.

2.5.2.2(1)(f) In consultation with the Owner to ensure compatibility with the Owner's CMMS, Project Co will provide a BIM Asset Management tool to support efficient Facility Management operations;

2.5.2.2.1.(f).1 the cloud-based Asset Management tool will accommodate required Asset attributes (Asset metadata and associated documents) in a specified format that is to be provided relative to each tracked Asset type and instance. Project Co will provide access to the BIM Software to the Owner and Commissioning Agent.

2.5.2.2(1)(g) Tracked Assets that are required to be modelled will be refined in consultation with the Owner and will be augmented with more information throughout Construction to support use by Facilities Maintenance and Operations (FMO).

2.5.2.2(1)(h) The submission schedule for BIM deliverables will be determined in consultation with the Owner to support Owner activities.

2.5.2.2.1.(h).1 Project Co will support the Owner in their review and Commissioning activities by

sharing and re-uploading the most up to date design models at the Owner's request.

2.5.2.2(1)(i) Fabrication files used will be defined by Project Co. Project Co will employ a software agnostic, cloud-based virtual coordination tool, such as Revizto, to allow all parties to collaborate and coordinate on BIM files. This tool will assist with the tracking and management of Owner comments and revisions during the process described in Appendix 2C [User Consultation and Design Review];

2.5.2.2.1.(i).1 the software will have the ability to automate the clash review process based on customizable settings using the model geometry and underlying component information and to uniquely track issues, assign responsibility and save views of issues.

2.5.2.2(2) Provide 3-Dimensional, photo-realistic colour exterior renderings, including:

2.5.2.2(2)(a) All Facility elevations, including the Energy Centre as viewed from the four (4) corners of the Health Campus;

2.5.2.2(2)(b) Main Entrance Lobby to the Facility, as viewed from the arrival points along Healthcare Boulevard;

2.5.2.2(2)(c) Main Entrance Lobby including the Waiting, Passenger Elevators and Reception;

2.5.2.2(2)(d) Emergency Department Entrance Vestibule-Walk-in from the Patients' arrival area;

2.5.2.2(2)(e) Secure Outdoor spaces;

2.5.2.2(2)(f) Plaza;

2.5.2.2(2)(g) Enclosed Atrium, featuring the relationship between the Chapel and the All Nations Sacred Space;

2.5.2.2(2)(h) Emergency Department entry and Triage;

2.5.2.2(2)(i) A typical Patient Room in each of the following components:

2.5.2.2.2.(i).1 Critical Care Complex;
2.5.2.2.2.(i).2 Inpatient Care;
2.5.2.2.2.(i).3 Maternity Centre; and
2.5.2.2.2.(i).4 Mental Health Inpatients.

2.5.2.2(2)(j) Operating Room;

2.5.2.2(2)(k) Interventional Suite;

2.5.2.2(2)(l) Imaging–CT room with Control-Imaging; and

2.5.2.2(2)(m) Equipment and systems schematic of the interior space of the Energy Centre.

2.5.2.2(3) All 3-Dimensional photo realistic renderings will be prepared using Enscape or software with similar output quality. All 3-Dimensional photo realistic renderings will be updated as the Design progresses and provided at each of the Design and Construction Documents stages as indicated in this Section. Project Co will consult with the Owner regarding quantity of 3-Dimensional photo realistic renderings required at each stage.

2.5.2.2(4) All drawings will be in metric (millimetre) and prepared in accordance with Good Industry Practice.

2.5.2.2(5) All drawings will be scaled appropriately for the information conveyed in the drawing.

2.5.2.2(6) Site context plan will be to 1:500 scale.

2.5.2.2(7) Site Mapping Workflow – 360 cameras with cloud software platform

2.5.2.2(7)(a) Project Co will utilize 360 camera technology and cloud software to map, manage and organize real world Construction conditions for all rooms in a coordinated strategy throughout each stage of the Project to facilitate improved coordination with all stakeholders.

2.5.2.2.7.(a).1 Project Co will provide cloud software licencing (Holobuilder or approved equal) to store and organize 360 photos on a common set of construction PDF drawing backgrounds for sharing with Owner stakeholders.

2.5.2.2(7)(b) Cloud software will provide a smartphone app that can be used to synchronize 360 camera photographs within floor plan locations in an off-line mode for Construction walkthroughs.

2.5.2.2(7)(c) Standard photos and metadata will be embedded within the 360 photos within the cloud software program to provide additional resolution and

information to document installation progress and details.

2.5.2.2(7)(d) Project Co will transfer ownership of the completed site mapping model as part of the As-built records for the Project.

2.5.2.2(7)(e) The following photographs will be provided to document the progressive activity of the Project:

2.5.2.2.7.(e).1 Building Systems and equipment:

(e).1.1 Foundations before concrete pours;

(e).1.2 all incoming utility locations entering and exiting the building concrete structure, all major electrical, mechanical, and telecommunications infrastructure risers before installing cabling, ducting, or pipes, and any in-slab conduit being installed prior to pouring concrete;

(e).1.3 Mechanical, electrical and plumbing systems sequenced during construction; and

(e).1.4 Rough-in images prior to enclosing behind walls, ceilings and floors.

2.5.2.2.7.(e).2 Interior views

(e).2.1 Still images demonstrating finish material installation techniques;

(e).2.2 Final finishes, including images of product labels if available; and

(e).2.3 Time (date or time period).

2.5.2.2.7.(e).3 Construction milestones (pre-slab, post-slab, etc.);

2.5.2.2.7.(e).4 Area progressions (exterior, interior);

2.5.2.2.7.(e).5 Systems (mechanical, electrical, plumbing, technology systems etc.); and

2.5.2.2.7.(e).6 In addition to still images - videos, PDFs and test reports can be embedded to demonstrate the Construction progression and record documentation.

2.5.2.3 Specifications

2.5.2.3(1) Submit specifications as hard copies and electronic copies in PDF and Word format.

2.5.2.3(2) Specifications for all disciplines will be organized according to CSI/CSC Master Format using CSC full-page Section Format/Page Format.

2.5.2.3(3) Project Co will provide specifications for all disciplines progressively with sufficient information to enable the Owner to verify the compliance with the requirements of this Schedule and the Agreement and to accurately construct the Facility as intended.

2.5.2.3(4) Use proprietary specifications where proprietary products are known:

2.5.2.3(4)(a) Research sufficient additional materials to provide a range of acceptable products that will match the performance requirements specified.

2.5.2.3(4)(b) When a single source product, type and model are listed within the specification, it will include a full technical specification that lists critical technical characteristics deemed necessary to permit a review to assess compliance of any potential substitution.

2.5.2.3(4)(c) Shop drawings and product data sheets are not considered as specifications for the progress Submittals.

2.5.2.4 Shop Drawing Requirements

2.5.2.4(1) Shop drawings means drawings, diagrams, illustration, samples, schedules, performance charts, literature, brochures, and other data to be provided by Project Co to illustrate details of a portion of the Design and Construction.

2.5.2.4(2) Submit fully detailed shop drawings, indicating materials, methods of Construction and attachment or anchorage, erection diagrams, connections, explanatory notes, required backing or accessories including those to be provided by others, colour charts for selecting colour where applicable, design calculations, and other pertinent information necessary to complete the Design and Construction. Where items attach to other items, or to waterproof membranes, indicate that such items have been coordinated, regardless of the section under which such adjacent items are supplied and installed. Indicate cross references to the requirements of this Agreement.

2.5.2.4(3) Shop drawings will be in metric units (measurements and dimensions).

2.5.2.4(4) Shop drawings will include a documented review by Project Co's Design Professional of Record indicated by a reviewed stamp prior to submission to the Owner.

2.5.2.4(5) Review of shop drawings by the Owner is for the sole purpose of ascertaining general conformance with the Agreement. The Owner's review does not constitute approval of detail design inherent in shop drawings, the responsibility for which remains with Project Co. Such review does not relieve responsibility for meeting requirements of this Agreement, unless the Owner has accepted a deviation in writing.

2.5.2.4(6) Shop drawings for all system and sub-system devices referenced within Integrated Automation (Division 25) systems will be provided with a BACnet (PICS) Protocol Implementation Conformance Statement.

2.5.2.4(7) Shop drawings will be submitted in electronic PDF format or provide software to enable viewing of files of the other formats at no additional cost to the Owner.

2.5.2.5 Submit shop drawings that the Owner would customarily receive, or expect to receive, for a healthcare facility similar to the Facility in accordance with Good Industry Practice, including the following, at minimum:

2.5.2.5(1) Cast-in-Place Concrete;

2.5.2.5(2) Concrete Topping;

2.5.2.5(3) Clay Unit Masonry Assemblies;

2.5.2.5(4) Concrete Unit Masonry;

2.5.2.5(5) Structural Steel;

2.5.2.5(6) Steel Decking;

2.5.2.5(7) Load Bearing Steel Studs (Metal Support Assemblies);

2.5.2.5(8) Metal Fabrications;

2.5.2.5(9) Glazed Detention and Windscreen Enclosures;

2.5.2.5(10) Rough Carpentry;

2.5.2.5(11) Finish Carpentry;

2.5.2.5(12) Architectural Woodwork;

2.5.2.5(13) Below Grade Sheet Waterproofing;

2.5.2.5(14) Cold Fluid Applied Waterproofing (for above grade applications);

2.5.2.5(15) Two Component Cold Joint Crystalline Waterproofing;

2.5.2.5(16) Foamed in Place Polyurethane Insulation;

2.5.2.5(17) Weather Barriers;

2.5.2.5(18) Metal Wall Panels;

2.5.2.5(19) Composite Wall Panels;

2.5.2.5(20) Wood Siding;

2.5.2.5(21) Mineral Fibre Reinforced Composite Panels;

2.5.2.5(22) SBS Membrane Roofing;

2.5.2.5(23) Standing Seam Metal Roofing;

2.5.2.5(24) Sheet Metal Flashing and Trim;

2.5.2.5(25) Applied Fireproofing;

2.5.2.5(26) Firestopping and Smoke Seals;

2.5.2.5(27) Metal Doors and Frames;

2.5.2.5(28) Wood Doors;

2.5.2.5(29) Access Doors and Panels;

2.5.2.5(30) Coiling Doors and Grilles;

2.5.2.5(31) Sound Control Door Assemblies;

2.5.2.5(32) Folding Security Grilles;

2.5.2.5(33) Aluminum Framed Entrances and Storefronts;

2.5.2.5(34) Automatic Entrances;

2.5.2.5(35) Glazed Aluminum Curtain Walls;

2.5.2.5(36) Metal Framed Skylights;

2.5.2.5(37) Door Hardware;

2.5.2.5(38) Access Control Hardware;

2.5.2.5(39) Glass and Glazing;

2.5.2.5(40) Louvres and Vents;

2.5.2.5(41) Acoustical Ceilings;

2.5.2.5(42) Visual Display Surfaces;

2.5.2.5(43) Signage;

2.5.2.5(44) Toilet Compartments;

2.5.2.5(45) Cubicle Curtain and Track;

2.5.2.5(46) Wall and Door Protection;

2.5.2.5(47) Toilet and Bath Accessories;

2.5.2.5(48) Fire Protection Specialties;

2.5.2.5(49) Metal Lockers;

2.5.2.5(50) Exterior Sun Control Devices;

2.5.2.5(51) Fall Arrest Equipment;

2.5.2.5(52) Food Services Equipment;

2.5.2.5(53) Artwork Supports;

2.5.2.5(54) Window Coverings;

2.5.2.5(55) Countertops;

2.5.2.5(56) Entrance Floor Grilles;

2.5.2.5(57) Furniture;

2.5.2.5(58) Site Furnishings;

2.5.2.5(59) Manufactured Planters;

2.5.2.5(60) Elevators;

2.5.2.5(61) Motors Starters and Wiring;

2.5.2.5(62) Adjustable Frequency Drives;

2.5.2.5(63) Controls System Components (BMS);

2.5.2.5(64) Flex Connections, Expansion Joints, Anchors and Guides;

2.5.2.5(65) Flow and Energy Meters;

2.5.2.5(66) Indicating Gauges;

2.5.2.5(67) Valves;

2.5.2.5(68) Check Valves;

2.5.2.5(69) Balancing Valves (All Systems);

2.5.2.5(70) Pressure Reducing Valves/Stations (All Systems);

2.5.2.5(71) Backflow Prevention Devices;

2.5.2.5(72) Hangers and Supports;

2.5.2.5(73) Vibration and Seismic Controls;

2.5.2.5(74) Seismic Restraint Systems;

2.5.2.5(75) Identification and Labelling (All Systems);

2.5.2.5(76) Equipment Insulation;

2.5.2.5(77) Piping Insulation;

2.5.2.5(78) Ductwork Insulations;

2.5.2.5(79) Acoustic Liners;

2.5.2.5(80) Air Distribution Systems Silencers;

2.5.2.5(81) Ductwork (All Systems);

2.5.2.5(82) Manual Air Dampers;

2.5.2.5(83) Motorized Air Dampers;

2.5.2.5(84) Backdraft Dampers;

2.5.2.5(85) Start-Up and Performance Testing Reporting;

2.5.2.5(86) Fire Protection Standpipe System;

2.5.2.5(87) Wet Pipe Sprinkler System;

2.5.2.5(88) Dry Pipe Sprinkler System;

2.5.2.5(89) Pre-action Sprinkler System;

2.5.2.5(90) Packaged Fire Pump(s);

2.5.2.5(91) Clean Agent Systems;

2.5.2.5(92) Plumbing Pumps;

2.5.2.5(93) Incoming City Water Filtration System;

2.5.2.5(94) Domestic Water Piping Fittings, Joint Methods;

2.5.2.5(95) Domestic Water Heaters /Generators;

2.5.2.5(96) RO Systems

2.5.2.5(97) Rainwater Harvesting System;

2.5.2.5(98) Underground Tanks;

2.5.2.5(99) Plumbing Specialties;

2.5.2.5(100) Plumbing Fixtures and Trim; ;

2.5.2.5(101) Grease Interceptors;

2.5.2.5(102) Oil Interceptors;

2.5.2.5(103) Medical Gas Systems;

2.5.2.5(104) Technical/Service Gases Systems (All Systems Other Than Natural Gas and Medical Gas Systems);

2.5.2.5(105) Facility Fuel Oil Piping;

2.5.2.5(106) Natural Gas Systems;

2.5.2.5(107) Oil Storage Tanks;

2.5.2.5(108) Fuel Oil Pumps;

2.5.2.5(109) Fuel Filtration Systems;

2.5.2.5(110) Fuel Oil Polishing System;

2.5.2.5(111) Fuel Management System;

2.5.2.5(112) Water Specialties-Heating and Cooling;

2.5.2.5(113) Steel Pipe and Fittings – Heating and Cooling;

2.5.2.5(114) Piping and Fittings Systems (For All Systems);

2.5.2.5(115) All Piping Joint Methods for All Piping Associated Systems,

2.5.2.5(116) Pumps – All Systems;

2.5.2.5(117) Hydronic Closed Loops Chemical Treatment Systems;

2.5.2.5(118) Condenser Water Open Loop Filtration and Chemical Treatment Systems;

2.5.2.5(119) Fans;

2.5.2.5(120) Terminal Boxes/VAVs;

2.5.2.5(121) Fan Coil Units;

2.5.2.5(122) Fan Filtered HEPA Filtration Units;

2.5.2.5(123) Air Filters (All Types of Filtration Other Than Specifically Listed Here);

2.5.2.5(124) Kitchen Grease Removal Filtration System;

2.5.2.5(125) Isolation Rooms Contaminated Exhaust Filtration Units;

2.5.2.5(126) Grilles, Registers and Diffusers;

2.5.2.5(127) Louvers;

2.5.2.5(128) Fabricated Breeching and Accessories;

2.5.2.5(129) Fabricated Stacks;

2.5.2.5(130) Insulated Sectional Chimneys;

2.5.2.5(131) Packaged Hot Water Boiler – Condensing (including ancillary equipment);

2.5.2.5(132) Packaged Boiler – Fire Tube (including ancillary equipment);

2.5.2.5(133) Steam Boilers/Generators (including ancillary equipment);

2.5.2.5(134) Humidifiers;

2.5.2.5(135) Deaerators;

2.5.2.5(136) Condensate Receiving System(S);

2.5.2.5(137) Steam Specialties;

2.5.2.5(138) Steel Pipe and Fittings – Steam And Condensate;

2.5.2.5(139) Stainless Steam Piping (MDRD);

2.5.2.5(140) Heat Exchangers;

2.5.2.5(141) Expansion Tanks (All Systems);

2.5.2.5(142) Refrigeration Piping;

2.5.2.5(143) Refrigerant Detection System;

2.5.2.5(144) AC Chillers;

2.5.2.5(145) Heat Recovery Chillers;

2.5.2.5(146) Cooling Towers;

2.5.2.5(147) Cooling Towers – Automatic Blown-Down TDS System;

2.5.2.5(148) Air Handling Units;

2.5.2.5(149) Makeup Air Units;

2.5.2.5(150) Ducted and Ductless Split Air Conditioners;

2.5.2.5(151) Hydronic Coils (All Systems);

2.5.2.5(152) Chilled Beams;

2.5.2.5(153) Passive & Active Induction Units;

2.5.2.5(154) Electric Reheat Coils;

2.5.2.5(155) Heat Tracing;

2.5.2.5(156) Unit Heaters;

2.5.2.5(157) Forced Flow Heaters;

2.5.2.5(158) Radiant Slab Systems;

2.5.2.5(159) EMC General Requirements;

2.5.2.5(160) FMO Network Components and Infrastructure;

2.5.2.5(161) Integrated Building Management Platform;

2.5.2.5(162) Facility Metering shop drawings;

2.5.2.5(163) Switchgear;

2.5.2.5(164) CDPs;

2.5.2.5(165) Panelboards;

2.5.2.5(166) SPDs;

2.5.2.5(167) Generators (Complete System, including Silencers, Day Tanks, Pumps);

2.5.2.5(168) Load Banks;

2.5.2.5(169) Paralleling Control and Load Management Systems;

2.5.2.5(170) Transfer Switches;

2.5.2.5(171) UPS;

2.5.2.5(172) Transformers;

2.5.2.5(173) Isolated Power Systems;

2.5.2.5(174) Power Factor and Harmonic Correction Equipment;

2.5.2.5(175) Firestop Details;

2.5.2.5(176) Maintenance Holes;

2.5.2.5(177) Wiring Products and Raceways;

2.5.2.5(178) Wiring Devices;

2.5.2.5(179) Lightning Protection and Grounding Equipment;

2.5.2.5(180) EVSE;

2.5.2.5(181) Luminaires;

2.5.2.5(182) Lighting Control Systems and Devices;

2.5.2.5(183) Clocks;

2.5.2.5(184) Fire Alarm System and Devices;

2.5.2.5(185) Fire Alarm Annunciator Graphic and CACF Layout;

2.5.2.5(186) IM/IT Common Works;

2.5.2.5(187) IM/IT Structured Cabling;

2.5.2.5(188) IM/IT Wireless Network;

2.5.2.5(189) IM/IT Data Network;

2.5.2.5(190) IM/IT End-Use equipment

2.5.2.5(191) Audio-Visual Systems;

2.5.2.5(191)(a) Multimedia Rooms;

2.5.2.5(191)(b) Clinical Operations Centre;

2.5.2.5(191)(c) Guest Infotainment; and

2.5.2.5(191)(d) Digital Signage.

2.5.2.5(192) IM/IT VoIP System;

2.5.2.5(193) Integration Engine;

2.5.2.5(194) Patient Physiological Monitoring System;

2.5.2.5(195) Public Address System;

2.5.2.5(196) Nurse Call Systems;

2.5.2.5(197) Distributed Antenna System (DAS);

2.5.2.5(198) Location Services (RTLS);

2.5.2.5(199) Access Control System;

2.5.2.5(200) Wireless Staff Duress System;

2.5.2.5(201) Fixed Duress System;

2.5.2.5(202) Intrusion Detection System;

2.5.2.5(203) Intercommunications System;

2.5.2.5(204) IP Video Surveillance System;

2.5.2.5(205) Clinical Observation Camera System;

2.5.2.5(206) MRI Quench Tubes;

2.5.2.5(207) Security Signage;

2.5.2.5(208) Patient Wandering System;

2.5.2.5(209) Chain Link Fences and Gates;

2.5.2.5(210) Irrigation;

2.5.2.5(211) Growing Medium Preparation;

2.5.2.5(212) Waterworks;

2.5.2.5(213) Sanitary Sewers;

2.5.2.5(214) Storm Sewers;

2.5.2.5(215) Manholes and Catch Basins;

2.5.2.5(216) Pneumatic Tube Systems; and

2.5.2.5(217) AGV System (including vehicles, carts and chargers).

2.5.2.6 Samples

2.5.2.6(1) Submit physical samples of all interior and exterior finished materials that the Owner would customarily receive, or expect to receive, for a healthcare facility similar to the Facility in accordance with Good Industry Practice.

2.5.2.6(2) Submit samples of each luminaire, illuminated sign, and lighting sensor/control device type for review by the Owner. Each approved sample will be retained on job site until Service Commencement.

2.5.2.6(3) Submit samples of each type of wiring and nurse call device type (complete with cover plates), re-penetrable firestop systems, and permanent labels/nameplates for review by the Owner. Each approved sample will be retained on job site until Service Commencement.

2.5.2.6(4) Luminaires, equipment and devices that do not match quality and workmanship of standard sample will be rejected.

2.5.2.6(5) Provide a sample of each IP system device within the Integrated Automation (Division 25) system for potential 3rd party testing purposes.

2.5.2.6(6) Luminaires that do not match quality and workmanship of the standard sample will be rejected.

2.5.2.7 Operation and Maintenance Manuals

2.5.2.7(1) Format Requirements

2.5.2.7(1)(a) Provide operation and maintenance manuals in bound hard copy and electronic formats. Include operating and maintenance instructions for each system and major piece of equipment, as well as maintenance instructions for building elements, fixtures and finishes.

2.5.2.7(1)(b) Hard copy formats will be as follows:

2.5.2.7.1.(b).1 Each maintenance manual will be in a suitably labelled, hard back, D-Ring type commercial binder, each complete with an index and tabbed title sheets for each section. All binder pages will have self-adhesive reinforcing rings at each binder ring; and

2.5.2.7.1.(b).2 All maintenance manual data will be printed on 8 1/2” x 11” heavy bond paper indexed, tabbed, punched and bound in the binders.

Drawings will be printed on 11” x 17” sheets. Each manual will have a title sheet labelled “Operation and Maintenance Manual” with an associated table of contents for each volume. If a manual exceeds 75 mm in thickness, provide additional manuals as required.

2.5.2.7.1.(b).3 Where the following requirements are met:

2.5.2.7(1)(c) Electronic format will be as follows:

2.5.2.7.1.(c).1 Provide a copy of each maintenance manual in portable document format (PDF) file format on a separate USB memory key;

2.5.2.7.1.(c).2 Break down large files into sections and use bookmark structure for easy navigation; and

2.5.2.7.1.(c).3 Organize electronic data using directories and sub-directories as generally described in Section 2.5.2.7(2). Prior to assembling the electronic data, submit to the Owner a detailed list of the proposed directory/sub-directory structure including proposed file names. File names will be easily recognizable so that there is no need to open the document to know what information the file contains. Directory structure and file naming is subject to the approval of the Owner.

2.5.2.7(2) Content Requirements

2.5.2.7(2)(a) Operation and maintenance manuals will include, at minimum, copies of product data sheets (with checkmarks for all options included), reviewed shop drawings, manufacturer’s certificates, field test reports, material safety data sheets, installation instructions, parts lists and operation or instruction data for operating equipment and building components, cleaning and maintenance schedules, filters, overhaul, replacement, servicing, lubrication and adjustment schedules, emergency procedures where applicable, and similar maintenance information.

2.5.2.7(2)(b) Instructions in manuals will be written in plain language (Canadian English) so as to guide the Owner in the proper operation and maintenance of building materials, components, equipment and systems.

2.5.2.7(2)(c) Cover Page: Include title of project, date of submission, names, addresses, and telephone numbers of the Owner and contractor with the names of responsible parties.

2.5.2.7(2)(d) Table of Contents: Arrange content by systems under section numbers and sequence of table of contents

2.5.2.7(2)(e) Contact Information: For each product or system, list name, contact, full address, telephone and facsimile numbers, internet and email addresses of subcontractors and suppliers, including the local source of supplies and replacement parts.

2.5.2.7(2)(f) Product Data: Mark each sheet to clearly identify specific products and component parts; delete inapplicable information. Provide sequence of instructions for each process and procedure, incorporating manufacturer's written installation instructions.

2.5.2.7(2)(g) Shop Drawings: Include complete set of final reviewed shop drawings with seals and stamps indicating review by subcontractor, contractor, engineer (where required), and applicable consultants.

2.5.2.7(2)(h) Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

2.5.2.7(2)(i) Certificates of Acceptance: Relevant certificates issued by Authorities Having Jurisdiction, including code compliance certificate life safety systems performance certificate and pressure vessel acceptance.

2.5.2.7(2)(j) Update the manuals periodically during the installation and Commissioning phase of the Work so that the manuals are final by Total Completion.

2.5.2.7(2)(k) Include Equipment supplied by the Owner.

2.5.2.8 Record Documentation

2.5.2.8(1) At a minimum, the record drawing package supplied by Project Co will include:

2.5.2.8(1)(a) PDF (combined into a single document per system);

2.5.2.8(1)(b) The completed BIM software model representing the as-built conditions of the Project;

2.5.2.8(1)(c) Full size set of record drawings; and

2.5.2.8(1)(d) (3) USB memory keys of records.

2.5.3 Architectural Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
Title sheet, legends, drawing list, key plans and assembly listings	X	X	X	X	X	X
Site plans, context site plan	X	X	X	X	X	X
Floor plans and roof plans	X	X	X	X	X	X
Reflected ceiling plans	-	X	X	X	X	X
Exterior elevations	X	X	X	X	X	X
Interior elevations	-	X	X	X	X	X
Building sections, transverse, longitudinal	X	X	X	X	X	X
Wall sections	-	X	X	X	X	X
Large Scale (1:50) Minimum Room Requirement Sheets	-	X	X	X	X	X
Plan and section details	-	X	X	X	X	X
Vertical Movement (Plans) –	X	X	X	X	X	X
Vertical Movement (Sections and Details)		X	X	X	X	X
Special elements, signage, etc.	-	X	X	X	X	X
Schedules, doors, windows, hardware, finishes, etc.	-	X	X	X	X	X
Millwork – (Plans)	-	X	X	X	X	X
Millwork – (Sections and Details)	-	X	X	X	X	X
Code Compliance Fire Separations (vertical and horizontal), Exiting Travel Distance Plans	X	X	X	X	X	X
Occupant loads, and exit width capacities	X	X	X	X	X	X
AGV Routing Plans	X	X				
Specifications						
Table of Contents	-	X	X	X	X	X
General Requirements	-	X	X	X	X	X
Existing Conditions (if any)	-	X	X	X	X	X
Concrete	-	X	X	X	X	X
Masonry	-	X	X	X	X	X
Metals	-	X	X	X	X	X
Wood, Plastics and Composites	-	X	X	X	X	X
Thermal and Moisture Protection	-	X	X	X	X	X
Openings	-	X	X	X	X	X
Finishes	-	X	X	X	X	X
Specialties	-	X	X	X	X	X
Equipment	-	X	X	X	X	X
Furnishings	-	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Conveying Equipment -Elevators	-	X	X	X	X	X
Other						
Design Brief	X	X	-	-	-	-
Code Compliance Report	X	X	X	X	X	X
Acoustic Report	X	X	X	X	X	-
Colour Boards Master Colour Palette	-	X	X	X	X	-
AGV Cart Matrix	X	X				
Life Cycle Matrix and Vendor Sign Off Forms	X	X	X	X	X	X

2.5.3.1 Schedule of Accommodations

2.5.3.1(1) With each progressive Submittal, provide a comparison between Project Co's Design and Appendix 3A [Clinical Specifications and Functional Space Requirements] utilizing the Schedule of Accommodation format (in excel). Include the following:

2.5.3.1(1)(a) NSM for each room and the percentage variance rounded to the nearest whole number;

2.5.3.1(1)(b) Component gross areas expressed as totals for each component area;

2.5.3.1(1)(c) Gross area for the Energy Centre; and

2.5.3.1(1)(d) Component gross area and building gross area expressed as totals for each floorplate and for the entire Facility.

2.5.3.2 Plans, sections and elevations will contain the following:

2.5.3.2(1) Floor elevations (geodetic, on floor plans, sections and elevations) complete with floor level changes, stairs and ramps;

2.5.3.2(2) Floor finishing tolerances, slopes for drainage, drain openings, etc. will be identified;

2.5.3.2(3) Gridlines and gridline dimensions;

2.5.3.2(4) Outlines of the exterior walls and partitions in relation to the structural framework complete with graphical representation of materials cross- referenced to partition types and dimensions;

2.5.3.2(5) Clearly indicated functions of each building material component and Rain Screen construction component (e.g., air barrier, vapour barrier, moisture barrier, acoustical barrier, security barrier, fire resistance, thermal resistance, etc.);

2.5.3.2(6) The location of doors and windows, and other openings complete with cross-references to door, window and hardware schedules;

2.5.3.2(7) The location of fixtures and equipment for washrooms, kitchens, conference rooms, equipment rooms, mechanical rooms, Electrical Rooms and Communications Rooms complete with cross-references to equipment schedules, notes and dimensions;

2.5.3.2(8) Clearly indicate access for Persons with Disabilities, path of travel, clearances complete with notes and dimensions;

2.5.3.2(9) Designate room name and number of interior spaces. Maintain the Owner room reference number as stated in the Appendix 3A [Clinical Specifications and Functional Space Requirements] Schedule of Accommodation. The Record Drawings will include final room numbering as set out in Section 5.13.2.4(4) and as coordinated with and approved by the Owner;

2.5.3.2(10) Graphically represent Construction and finish materials for walls and floors;

2.5.3.2(11) Graphically represent the wall thickness on the floor plans to indicate the overall construction assembly including shielding for medical imaging Equipment or concrete block walls;

2.5.3.2(12) Illustrate built-in seating elements, Millwork, Modular Casework and equipment;

2.5.3.2(13) Graphically illustrate fire separation(s), Areas of Refuge, contained use areas, Outbreak Control Zones, acoustic separation(s), security separation(s), etc.; and

2.5.3.2(14) Vertical movement plans, sections and details will contain clearly indicated rise and run, headroom clearances, landing elevations, vertical and horizontal dimensions, railing and guards complete with clearances for Persons with Disabilities, and notes.

2.5.3.3 Equipment access and replacement route plans will clearly indicate access provisions and routes designed for the installation and replacement of equipment, including medical Equipment.

2.5.3.4 Reflected ceiling plans will contain:

2.5.3.4(1) Graphical representation of ceiling finishes, equipment (such as ceiling mounted ceiling lifts), luminaires complete with cross-reference to lighting, security, sprinkler, HVAC, fire alarm, and Ceiling Heights etc.;

2.5.3.4(2) Clearly indicated bulkheads complete with graphical representation of Construction and materials, notes, Ceiling Heights and dimensions; and

2.5.3.4(3) Clearly indicated graphical representation of systems and equipment interference for structural, mechanical, electrical, communications, safety and security, etc., complete with cross-reference notes and dimensions.

2.5.3.5 Penthouse and roof plans will contain:

2.5.3.5(1) The location of fixtures and equipment for mechanical, electrical, maintenance, etc. complete with notes and dimensions;

2.5.3.5(2) Clearly indicated roof penetrations for equipment, hatches, access paver paths, fall arrest anchors, antennae supports/ties, etc.; and

2.5.3.5(3) Graphically represent Construction and finish materials for roof.

2.5.3.6 Exterior elevations will contain:

2.5.3.6(1) The location of doors and windows, sidelights, and other openings;

2.5.3.6(2) Graphical representation of Construction and finish materials, including a legend and notations;

2.5.3.6(3) Scuppers, downs spouts or drainage systems, hose bibs and electrical outlet and exterior light locations; and

2.5.3.6(4) Landscape treatment proposed in relation to exterior and windows.

2.5.3.7 Interior elevations will contain:

2.5.3.7(1) The location (height) of doors, windows, and other openings; all wall-mounted equipment, mechanical, electrical, communications and safety and security, dimensions of vertical changes in materials or finishes and room numbers;

2.5.3.7(2) Graphical representation of Construction and finish materials including a legend and notations is to be provided: and

2.5.3.7(3) Clearly indicate wall finishes, colour choices and details.

2.5.3.8 Building sections will contain:

2.5.3.8(1) Clearly indicated floor construction/assemblies, floor elevations, dimensions and finished ceiling elevations; and

2.5.3.8(2) Clearly indicated graphical representation of systems and equipment interference for structural, mechanical, electrical, communications, safety and security, etc., complete with cross-reference notes and dimensions.

2.5.3.9 Wall sections (scale 1:20) will contain:

2.5.3.9(1) Clearly indicated detail location tags and references to the floor plans; wall type notations; and critical dimensions; and

2.5.3.9(2) Clearly indicated graphical representation of systems and equipment interference for structural, mechanical, electrical, communications, safety and security, etc., complete with cross-reference notes and dimensions.

2.5.3.10 Minimum Room Requirements will include, on one coordinated drawing sheet:

2.5.3.10(1) The following spaces, including all rooms related to them as shown in the Schedule of Accommodations in Appendix 3A [Clinical Specifications and Functional Space Requirements]:

2.5.3.10(1)(a) Rooms and areas listed under the space descriptions / variants listed in Appendix 3O [Electrical IM/IT Matrix];

2.5.3.10(1)(b) Other rooms and spaces as required by the Owner for the process described in Appendix 2C [User Consultation and Design Review];

2.5.3.10(1)(c) Mechanical Rooms;

2.5.3.10(1)(d) Electrical Rooms; and

2.5.3.10(1)(e) Communications Rooms.

2.5.3.10(2) 1:50 scale plans of rooms with dimensions, including interior elevations and reflected ceiling plans, with all relevant Furniture, Clinical Systems Furniture, and Equipment shown and including structural, mechanical, electrical , communications, safety, security, and clearance and service requirements.

2.5.3.10(3) Architectural requirements to include interior finishes, doors, Millwork, wall protection, door protection, room accessories and window coverings;

2.5.3.10(4) Mechanical requirements to include HVAC type, plumbing fixtures, room controls, ventilation diffusers, sprinkler system and medical gases;

2.5.3.10(5) Electrical requirements to include power, lighting, and lighting controls;

2.5.3.10(6) Communications requirements to include systems and device locations; and

2.5.3.10(7) Safety and security requirements to include Risk Category, systems and device locations.

2.5.3.11 Millwork plans, sections and details will include:

2.5.3.11(1) Millwork layout, section elevations, and details complete with material choices, notes and dimensions.

2.5.3.12 Special elements, Furniture, Clinical Systems Furniture, Systems Furniture and signage will include:

2.5.3.12(1) Detailed graphical representations of the above noted items in relation to exterior and interior walls, structural framework, material connections and interrelationships complete with cross-reference to schedules, notes, materials, and dimensions;

2.5.3.12(2) Detailed location of fixtures and equipment for communications, safety and security complete with cross-reference to equipment schedules, notes and dimensions; and

2.5.3.12(3) Base-building elements will be graphically distinct from special elements.

2.5.3.13 Schedules (doors, door hardware, windows, room finishes, Furniture, Clinical Systems Furniture, Systems Furniture, signage, etc.) will include:

2.5.3.13(1) Clearly indicated material, size, fire / thermal / acoustic / security resistance rating, colour, texture, pattern, etc.; and

2.5.3.13(2) Schedules may be graphical and/or tabular in drawing or specification format.

2.5.3.14 Acoustic and Vibration Submittals

2.5.3.14(1) Project Co will demonstrate compliance with the Agreement, Owner design reviews and input by the Acoustic and Vibration Consultant with the submission of an Acoustic Report at each Phase.

2.5.3.14(2) The 30% Phase Submittal will include at minimum:

2.5.3.14(2)(a) Site noise and vibration;

2.5.3.14(2)(b) Building structural vibration assessment for noise sensitive spaces; and

2.5.3.14(2)(c) Minimum STC ratings of demising walls and floor/ceiling assemblies.

2.5.3.14(3) The 50% Phase Acoustic Report submittal will include at minimum:

2.5.3.14(3)(a) Envelope sound isolation; and

2.5.3.14(3)(b) Partitions assemblies; and

2.5.3.14(3)(c) Minimum STC ratings of demising walls and floor/ceiling assemblies.

2.5.3.14(4) The 70% and 90% Phase Acoustic Report submittal will include at minimum:

2.5.3.14(4)(a) Minimum STC ratings of demising walls and floor/ceiling assemblies;

2.5.3.14(4)(b) Environmental noise;

2.5.3.14(4)(c) Mechanical noise; and

2.5.3.14(4)(d) Design options for the Owner to select upgrades to meet or improve noise control in spaces where OITC 33 is insufficient to meet the heliport operations noise targets as indicated in Section 2.8.

2.5.3.14(5) The 100% and Record Submittals will include at minimum:

2.5.3.14(5)(a) Minimum STC ratings of demising walls and floor/ceiling assemblies;

2.5.3.14(5)(b) ASTC compliance testing in early phase of partition installation;

2.5.3.14(5)(c) Follow-up ASTC compliance testing, as required;

2.5.3.14(5)(d) Background noise compliance testing after HVAC system balancing;

2.5.3.14(5)(e) Room acoustic compliance testing after finishes are installed; and

2.5.3.14(5)(f) Confidential sound isolation compliance testing after confidential spaces are complete.

2.5.3.15 AGV Submittals

2.5.3.15(1) Provide drawings that include, for the AGV system:

2.5.3.15(1)(a) Primary two-way circulation routes;

2.5.3.15(1)(b) Secondary bi-directional pathways;

2.5.3.15(1)(c) Primary Send and Receive stations;

2.5.3.15(1)(d) Secondary Send and Receive lobbies;

2.5.3.15(1)(e) Battery charging locations and size; and

2.5.3.15(1)(f) Maintenance room location and size.

2.5.3.15(2) Submit AGV routing plans for each floor serviced. Plans will also indicate:

2.5.3.15(2)(a) Battery chargers;

2.5.3.15(2)(b) Send/receive stations;

2.5.3.15(2)(c) Station and I/O panels; and

2.5.3.15(2)(d) Maintenance room.

2.5.3.16 Building Code Submittals

2.5.3.16(1) Code compliance report will contain the following:

2.5.3.16(1)(a) VBBL Data Matrix including design considerations; and

2.5.3.16(1)(b) Fire and Life Safety Data Summary (may be illustrated graphically).

2.5.3.16(2) When applicable, alternative solutions will contain:

2.5.3.16(2)(a) All information required by the Governmental Authority;

2.5.3.16(2)(b) Any operational impacts of the Alternate Solution; and

2.5.3.16(2)(c) Any operations and maintenance impacts of the Alternate Solution.

2.5.3.17 Maintenance Manuals

2.5.3.17(1) Project Co will provide maintenance manuals containing the following:

2.5.3.17(1)(a) Copy of hardware schedule for products, as installed;

2.5.3.17(1)(b) Copy of material and paint colour schedules, with complete description and manufacturer's product identification names and numbers;

2.5.3.17(1)(c) Manufacturer's equipment, materials, and products, including data, details, identification, schedules of maintenance, operational and installation instruction information;

2.5.3.17(1)(d) Guarantees, warranties, maintenance bonds, certificates, letters of verification, and registration cards, including the following information:

2.5.3.17.1.(d).1 Name and address of subject/project; and

2.5.3.17.1.(d).2 Signature and seal of the contractor, installer, manufacturer and/or supplier, as applicable, providing the guarantee or warranty;

2.5.3.17(1)(e) Certificates of Inspection;

2.5.3.17(1)(f) Test reports and certificates, as applicable;

2.5.3.17(1)(g) Confirmation letters that all portable units, equipment, materials such as fire extinguishers, special tools, keys for all equipment and/or panels, elevator pads/accessories, and keys to Millwork and Modular Casework have been properly handed over and received by the Owner in good order.

2.5.3.18 Record Documentation

2.5.3.18(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.4 Civil Construction Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
On-site Drawings Title sheet, typical sections and details used on this Project	X	X	X	X	X	X
Existing Conditions	X	X	X	X	X	-
Erosion and Sediment Control	X	X	X	X	X	-
Temporary Service during Construction	X	X	X	X	X	-
Site Coordination Layout, turning templates for emergency and service vehicles	X	X	X	X	X	-
Storm Water Drainage Plan	X	X	X	X	X	X
Grading, site servicing, roads, parking lot(s),	X	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Hardscape and streetlights	X	X	X	X	X	X
Utilities Plan and profile	X	X	X	X	X	X
Retaining Walls Plan and Profile	X	X	X	X	X	X
Sections and details	-	X	X	X	X	X
Pavement Marking and Signage Plans	-	X	X	X	X	X
Hydrogeological Study		X		X	X	X
Constructing phasing	X	X	X	X	X	-
Rainwater Management Plan	X	X	X	X	X	-
Sanitary and Water Analysis Design Brief	X	X	X	X	X	-
Off-site Drawings						
Deep and Shallow Utilities Plan and profile	X	X	X	X	X	X
Right-of-way Plans	X	X	X	X	X	
Storm Water Drainage Plan	X	X	X	X	X	X
Specifications						
Civil Specifications	-	-	-	X	X	-

2.5.4.1 Plans, sections and elevations will contain the following:

2.5.4.1(1) Provide diagrams describing:

2.5.4.1(1)(a) How general traffic works during Construction; and

2.5.4.1(1)(b) How parking stall allocation works during Construction.

2.5.4.1(2) Existing Site conditions;

2.5.4.1(3) Erosion and sediment control plans;

2.5.4.1(4) Storm sewer drainage profiles and plans;

2.5.4.1(5) Sanitary sewer profiles and plans;

2.5.4.1(6) Water main profiles and plans;

2.5.4.1(7) Third-party Utilities plans;

2.5.4.1(8) Site coordination layouts, including turning movements for emergency and service vehicles;

2.5.4.1(9) Site grading and roadworks plans;

2.5.4.1(10) Retaining wall profiles and plans;

2.5.4.1(11) Pavement marking and signage plans;

2.5.4.1(12) Water analysis design brief identifying the demands of the Site and the impact on the surrounding network;

2.5.4.1(13) Sanitary analysis design brief identifying the demands of the Site and the impact on the surrounding network;

2.5.4.1(14) Construction phasing plans;

2.5.4.1(15) Rainwater management plan;

2.5.4.1(16) Developed off-site drawings:

2.5.4.1(16)(a) Storm sewer drainage profiles and plans;

2.5.4.1(16)(b) Green infrastructure plans and details;

2.5.4.1(16)(c) Sanitary sewer profiles and plans;

2.5.4.1(16)(d) Water main profiles and plans;

2.5.4.1(16)(e) Third-party Utilities plans; and

2.5.4.1(16)(f) Right-of-way plans.

2.5.4.2 Existing conditions drawing will contain all pertinent topographic information, contours at appropriate interval with spot elevations in clear legible format, all underground Utilities including inverts and depths, size and type, borehole and test pit locations and elevations, existing and new survey monuments.

2.5.4.3 Erosion and sediment control drawings will contain existing topographic information, contours at appropriate intervals with spot elevations, calculations for sizing of erosion and sediment control facilities, design and layout of each Facility, stormwater discharge connection and location, quality measurement point and details of erosion and sediment control facilities.

2.5.4.4 Site coordination and layout drawing will contain:

2.5.4.4(1) Horizontal and vertical control, the principal site elements to be constructed, survey monuments and/or nearby buildings or structures that may be used to show the relative location of the proposed structure of work, sufficient dimensions or coordinates that the exact location of proposed work is clearly identified, Construction lay down area, relative locations of all below and above ground Utilities (e.g., electrical, water main, sanitary sewer, storm sewer, etc.), site removals; and

2.5.4.4(2) Demonstrated vehicle and pedestrian movements for all types of expected traffic to and from the Facility.

2.5.4.5 Grading plan will contain the footprint and finished floor elevation of the Facility, proposed grades with existing contours/grades provided in background in light font, drainage structures numbered, typical sections, dimensions and proposed

site development features, including pavement/curb, sidewalk type, and street light locations.

2.5.4.6 Deep and shallow Utilities plan and profile will contain horizontal location and vertical depths of new, existing, and temporary services; Utilities; manholes; drainage structures; valves; roof leader tie in points; location of foundation drainage (if required); structure data table; pipe load and capacities per VBBL.

2.5.4.7 Site servicing plan will include a Phasing Plan for water main flushing, pressure testing and disinfecting the services to the Facility. Plan to be submitted and reviewed by the Governmental Authority for approval.

2.5.4.8 Storm water management plan will contain catchment areas, existing storm sewer system, flow direction, calculations for pre-development and post-development flows, detention calculations, and best management practices.

2.5.4.9 Rainwater Management

2.5.4.9(1) Project Co will submit a Rainwater Management Plan for each Precinct specific Development Permit application which will be required to include:

2.5.4.9(1)(a) An overview of how the Site intends to meet the City's storm sewer volume reduction, water quality and release rate criteria, for both pre- and post-site conditions specific to each Precinct, a summary of the rainwater management approach being taken, calculations and assumptions to support any figures provided;

2.5.4.9(1)(b) A Precinct Plan which shows the surface types and identifies the rainwater management method that will be used in each area. The plan will indicate any rainwater routing into proposed practices, show the extents of underground parking and the location of any proposed practices. If landscaping will be used to capture any runoff, then area and depth of landscaping must be provided;

2.5.4.9(1)(c) A Site Servicing and Grading plan which shows the locations of all proposed rainwater management practices or devices with service connections to the municipal network and surface grading and drainage patterns;

2.5.4.9(1)(d) An Infiltration Report which supports any proposal for infiltration on site, prepared by a qualified professional. Any proposed infiltration practices must be designed based on site-specific conditions,

including pollutant loading, groundwater elevation/contamination, infiltration rates, etc.;

2.5.4.9(1)(e) Detailed drawings for any proposed system or device being employed which include tank and orifice specifications, raingarden, swale or tree trench design drawings. Typical detail for each green infrastructure practice is to include inflow locations, flow dissipation, safe overflows, and sub-drains;

2.5.4.9(1)(f) Proprietary information for any proposed water quality treatment device, demonstrating that it meets either the Washington State Department of Ecology's Technology Assessment Protocol (TAPE) or ISO 14034 ETV certification. If the device is being used as a primary treatment tool for high pollutant surfaces, then it will have the 'basic treatment' certification for 80% TSS removal, otherwise lower performing devices can be used for pre-treatment or as part of a treatment train. Project Co may propose other technologies but will provide supporting information that shows the technology meets the standards; and

2.5.4.9(1)(g) Operation & Maintenance (O&M) Manual for all rainwater systems will be employed on site and off site. O&M Manual will describe the level of effort and frequency of tasks required to maintain optimal performance for each individual component of the system.

2.5.4.10 Offsite drawings will include all drawings and details required by the City to secure a works and services agreement for the offsite works.

2.5.4.11 Groundwater Management

2.5.4.11(1) Project Co will submit a Hydrogeological Study for each Precinct specific Development Permit application, which will be based on the following:

2.5.4.11(1)(a) The requirements as shown in the City's current Groundwater Management Bulletin.

2.5.4.11(1)(b) The Preliminary Hydrogeological Study Prepared by PGL Environmental Consultants (Feb 2019).

2.5.4.12 Record Documentation

2.5.4.12(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.5 Structural Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
Title Sheet, General Notes	X	X	X	X	X	X
Typical Details	X	X	X	X	X	X
Slab, Column, Beam, Wall Schedules	X	X	X	X	X	X
Foundation Plans	X	X	X	X	X	X
Floor and Roof Framing Plans	X	X	X	X	X	X
Sections and Details	X	X	X	X	X	X
Wall and Bracing Elevations	X	X	X	X	X	X
Wall Sections	X	X	X	X	X	X
Specifications						
Concrete (Division 03)	X	X	X	X	X	-
Masonry (Division 04)	X	X	X	X	X	-
Metals (Division 05)	X	X	X	X	X	-
Wood (Division 06)	X	X	X	X	X	-
Earthwork and Piling (Division 31)	X	X	X	X	X	-
Reports						
Seismic Building Performance Assessment Report (if applicable)	X	X	X	X	X	
Basis of Design report (including base isolation, if applicable)	X	X	X	X	X	-
Calculation reports	X	X	X	X	X	-
Base isolation calculation and testing reports (if applicable)	X	X	X	X	X	-

2.5.5.1 Title Sheet, General Notes, will contain:

2.5.5.1(1) General description of the structure, its main components, gravity load resisting and lateral load resisting systems;

2.5.5.1(2) Codes and standards, with dates of issue, to which the design conforms;

2.5.5.1(3) Description of the lateral load resisting system will indicate values of Rd (ductility factor) and Ro (over strength factor) used in the design;

2.5.5.1(4) Importance factors used in the design;

2.5.5.1(5) Design criteria indicating vertical design loads including dead and superimposed dead loads; occupancy live loads; snow loads (including drift); wind uplift loads; mechanical equipment loads; Construction loads; ceiling lift loads; special loading considerations;

2.5.5.1(6) Horizontal design loads indicated including seismic loads, wind loads, lateral earth pressures and hydrostatic pressures;

2.5.5.1(7) Loading plans showing area loads not covered by design criteria information such as planter and soil loads with an indication of maximum soil depth;

2.5.5.1(8) Geotechnical information used in the design including reference to the Geotechnical Reports, footing or pile bearing capacities, site classification and site coefficients;

2.5.5.1(9) Concrete mix requirements indicating application, exposure classification, minimum 28-day compressive strength, and maximum aggregate size; and

2.5.5.1(10) Concrete cover requirements, based on weather and soil exposure, fire resistance rating, or chloride penetration.

2.5.5.2 Schedules as required for items such as columns, beams, slabs, walls, foundations, baseplates, and embed plates.

2.5.5.3 Foundation plans, fully coordinated with other consultants' drawings, will contain:

2.5.5.3(1) Gridlines and gridline dimensions;

2.5.5.3(2) Foundation types, sizes and reinforcement, including strip footings, pad footings, rafts, piles and pile caps, soil anchors and grade beams. Foundations should be located relative to the supported structure. Indicatively show and detail steps in footings; indicate pile base and cut-off elevations. Indicate frost protection and freeze mitigation measures;

2.5.5.3(3) Interior slabs-on-grade including thickness, reinforcement, contraction joint requirements, and subgrade requirements including moisture barrier if required. Indicate step heights or top of slab elevations and ensure step conditions etc. are sufficiently detailed. Show pits for elevators and mechanical openings;

2.5.5.3(4) Concrete walls including thickness and reinforcement. Clearly indicate shear walls and, if detailed elsewhere, ensure adequate referencing. Ensure wall corners, openings, intersections control joints, expansion joints, and construction joints are sufficiently detailed. Provide full height wall sections as required;

2.5.5.3(5) Concrete columns, pedestals and pilasters including dimensions and reinforcement, including tie arrangement details;

2.5.5.3(6) Steel columns and other steel framing elements including size and base plate details; and

2.5.5.3(7) Load bearing masonry walls if applicable, including masonry unit dimensions, reinforcement and grouting. Stud walls, if applicable, including stud sizes and spacing, plywood sheathing thickness and nailing requirements. Provide sufficient details as required.

2.5.5.4 Floor and roof framing plans, fully coordinated with other consultants' drawings, will contain, at a minimum, the following items:

2.5.5.4(1) Gridlines and gridline dimensions;

2.5.5.4(2) Concrete slabs including thickness, cambers and reinforcement. Show all openings coordinated with other consultants. Indicate step heights or relative elevations. Ensure step conditions, slab edge conditions, construction joints, delay strips, and such are sufficiently detailed;

2.5.5.4(3) Concrete walls including thickness and reinforcement. Clearly indicate shear walls and, if detailed elsewhere, ensure adequate referencing. Ensure wall corners, intersections, control and construction joints are sufficiently detailed. Provide full height wall sections as required;

2.5.5.4(4) Concrete columns, pedestals and pilasters including size and reinforcement, including tie and column rebar arrangement details. Ensure that columns starting, stopping and continuing are sufficiently detailed; ensure that offset column transitions are sufficiently detailed;

2.5.5.4(5) Concrete beams including dimensions and reinforcement. Elevate beams with complex reinforcement. Ensure beams are sufficiently detailed;

2.5.5.4(6) Detail concrete stairs, including throat thickness, reinforcement and sufficient details for cast in place stairs. For precast concrete stairs provide sufficient seating details;

2.5.5.4(7) Steel deck with or without concrete topping including thicknesses, deck type, connection to supporting structure, and shear transfer elements. Ensure sufficient deck edges, mechanical openings, ledger angles, framing around openings, and structural requirements for support of equipment are adequately detailed;

2.5.5.4(8) Steel beams, open web steel joists and steel trusses, including member sizes or depths, spacing, embed plates where connected to concrete and cambers. Ensure all design forces and moments are provided for use by connection designer, open web steel joist designer and truss designer. Ensure steel girts and ledgers between levels are clearly called up. Ensure desired intent for

visually exposed connections is specified. Provide elevations for members between levels if required for clarity;

2.5.5.4(9) Steel columns including size, base plate, embed plate and cap plate details; and

2.5.5.4(10) Detail steel stairs, including stringer sizes and connection details.

2.5.5.5 Elevations, fully coordinated with other consultants' drawings, will contain, at a minimum, the following items:

2.5.5.5(1) Concrete wall or shear wall elevations as required to convey information not detailed on plan including complex areas of reinforcement, openings, shear wall zones, headers and such;

2.5.5.5(2) Concrete beam elevations for beams with complex reinforcement;

2.5.5.5(3) Steel bracing elevations including member sizes, forces and sufficient information for connection designer; and

2.5.5.5(4) Any other elevations deemed necessary to convey sufficient structural information.

2.5.5.6 Sections and details will contain information for all structural conditions not dealt with completely on plans, elevations or schedules. Additional information includes clarification of structural geometry, reinforcement, connection configurations and welding.

2.5.5.7 If a FEMA P-58 or approved equivalent method is adopted:

2.5.5.7(1) Within 30 days of the Effective Date, Project Co will propose a review process for the seismic building performance assessment for agreement with the Owner. The review process will occur throughout the design period.

2.5.5.7(2) The seismic building performance assessment will meet the requirements described in Section 5.2. The assessment report will include:

2.5.5.7(2)(a) FEMA P-58 assessment type;

2.5.5.7(2)(b) FEMA P-58 performance variables and objectives;

2.5.5.7(2)(c) FEMA P-58 assessment tool;

2.5.5.7(2)(d) Analysis method;

2.5.5.7(2)(e) Earthquake hazards;

2.5.5.7(2)(f) Source of performance, cost and quantity data;

2.5.5.7(2)(g) Any other noteworthy assumptions;

2.5.5.7(2)(h) Summary of structural components, non-structural components, medical equipment and non-medical equipment included in the assessment;

2.5.5.7(2)(i) FEMA P-58 assessment results; and

2.5.5.7(2)(j) Seismic post-disaster occupancy and functionality assessment.

2.5.5.8 If a base-isolated approach is adopted:

2.5.5.8(1) Within 30 days of the Effective Date, Project Co will propose a peer review process for the design of the Seismically Isolated Structure for agreement with the Owner.

2.5.5.8(2) At the submittal stages indicated in 2.5.5, the Owner will review the Basis of Design report and the base isolation calculation and testing report for compliance with the seismic isolation requirements in Section 5.9.

2.5.5.8(2)(a) The Basis of Design report will include:

- 2.5.5.8.2.(a).1 Moat, isolator plane and strategy for elevators, stairs and utility connections;
- 2.5.5.8.2.(a).2 Types and properties of isolators;
- 2.5.5.8.2.(a).3 Manufacturer of isolators;
- 2.5.5.8.2.(a).4 Manufacturer's qualifications;
- 2.5.5.8.2.(a).5 Testing methodology;
- 2.5.5.8.2.(a).6 Analysis and design methodology;
- 2.5.5.8.2.(a).7 Design assumptions and data;
- 2.5.5.8.2.(a).8 Performance objectives and acceptance criteria;
- 2.5.5.8.2.(a).9 Seismic ground motion selection, scaling and data; and
- 2.5.5.8.2.(a).10 Schedule for isolator design, procurement, testing and delivery.

2.5.5.8(2)(b) The calculation and testing report will include calculations, copies of all documents required to demonstrate conformance with the quality control and testing requirements, and any other documents needed to meet the design review requirements in Section 5.9.11.

2.5.5.9 Record Documentation

2.5.5.9(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.6 Mechanical Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
Legends, regulatory data, drawing list, key plans	X	X	X	X	X	X
Fire suppression - plans, sections, details	-	X	X	X	X	X
Plumbing - plans, sections, details	X	X	X	X	X	X
Heating and Cooling (Hydraulic) - plans, sections, details	X	X	X	X	X	X
HVAC - plans, sections, details	X	X	X	X	X	X
Integrated Automation and IBMP Systems – Design Narratives and System Integration Diagrams	-	-	-	X	X	X
FMO Network Structured Cabling Riser Diagram	X	X	X	X	X	X
FMO Network System Diagram	X	X	X	X	X	X
FMO Network Data Drop Floor plans	-	X	X	X	X	X
BMS - plans, sections, details Schematics and schedules, air and water flow diagrams, equipment schedules, control schematics, sequence of operations, etc.	-	X	X	X	X	X
Specifications						
General Requirements	-	X	X	X	X	-
Fire Suppression	-	X	X	X	X	-
Plumbing	-	X	X	X	X	-
Heating, Ventilating and Air Conditioning	-	X	X	X	X	-
BMS Integrated Automation	-	X	X	X	X	-
Other						
Updated Energy Model and Report	X	X	-	-	X	-
Fire suppression - Calculations	-	X	X	X	X	X
Plumbing - Calculations	X	X	X	X	X	X
Heating and Cooling (Hydraulic) - Calculations	X	X	X	X	X	X
HVAC - Calculations	X	X	X	X	X	X

2.5.6.1 Regulatory Sheet (may be included on title sheet) will contain:

2.5.6.1(1) Design load assumptions and calculations including rainfall intensity.

2.5.6.1(2) Calculate and submit an electronic spreadsheet to the Owner demonstrating the estimated maximum flow requirement for the domestic hot water supply. The calculation will include a complete fixture unit count for each of the plumbing system components, pressure drop, and pipe sizes including future allowance.

2.5.6.2 Fire Suppression - Plans, Sections, Calculations and Details will contain:

2.5.6.2(1) Design calculations for water flow with water supply flow data, fire pump (if required), and smoke control;

2.5.6.2(2) All design calculations will indicate the planned design conditions and the allowance for spare and future provisions identified;

2.5.6.2(3) Sprinkler zoning including indication of dry pipe and pre-action systems;

2.5.6.2(4) Provisions to accommodate security hazard classifications;

2.5.6.2(5) Clearly indicated ceiling and slab elevations (geodetic) complete with level changes, bulkheads, beams, etc.;

2.5.6.2(6) The location of doors and windows, and other openings;

2.5.6.2(7) The location of “special fire hazard / load” conditions such as compact storage shelving, vaults, electronic data processing rooms, etc.;

2.5.6.2(8) The location of interconnected floor spaces;

2.5.6.2(9) The location of fixtures and equipment for washrooms, kitchens, conference rooms, equipment, mechanical, electrical and Communications Rooms;

2.5.6.2(10) The designation (usually by room name and number) of interior spaces including sprinkler head type;

2.5.6.2(11) Graphic indication of fire separation(s), acoustic separation(s), security separation(s), etc.; and

2.5.6.2(12) Specialist fire suppression elements required as part of an alternative solution.

2.5.6.3 Plumbing - Plans, Sections, Calculations and Details will contain:

2.5.6.3(1) The following design calculations will be submitted at the time of Project submission for Building Permit to the City and at the completion of the Project:

2.5.6.3(1)(a) Domestic cold water system;

2.5.6.3(1)(b) Domestic hot water system;

2.5.6.3(1)(c) Domestic hot water storage tank sizing;

2.5.6.3(1)(d) RO system sizing;

2.5.6.3(1)(e) Storm water system complete with all rainfall calculations as described in this Schedule;

2.5.6.3(1)(f) Sanitary drainage system;

2.5.6.3(1)(g) Contaminated waste system;

2.5.6.3(1)(h) Grease / solids / acid neutralizer / interceptor sizing calculations;

2.5.6.3(1)(i) Post-disaster water and sewage waste holding tank sizing;

2.5.6.3(1)(j) Laboratory air compressor and pipe sizing;

2.5.6.3(1)(k) Utility (Shop) air compressor and pipe sizing;

2.5.6.3(1)(l) Medical Gas pipe sizing;

2.5.6.3(1)(m) Medical Gas Compressor and Vacuum Pump sizing (including all intake and exhaust piping);

2.5.6.3(1)(n) Medical Gas AGSS system and pipe sizing (including all intake and exhaust piping);

2.5.6.3(1)(o) Medical Gas Cylinder sizing for both normal use and post disaster conditions;

2.5.6.3(1)(p) Other medical gases sizing; and

2.5.6.3(1)(q) Lab gases sizing.

2.5.6.3(2) All design calculations will be in an excel spreadsheet that is not locked, or password protected.

2.5.6.3(3) All design calculations will indicate the planned design conditions the allowance for spare and future provisions identified;

2.5.6.3(4) Design calculations will indicate the number of, and the rationale for, the amount of bottle storage that has been provided in the medical gas systems for the post-disaster condition.

2.5.6.3(5) Design calculations will be updated throughout Design and Construction and the final submission will reflect the final Construction conditions as released to the Owner.

2.5.6.3(6) All final design calculations will be provided to the Owner at the completion of the Project to assist in calculating any changes that occur in the Facility post completion.

2.5.6.3(7) Provide a Legionella Mitigation Plan for both the design and future maintenance of the domestic hot water systems. The legionella mitigation plan will incorporate the requirements of the latest

version of CSA 317.1, ASHRAE AE / NSF Standard 514, NSF, and ASPE standards on Legionella design and control in Health Care Facilities.

2.5.6.3(8) Design calculations for water supply including pressure, hot water heating, sanitary waste sizing and roof drainage.

2.5.6.3(9) Riser diagrams with flows indicated for domestic hot and cold water lines, waste and vent lines.

2.5.6.3(10) Plumbing fixture schedule.

2.5.6.4 Heating and Cooling (Hydronic) - Plans, Sections, Calculations and Details will contain:

2.5.6.4(1) Design calculations for water supply including pressure, hot water heating, glycol solution and chilled water;

2.5.6.4(2) Riser diagrams with flows indicated for hot, steam and chilled water lines; and

2.5.6.4(3) Equipment schedule.

2.5.6.5 Heating, Cooling and Ventilation (HVAC) - Plans, Sections, Calculations and Details will contain:

2.5.6.5(1) Design calculations for block loads for heating and refrigeration, system load and airflow calculations including minimum outside air to be admitted and duct leakage allowance, system pressure static analysis at peak and minimum block loads, acoustical calculations, building heating, cooling and ventilation loads, flow and head calculations for pumping systems, sizing of fuel storage, distribution and vibration isolation;

2.5.6.5(2) All design calculations will indicate the planned design conditions and will indicate the allowance for spare and future provisions identified.

2.5.6.5(3) HVAC piping layouts including valves complete with locations where temperature, pressure, flow, contaminant/combustion gases, vibration gauges and remote sensing is required;

2.5.6.5(4) HVAC duct layouts and true sizes (double line) including fire dampers and volume control dampers;

2.5.6.5(5) Layout of equipment rooms showing mechanical equipment including space for maintenance (filter replacement, valve adjustments, etc.) and removal / replacement of mechanical equipment (coils, heat exchangers, pumps, boilers, chiller tube bundles, etc.);

2.5.6.5(6) Roof plan with roof-mounted equipment and penthouses complete with indication of servicing and maintenance access;

2.5.6.5(7) Provide 3rd Party Dispersion Study Analysis and Report to support the placement of intakes; refer to Section 7.5.9.2(10).

2.5.6.5(8) HVAC outside air intake and exhaust air discharge including louver sizes and locations relative to each other, ensuring security and acoustic concerns have been taken into considerations;

2.5.6.5(9) HVAC riser diagram(s), schematic flow and riser diagrams including airflow and water flow quantities and balancing for heating and cooling equipment, flow energy measuring devices for water and air systems. Clear indication of penetrations through rated wall, floor and roof assemblies complete with details;

2.5.6.5(10) Automatic temperature control diagram(s) including control flow diagrams showing sensors, valves and controllers, sequence of operation of systems, diagram showing control signal interface with sequence of operation, locations and connections of energy metering devices for major equipment;

2.5.6.5(11) Equipment schedule including chillers, boilers, pumps, air handling units, fans, terminal units, diffusers and grilles;

2.5.6.5(12) Clear indication of seismic restraints for HVAC systems and equipment; and

2.5.6.5(13) Plans indicating fire compartments with matrices indicating relative pressurization between compartments during normal and fire modes of operation.

2.5.6.6 Integrated automation details will contain:

2.5.6.6(1) Integrated automation layout (refer to BMS Controls shop drawings requirements).

2.5.6.7 Drawings and schedules will contain:

2.5.6.7(1) Clearly indicated type, flow, head, speed, class, BHP, electrical, etc.; and

2.5.6.7(2) Schedules may be graphical and/or tabular in drawing and/or specification format.

2.5.6.8 Energy Modeling

2.5.6.8(1) Refer to energy modelling methodology Appendix 2D for detailed requirements.

2.5.6.8(2) Using ASHRAE 140 compliant software, as detailed in the BC Hydro New Construction Energy Modeling Guideline, demonstrate that the proposed Design meets the energy use provisions of this Schedule as detailed in Part 7.

2.5.6.8(3) Provide updated Energy Model report, which will include the following information as a minimum:

2.5.6.8(3)(a) Executive Summary;

2.5.6.8(3)(b) Facility information, including the location, weather file used, total floor area, outdoor design temperatures and humidity;

2.5.6.8(3)(c) Building envelope inputs for both reference building and proposed building, including roof assembly U-value, wall assembly U-value, fenestration overall U-value, window to wall ratio, shading coefficient, internal and external shading devices;

2.5.6.8(3)(d) Internal loads inputs per room for both reference building and proposed building, including lighting power density, lighting control, plug loads, occupants;

2.5.6.8(3)(e) Indoor design conditions per room for both reference building and proposed building, including occupancy schedules, indoor design temperatures, indoor design humidity levels, ventilation air;

2.5.6.8(3)(f) Mechanical systems for both reference building and proposed building, including system description, fan control, fan power, outdoor air, exhaust air, heat recovery system, equipment efficiencies;

2.5.6.8(3)(g) Facility energy plant for both reference building and proposed building, including heating type and efficiencies, cooling type and efficiencies, service water heating type and efficiencies;

2.5.6.8(3)(h) Utility rates for all types of fuel;

2.5.6.8(3)(i) Energy modelling results for both reference building and proposed building, including energy summary by end use, energy type, energy use and energy intensity, energy use savings and energy cost savings; and

2.5.6.8(3)(j) List of recommended energy conservation measures, including annual estimated savings, incremental capital costs, life expectancy, and Life Cycle Cost analysis.

2.5.6.9 Mechanical Maintenance Manuals

2.5.6.9(1) Project Co will provide maintenance manuals which contain the following (as minimum) for each system:

2.5.6.9(1)(a) Narratives and simple diagrams for system;

2.5.6.9(1)(b) List of equipment supplier(s), including contact info and local service contact(s);

2.5.6.9(1)(c) Set of all final reviewed shop drawings including controls shop drawings;

2.5.6.9(1)(d) A copy of all record drawings;

2.5.6.9(1)(e) Records of all testing procedures and certificates;

2.5.6.9(1)(f) Regular maintenance/service schedule;

2.5.6.9(1)(g) 360 record photos of all mechanical rooms and service spaces/rooms;

2.5.6.9(1)(h) Manufacturer Warranty documents for equipment and workmanship;

2.5.6.9(1)(i) Manufacturer certification and test result printouts;

2.5.6.9(1)(j) Final Balancing Report; and

2.5.6.9(1)(k) Final Commissioning Report.

2.5.6.10 Record Documentation

2.5.6.10(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.7 Electrical Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
Legends, regulatory data, drawing list, key plans	X	X	X	X	X	X
Site plans	X	X	X	X	X	X
Power Single Line Diagram	X	X	X	X	X	X
Power Riser Diagram	X	X	X	X	X	X
Large Scale - Electrical Room equipment layouts (only one typical room of each type required for 30% Submittal)	X	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Large Scale - Electrical Room 3-D equipment layouts including equipment dimensions.	-	-	X	X	X	X
Grounding Riser Diagram	X	X	X	X	X	X
Grounding Details	-	-	-	X	X	X
Lightning Protection Riser, Plans	-	X	X	X	X	X
Lightning Protection Details	-	-	-	X	X	X
Lighting Control Riser	X	X	X	X	X	X
Lighting Control Details	-	-	X	X	X	X
Clock System Riser	-	-	X	X	X	X
Metering Risers	-	X	X	X	X	X
Fire Alarm and Voice Communication System Riser	X	X	X	X	X	X
Lighting and Lighting Control:						
Plans	X	X	X	X	X	X
Circuiting	-	-	-	X	X	X
Power:						
Plans	X	X	X	X	X	X
Circuiting	-	-	-	X	X	X
Fire Alarm and Voice Communication Systems Plans	X	X	X	X	X	X
Switchgear/CDP/Unit Substation, elevations and schedules	-	X	X	X	X	X
Fire Alarm and Voice Communication Systems schedules	-	-	X	X	X	X
Site Service details	-	X	X	X	X	X
Miscellaneous details	-	-	-	X	X	X
All other drawings	-	-	-	X	X	X
Specifications						
Table of Contents: listing all sections	X	X	X	X	X	-
General Requirements	X	X	X	X	X	-
Electrical	X	X	X	X	X	-
Branch Circuit Panelboard Schedules	-	-	-	X	X	-
Luminaire Schedules	X	X	X	X	X	-
Lighting Control Schedules	-	-	X	X	X	-
Communications (clock system and interval timers)	-	X	X	X	X	-
Electronic Safety and Security	-	-	X	X	X	-
Other						
Total load calculations (utility electric service)	X	X	X	X	X	-
Total load calculations (generator power)	X	X	X	X	X	-
Load calculations (transformer loadings)	X	X	X	X	X	-
Load calculations (UPS power)	X	X	X	X	X	-
Power system ground grid calculations	-	X	X	X	X	-
Voltage drop calculations	-	-	-	X	X	-
Short circuit calculations	-	X	X	X	X	-
Arc flash calculations	-	-	-	X	X	-
Co-ordination study	-	-	X	X	X	-
Magnetic Field study	-	-	-	X	X	-
Lighting calculations	-	-	X	X	X	-
Cable tray calculations	-	-	-	X	X	-

2.5.7.1 Regulatory Data (may be included on title sheet) will contain:

2.5.7.1(1) Design load assumptions and calculations to demonstrate code compliance.

2.5.7.2 Site plans will include:

2.5.7.2(1) Property limits;

2.5.7.2(2) Public and private roadways and lighting;

2.5.7.2(3) Driveways;

2.5.7.2(4) Parking lots;

2.5.7.2(5) Electric utility services;

2.5.7.2(6) Electrical high voltage feeders;

2.5.7.2(7) Site lighting and underground conduits;

2.5.7.2(8) Exterior Facility lighting;

2.5.7.2(9) Exterior Signage

2.5.7.2(10) Parking control systems;

2.5.7.2(11) Electric vehicle supply equipment and bike share power infrastructure;

2.5.7.2(12) Maintenance hole locations with sump pump circuits as applicable;

2.5.7.2(13) Hand holes, duct banks, pull pits; and

2.5.7.2(14) High voltage and lightning protection ground grids.

2.5.7.3 Power Single Line Diagram will include:

2.5.7.3(1) The entire electrical system from the utility service to and including switchgear, CDPs, panelboards, MCCs, chillers, imaging equipment, motors 50 HP, elevators, generators, transformers, switches, splitters, bus ducts, power factor / harmonic correction units, grounding resistors, feeders and feeder breakers;

2.5.7.3(2) Ratings of transformers, generators, breakers, switches, fuses, transfer switches, switchgear, CDPs, MCCs;

2.5.7.3(3) Ratings of grounding resistors, zig-zag grounding transformers, fuses, bus ducts, feeders, splitters, safety switches, panelboards, power factor / harmonic correction units, etc., for 50%, 70%, 90% and 100% Submittals;

2.5.7.3(4) Transformer and generator winding arrangements, phase shifts, and system grounding locations;

2.5.7.3(5) Calculated maximum fault levels, symmetrical and asymmetrical, equipment short circuit current ratings, and protective device symmetrical interrupting ratings, for 70%, 90% and 100% Submittals;

2.5.7.3(6) Calculated arc flash incident energy level at each power distribution equipment bus, for 90% and 100% Submittals;

2.5.7.3(7) Interlock schemes;

2.5.7.3(8) Potential and current transformers, including neutral or ground fault current sensors;

2.5.7.3(9) Protective and control relays on high voltage breakers including transfer switches;

2.5.7.3(10) Metering, for 50%, 70%, 90% and 100% Submittals; and

2.5.7.3(11) Equipment names, following a consistent equipment naming methodology/convention that is suitable for use in Future Expansions, renovations, and future buildings on adjacent precincts.

2.5.7.4 Power Riser Diagram will include:

2.5.7.4(1) The entire electrical system from the utility service to and including switchgear, CDPs, panelboards, MCCs, chillers, imaging equipment, motors over 50 HP, elevators, generators, transformers, switches, splitters, bus ducts, power factor / harmonic correction units, grounding resistors, and feeders;

2.5.7.4(2) Equipment shown in elevation relative to its actual size;

2.5.7.4(3) Equipment shown on the floor level where it will be installed;

2.5.7.4(4) A two-dimensional relative representation of where the equipment will be located;

2.5.7.4(5) Feeders to equipment with fire protection methods noted where applicable;

2.5.7.4(6) A two-dimensional representation of the routing of the feeders; and

2.5.7.4(7) Equipment names, following a consistent equipment naming methodology.

2.5.7.5 Large Scale - Electrical Room Equipment Layouts will include:

2.5.7.5(1) All Electrical Rooms drawn to a scale of not less than 1:50;

2.5.7.5(2) All equipment in the room shown to scale;

2.5.7.5(3) Dimensions of equipment shown, for 50%, 70%, 90% and 100% Submittals;

2.5.7.5(4) Widths of access aisles dimensioned, and paths for removal and replacement of large equipment, for 50%, 70%, 90% and 100% Submittals;

2.5.7.5(5) Dimensions of drawn-out equipment components shown in their drawn-out positions, for 50%, 70%, 90% and 100% Submittals;

2.5.7.5(6) Dimensions of spare floor space, wall space, and adjacent areas reserved for Future Expansion requirements;

2.5.7.5(7) Equipment door swings indicated;

2.5.7.5(8) Room doors shown;

2.5.7.5(9) Room names and numbers; and

2.5.7.5(10) Horizontal and vertical provisions for future raceways and wiring; and

2.5.7.5(11) Three-dimensional drawing files provided for 70%, 90% and 100% Submittals.

2.5.7.6 Grounding Riser Diagram and Details will include:

2.5.7.6(1) The entire electrical grounding system from the ground grid to each Electrical Room, generator room, and Communications Room;

2.5.7.6(2) Ground rods, buried ground grid conductors, ground buses, grounding and equipotential bonding conductors;

2.5.7.6(3) Equipment shown in elevation;

2.5.7.6(4) Equipment shown on the floor level where they will be installed;

2.5.7.6(5) A two-dimensional relative representation of where the equipment will be located;

2.5.7.6(6) A two-dimensional representation of the routing of the conductors;

2.5.7.6(7) Ground bus names, following a consistent naming methodology/convention, for 70%, 90% and 100% Submittals;

2.5.7.6(8) Equipment and conductor sizing; and

2.5.7.6(9) Details of ground bus design and mounting, for 90% and 100% Submittals.

2.5.7.7 Lightning Protection Riser, Plans and Details will include:

2.5.7.7(1) The entire lightning protection system from the ground grid to the air terminals and roof top equipment connected to the system;

2.5.7.7(2) Ground electrode and grid down conductors, interconnecting conductors and bonding details;

2.5.7.7(3) Equipment shown in elevation;

2.5.7.7(4) Equipment shown on the floor level where they will be installed;

2.5.7.7(5) A two-dimensional relative representation of where the equipment will be located;

2.5.7.7(6) A two-dimensional representation of the routing of the down conductors and interconnecting conductors;

2.5.7.7(7) Equipment sizing;

2.5.7.7(8) Details of:

2.5.7.7(8)(a) Air terminal parapet mounting;

2.5.7.7(8)(b) Air terminal roof mounting;

2.5.7.7(8)(c) Roof penetrations;

2.5.7.7(8)(d) Air terminal to conductor connections;

2.5.7.7(8)(e) Conductor interconnections; and

2.5.7.7(8)(f) Bonding straps for other equipment.

2.5.7.8 Lighting control riser and details will include:

2.5.7.8(1) All lighting controllers and network connections;

2.5.7.8(2) Lighting controllers shown on the floor level where they will be installed;

2.5.7.8(3) A two-dimensional relative representation of where the lighting controllers will be located and the areas they serve;

2.5.7.8(4) Wiring runs to equipment;

2.5.7.8(5) A two-dimensional representation of the routing of the wiring runs;

2.5.7.8(6) Wiring details for each type of control device and major space types, showing wiring topology and methods, clearly indicating how luminaires, sensors, switches, controllers and network interfaces connect;

2.5.7.8(7) Equipment names, following a consistent equipment naming methodology/convention; and

2.5.7.8(8) Details of integration with other systems.

2.5.7.9 Clock System Riser will include:

2.5.7.9(1) Clock system communications network nodes and links, including transmitters, receivers, and booster units;

2.5.7.9(2) Equipment shown on the floor level where they will be installed;

2.5.7.9(3) A two-dimensional relative representation of where the equipment will be located;

2.5.7.9(4) Wiring runs and wireless communications links between equipment and to remote time servers;

2.5.7.9(5) Equipment names, following a consistent equipment naming methodology/convention; and

2.5.7.9(6) Details of integration with other systems.

2.5.7.10 Metering Riser will include:

2.5.7.10(1) The entire system including network connections and interfaces to other systems;

2.5.7.10(2) Equipment shown on the floor level where they will be installed;

2.5.7.10(3) A two-dimensional relative representation of where the equipment will be located;

2.5.7.10(4) Wiring runs to equipment;

2.5.7.10(5) A two-dimensional representation of the routing of the wiring runs; and

2.5.7.10(6) Equipment names, following a consistent equipment naming methodology/convention.

2.5.7.11 Fire alarm and voice communication system riser will include:

2.5.7.11(1) The entire fire alarm and voice communication system;

2.5.7.11(2) Equipment shown on the floor level where they will be installed;

2.5.7.11(3) A two-dimensional relative representation of where the equipment will be located;

2.5.7.11(4) Communication wiring between the head end and local panels, and between local panels;

2.5.7.11(5) A two-dimensional representation of the routing of the wiring between the head end and the local panels and between the local panels;

2.5.7.11(6) Each initiating loop out of a local panel, including every isolation module used in the loop;

2.5.7.11(7) Indication of each initiating zone;

2.5.7.11(8) Indication of each notification zone;

2.5.7.11(9) A typical representation of the initiating, monitoring and control devices installed on each segment of a loop (i.e. between isolation modules);

2.5.7.11(10) Each notification circuit out of a local panel;

2.5.7.11(11) A typical representation of the notification devices installed on each signal circuit;

2.5.7.11(12) Interconnections with other systems; and

2.5.7.11(13) Equipment names, following a consistent equipment naming methodology.

2.5.7.12 Lighting and lighting control plans will include:

2.5.7.12(1) Reflected ceiling plans to scale showing all luminaires, including emergency lighting and exit signs, in their relative locations;

2.5.7.12(2) An indication of the luminaire types, corresponding to the luminaire schedules;

2.5.7.12(3) Circuiting of each luminaire;

2.5.7.12(4) Lighting control devices, in their relative locations;

2.5.7.12(5) Control panels, in their relative locations;

2.5.7.12(6) Lighting control zoning;

2.5.7.12(7) Lighting panelboards, in their relative locations; and

2.5.7.12(8) Room names and numbers, doors and windows, corridor names.

2.5.7.13 Power Plans will include:

2.5.7.13(1) Floor plans to scale showing all:

2.5.7.13(1)(a) receptacles;

2.5.7.13(1)(b) equipment connections;

2.5.7.13(1)(c) safety switches;

2.5.7.13(1)(d) transfer switches;

2.5.7.13(1)(e) feeders;

2.5.7.13(1)(f) splitters;

2.5.7.13(1)(g) panelboards;

2.5.7.13(1)(h) switches controlling receptacles or equipment;

2.5.7.13(1)(i) timers;

2.5.7.13(1)(j) clocks;

2.5.7.13(1)(k) contactors;

2.5.7.13(1)(l) switchgear;

2.5.7.13(1)(m) CDPs;

2.5.7.13(1)(n) power factor or harmonic correction units;

2.5.7.13(1)(o) isolated power systems;

2.5.7.13(1)(p) transformers;

2.5.7.13(1)(q) generators;

2.5.7.13(1)(r) UPS equipment;

2.5.7.13(1)(s) motor control centres;

2.5.7.13(1)(t) chillers;

2.5.7.13(1)(u) motors over 50 HP;

2.5.7.13(1)(v) automatic door controls;

2.5.7.13(1)(w) control equipment (other than lighting control), shown in their relative locations;

2.5.7.13(1)(x) an indication of the equipment types, corresponding to the legend;

2.5.7.13(1)(y) circuiting of each item of equipment; and

2.5.7.13(1)(z) room names and numbers, doors and windows, corridor and other space names.

2.5.7.14 Fire alarm system plans will include:

2.5.7.14(1) Reflected ceiling plans to scale showing all initiating devices, notification devices, control devices, monitoring devices, isolation modules, in their relative locations;

2.5.7.14(2) An indication of the equipment types, corresponding to the Legend;

2.5.7.14(3) Annunciators, head end equipment, local panels, battery cabinets, paging stations, control centres, in their relative locations;

2.5.7.14(4) Identification of each zone boundary;

2.5.7.14(5) Circuiting of items requiring power for 90% and 100% Submittals;

2.5.7.14(6) Room names and numbers, doors and windows, corridor names;

2.5.7.14(7) Zone names; and

2.5.7.14(8) Fire walls, fire separations.

2.5.7.15 Switchgear/CDP/Unit Substation, Elevations and Schedules will include:

2.5.7.15(1) The elevation of each item of switchgear, each CDP and each unit substation showing protective devices, switching devices, bus arrangements, protective relays, control relays, metering, labelling, surge protective devices; and

2.5.7.15(2) Schedules identifying each protective device, switching device, transformer, bus, showing the ratings of these plus the settings of each protective device, including:

2.5.7.15(2)(a) Long-time pickup;

2.5.7.15(2)(b) Long-time delay;

2.5.7.15(2)(c) Short time pickup;

2.5.7.15(2)(d) Short time delay;

2.5.7.15(2)(e) Instantaneous;

2.5.7.15(2)(f) Ground fault pickup; and

2.5.7.15(2)(g) Ground fault delay, etc. as applicable.

2.5.7.16 Fire alarm and voice communication system schedules will include, in a matrix format:

2.5.7.16(1) All initiating, monitoring and control zone designations;

2.5.7.16(2) All notification zone designations;

2.5.7.16(3) A description of the area or equipment involved;

2.5.7.16(4) An indication of the system operation related to that zone;

2.5.7.16(5) All voice communications zone designations;

2.5.7.16(6) A description of the area involved for each voice communications zone; and

2.5.7.16(7) A description of the smoke control/smoke venting systems operations for each initiating zone.

2.5.7.17 Site Service Details will include:

2.5.7.17(1) Maintenance holes and hand holes;

2.5.7.17(2) Cable racking inside maintenance holes;

2.5.7.17(3) Cable pulling provisions inside maintenance holes;

2.5.7.17(4) Built in ladders inside maintenance holes;

2.5.7.17(5) Means of draining maintenance holes including gravity drainage and sump pump systems;

2.5.7.17(6) High water alarms for maintenance holes;

2.5.7.17(7) Lighting and power provisions inside maintenance holes;

2.5.7.17(8) Cross sections of each duct bank;

2.5.7.17(9) Cross sections of any direct buried cables;

2.5.7.17(10) Bases for lighting standards;

2.5.7.17(11) Bases for bollards;

2.5.7.17(12) Bases for other equipment;

2.5.7.17(13) Snow melting details; and

2.5.7.17(14) Roof and gutter de-icing details.

2.5.7.18 Miscellaneous Details will include:

2.5.7.18(1) All details required for the full description of the Design and Construction and the Facility not included on other drawings.

2.5.7.19 All Other Drawings will include:

2.5.7.19(1) Drawings as required for the full description of the Design and Construction and the Facility not included on other drawings.

2.5.7.20 Record Drawings will include:

2.5.7.20(1) Drawings included in the 100% Submittals plus any changes made and any drawings added up to the completion of Construction;

2.5.7.20(2) Updating of each drawing to the final “as built” condition;

2.5.7.20(3) Final locations of duct banks, maintenance holes, hand holes, conduit, outlets, panels, branch wiring, system wiring, pull boxes, bus ducts, and equipment;

2.5.7.20(4) Dimensions from column lines or edge of roadways to the location of buried conductors/ducts, and burial depth of each; and

2.5.7.20(5) Project surveyor’s information on the site services record drawings.

2.5.7.21 Electrical Specifications will include:

2.5.7.21(1) Sections in sufficient detail to unequivocally describe each material and each item of equipment to be used on the electrical scope of work for the Project;

2.5.7.21(2) The method of installation, testing, Commissioning and documenting for each material, item of equipment, and system that is part of the electrical scope of work for the Project; and

2.5.7.21(3) Identification of the codes and standards that the materials, equipment, and systems will be provided in accordance with.

2.5.7.22 Branch Circuit Panelboard Schedules will include:

2.5.7.22(1) A separate schedule for each panelboard;

2.5.7.22(2) Panelboard ratings, voltage and ampacity;

2.5.7.22(3) Main breaker ratings (where applicable);

2.5.7.22(4) Maximum number of branch breaker poles that the panelboard can accommodate;

2.5.7.22(5) The rating and number of poles for each branch breaker;

2.5.7.22(6) The phase that each breaker pole is connected to;

2.5.7.22(7) The name of the load supplied by each branch breaker;

2.5.7.22(8) The anticipated circuit and overall panel loading in Amperes, and spare capacity provisions;

2.5.7.22(9) Spare breakers;

2.5.7.22(10) Breaker spaces;

2.5.7.22(11) The interrupting rating of the circuit breakers; and

2.5.7.22(12) Circuits equipped with breaker “lock-on” devices.

2.5.7.23 Lighting control schedules will include:

2.5.7.23(1) A separate schedule for each control panel;

2.5.7.23(2) Lighting control zone designations;

2.5.7.23(3) Circuits and sub-circuits controlled;

2.5.7.23(4) Designation of each control relay;

2.5.7.23(5) Rating of each control relay;

2.5.7.23(6) A description of the type of control;

2.5.7.23(7) A listing of “scenes” allocated to the zone; and

2.5.7.23(8) Interfaces with other panels, head end equipment, other systems.

2.5.7.24 Calculations will be:

2.5.7.24(1) Published, handwritten calculations will not be submitted;

2.5.7.24(2) Fully detailed to allow review of each step of the calculations;

2.5.7.24(3) With connected power, power demand and diversity factors shown for each load category on each power branch on each substation using the following categories, early assumptions or placeholders for these factors will be provided starting at the 30% submittal and updated to reflect the current equipment selections at 50%, 70%, 90% and 100% Submittals:

2.5.7.24(3)(a) Basic load (interior lighting and plug loads);

2.5.7.24(3)(b) Seasonal cooling loads;

2.5.7.24(3)(c) Seasonal heating loads;

2.5.7.24(3)(d) Fans;

2.5.7.24(3)(e) Other (non-hydronic) pump loads;

2.5.7.24(3)(f) Other mechanical loads;

2.5.7.24(3)(g) Elevators;

2.5.7.24(3)(h) Imaging Equipment;

2.5.7.24(3)(i) Central Production Kitchen equipment;

2.5.7.24(3)(j) Nutrition Centre equipment;

2.5.7.24(3)(k) Bedpan Disinfectors;

2.5.7.24(3)(l) MDRD equipment;

2.5.7.24(3)(m) IM/IT equipment;

2.5.7.24(3)(n) Electric vehicle charging; and

2.5.7.24(3)(o) Other equipment.

2.5.7.24(4) With spare and future provisions identified; and

2.5.7.24(5) With all assumptions clearly stated.

2.5.7.25 Total Load Calculations (Utility Electric Service) will include:

2.5.7.25(1) Calculation of the annual peak demand load, in kW and kVA, expected for the Health Campus;

2.5.7.25(2) Calculation of the annual peak demand load, in kW and kVA, on each utility service under typical operating conditions, indicating the spare capacity on each service; and

2.5.7.25(3) Calculation of the annual peak demand load, in kW and kVA, on each utility service with one utility service shutdown.

2.5.7.26 Total Load Calculations (Generator Power) will include:

2.5.7.26(1) Calculation of the annual peak demand load on the generating system, in kW and kVA, expected for the Health Campus;

2.5.7.26(2) Calculation of the annual peak demand load, in kW and kVA, on each generator under typical operating conditions, indicating the spare capacity on each generator;

2.5.7.26(3) Calculation of the annual peak demand load, in kW and kVA, on each generator with one generator out of service;

2.5.7.26(4) Calculation of the annual peak demand load, in kW and kVA, on each generator with one generator bus (e.g. two generators) out of service.

2.5.7.26(5) Calculation of the reserve generator capacity for required spare, motor starting, and stepped loads;

2.5.7.26(6) Calculation of the annual peak demand load, in kW and kVA, on each HVATS; and

2.5.7.26(7) Calculation of each load shedding step at minimum and maximum loading conditions.

2.5.7.27 Load Calculations (Transformer Loadings) will include:

2.5.7.27(1) Calculation of the annual peak demand load, in kW and kVA, on each transformer under typical operating conditions;

2.5.7.27(2) Calculation of the annual peak demand load, in kW and kVA, on each transformer with one transformer out of service, the transformer out of service to be one that causes substation load to be transferred to the transformer for which the load calculation is being performed (e.g. it's twin);

2.5.7.27(3) Calculation of the anticipated future load growth on each transformer; and

2.5.7.27(4) Calculation of the spare capacity provided for in each transformer.

2.5.7.28 Load Calculations (UPS Power) will include:

2.5.7.28(1) Calculation of the annual peak demand load, in kW and kVA, on each UPS system under typical operating conditions;

2.5.7.28(2) Calculation of the anticipated future load growth on each UPS system;

2.5.7.28(3) Calculation of the spare capacity provided for in each UPS system; and

2.5.7.28(4) Calculation of the battery support time of each UPS system, based on:

2.5.7.28(4)(a) full load operation;

2.5.7.28(4)(b) with the redundant system not available;

2.5.7.28(4)(c) with the battery capacity derated to the actual ambient room temperature, and

2.5.7.28(4)(d) with the batteries at “end of life”.

2.5.7.29 Power System Ground Grid Calculations will include:

2.5.7.29(1) Identification of soil resistivity based on site testing, two layer resistivity values and depths used in computer models if applicable; and

2.5.7.29(2) Calculation of the GPR, step and touch potentials, in accordance with IEEE 80.

2.5.7.30 Voltage Drop Calculations will include:

2.5.7.30(1) Calculations of the steady state voltage drop from the utility service though to every power utilizing device;

2.5.7.30(2) Provided that a maximum of 3% voltage drop is allowed for each branch circuit then the voltage drop calculations can end at the branch panelboard or MCC;

2.5.7.30(3) Calculations based on a load equal to the maximum continuous load rating of the breaker or fuse protecting the circuit, unless the load is fixed and known (e.g.: a single motor), in which case the fixed known load can be used; and

2.5.7.30(4) Calculations based on a power factor of 90% unless a different power factor is known to apply in which case the known power factor is to be used.

2.5.7.31 Short Circuit Calculations will include:

2.5.7.31(1) Calculations of symmetrical and asymmetrical values of fault currents, based on the calculated X/R ratio of the system;

2.5.7.31(2) Calculations of the maximum three phase fault current, the maximum line to line fault current, the maximum line to ground fault current and the maximum line to ground fault current at every protective device and switching device in the electrical system, excluding local switches on branch circuits;

2.5.7.31(3) The maximum fault currents based on the utility supply in parallel with the generator supply, where closed transition transfer switches are used;

2.5.7.31(4) The utility and generator ultimate design fault levels;

2.5.7.31(5) Motor contribution; and

2.5.7.31(6) Actual transformer impedances, but until actual impedances are available, worst case (low) impedances.

2.5.7.32 Arc Flash Calculations will include:

2.5.7.32(1) Calculations of the arc flash incident energy at every piece of distribution equipment, protective device and every switching device in the system, excluding local switches on branch circuits.

2.5.7.32(2) Arc flash labels produced for all power distribution equipment, excluding local switches on branch circuits.

2.5.7.33 Coordination Study will include:

2.5.7.33(1) Graphs of each portion of the electrical system on log-log paper showing:

2.5.7.33(1)(a) The operating characteristics of each protective device;

2.5.7.33(1)(b) Full load ratings of transformers;

2.5.7.33(1)(c) Full load ratings of individual generators and generators in parallel;

2.5.7.33(1)(d) The maximum and minimum fault level at each protective device and each switching device;

2.5.7.33(1)(e) Transformer inrush current;

2.5.7.33(1)(f) Motor starting current;

2.5.7.33(1)(g) Cable damage curves;

2.5.7.33(1)(h) Transformer damage curves;

2.5.7.33(1)(i) Full load ratings of generators;

2.5.7.33(1)(j) Generator damage curves;

2.5.7.33(1)(k) Generator decrement curves for individual generators and paralleled generators;

2.5.7.33(1)(l) Full load ratings of UPS systems;

2.5.7.33(1)(m) UPS system fault levels;

2.5.7.33(1)(n) UPS system maintenance bypass fault levels; and

2.5.7.33(1)(o) A single line diagram of the portion of the system involved including the equipment names, ratings and settings.

2.5.7.33(2) No more than five time current curves of protective devices on each graph;

2.5.7.33(3) Graphs showing operation on utility power;

2.5.7.33(4) Graphs showing operation on generator power;

2.5.7.33(5) Graphs showing operation on UPS power;

2.5.7.33(6) A sufficient number of graphs to depict the entire electrical system including the Utilities protective devices and the generators down to feeders to lighting/receptacle/lab panels, splitters, motor control centres, chillers, motors of 50 HP and larger;

2.5.7.33(7) Separate graphs for phase currents;

2.5.7.33(8) Separate graphs for ground currents with phase trip curves shown as needed for ground fault coordination;

2.5.7.33(9) Schedules showing each protective device that is equipped with an adjustable trip unit, showing the device frame size, CT ratios and the detailed settings of its trip unit;

2.5.7.33(10) Identification of areas where equipment protection is not adequate; and

2.5.7.33(11) Identification of areas where full co-ordination is not achieved.

2.5.7.34 Magnetic field study will include:

2.5.7.34(1) Post-installation magnetic field measurements (60Hz magnetic field strength, in milligauss) in any areas with sensitive equipment located near transformers, motors, or other field-producing equipment.

2.5.7.34(2) Field measurements to be made where requested by the Owner.

2.5.7.35 Lighting calculations will include:

2.5.7.35(1) Minimum and average light levels measured in lux, for each unique room, stairway, corridor, public space, service space, Patient Care Area type, including multiple switching scenarios when applicable. Calculations to be based on grids not exceeding 0.3 m x 0.3 m and calculated at the workplane or wall/floor as appropriate.

2.5.7.35(2) Night light levels in public areas and Patient Care Areas.

2.5.7.35(3) Exterior minimum and average light levels at exits, walking paths/sidewalks, roadways, drive aisles, and gathering areas. Calculations to be based on grids not exceeding 1 m x 1 m.

2.5.7.36 Cable Tray calculations will include:

2.5.7.36(1) Number and type of cables at each location terminating at a service room, closet, or distribution equipment, and each location where there is a reduction in size of the cable tray.

2.5.7.36(2) The fill space available will be included based on percentage of cable type(s) and similar sizes in the cable tray for each of the locations noted above.

2.5.7.37 Submit reports for the following:

2.5.7.37(1) Operating and Maintenance Manuals;

2.5.7.37(2) Training session records;

2.5.7.37(3) Short circuit, protective device co-ordination, and arc flash studies.

2.5.7.37(4) Panelboard loading test results;

2.5.7.37(5) Transformer loading test results;

2.5.7.37(6) Motor control centre loading test results;

2.5.7.37(7) Seismic restraints;

2.5.7.37(8) Testing of Patient Care Areas to CSA Z32;

2.5.7.37(9) Lighting level (illuminance) measurements;

2.5.7.37(10) Factory witness testing;

2.5.7.37(11) Site acceptance (pre-service) testing;

2.5.7.37(12) Ground resistance measurements;

2.5.7.37(13) Lightning protection grounding resistance;

2.5.7.37(14) UPS battery testing;

2.5.7.37(15) UPS performance testing;

2.5.7.37(16) Generator testing;

2.5.7.37(17) Transfer switch testing;

2.5.7.37(18) Transformer testing;

2.5.7.37(19) High voltage cable testing;

2.5.7.37(20) Switchgear/CDP testing;

2.5.7.37(21) Distribution system dynamic performance verification;

2.5.7.37(22) Magnetic field studies for sensitive areas and post-installation measurements; and

2.5.7.37(23) Clock system signal coverage.

2.5.7.38 Submit the following Certificates and Verifications:

2.5.7.38(1) Manufacturers' letters verifying that the equipment has been installed in accordance with their instructions for the following, at a minimum:

2.5.7.38(1)(a) Fire stopping;

2.5.7.38(1)(b) Fire rated wiring;

2.5.7.38(1)(c) Lighting control systems;

2.5.7.38(1)(d) Clock system;

2.5.7.38(1)(e) Automatic transfer switches;

2.5.7.38(1)(f) Generators;

2.5.7.38(1)(g) Paralleling and load management systems;

2.5.7.38(1)(h) UPS systems;

2.5.7.38(1)(i) UPS batteries;

2.5.7.38(1)(j) EVSE;

2.5.7.38(1)(k) Power factor and harmonic correction units; and

2.5.7.38(1)(l) Metering

2.5.7.38(2) Seismic certifications and letters of assurance for:

2.5.7.38(2)(a) Transformers;

2.5.7.38(2)(b) Generators;

2.5.7.38(2)(c) Transfer switches;

2.5.7.38(2)(d) Switchgear /CDPs/MCCs; and

2.5.7.38(2)(e) Seismic restraints/anchorage of other electrical components.

2.5.7.38(3) Other documentation:

2.5.7.38(3)(a) Fire alarm system verification;

2.5.7.38(3)(b) Radio license for clock system;

2.5.7.38(3)(c) Request for final review;

2.5.7.38(3)(d) Electrical engineer's letter of assurance; and

2.5.7.38(3)(e) Equipment warranties.

2.5.7.39 Maintenance Manuals

2.5.7.39(1) Project Co will provide maintenance manuals that contain the following for each system:

2.5.7.39(1)(a) Narratives and simple diagrams for standard operating procedures and maintenance procedures;

2.5.7.39(1)(b) Set of final reviewed shop drawings;

2.5.7.39(1)(c) A copy of all record drawings;

2.5.7.39(1)(d) Bill of materials list for each system;

2.5.7.39(1)(e) Manufacturer Warranty documents for equipment and workmanship;

2.5.7.39(1)(f) Manufacturer certification and test result printouts;

2.5.7.39.1.(f).1 Fire-stop design and records documentation; and

2.5.7.39.1.(f).2 Names, addresses, phone numbers and facsimile numbers of Project Co, Project Co's sub-contractors and suppliers used on the work together with a specification reference of the portion of the work they undertook.

2.5.7.40 Record Documentation

2.5.7.40(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.8 Communications Systems Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
Legends, drawing list, key plans	X	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Location, Site - plans and details	X	X	X	X	X	X
Power and Data Drop Overall Floor plans (Coordinated on electrical power plans)	X	X	X	X	X	X
Data Drop Typical Room Floor plans	X	X	X	X	X	X
Communications Room Floor plans	X	X	X	X	X	X
Structured Cabling Riser Diagrams	X	X	X	X	X	X
Communications Room Wall Layouts	-	X	X	X	X	X
Telecommunications Bonding and Grounding Diagram	X	X	X	X	X	X
Intra-Building Pathways Floor plans	X	X	X	X	X	X
Intra-Building Backbone Cabling Diagram	X	X	X	X	X	X
Public Address Riser and System Diagrams	X	X	X	X	X	X
IM/IT Overall Systems Floor plans (Public Address, Nurse Call, RTLS Infrastructure)	X	X	X	X	X	X
RTLS Reflected Ceiling Plan Device Layouts and Zoning Diagrams	-	X	X	X	X	X
RTLS Riser and System Diagrams	X	X	X	X	X	X
Wireless Systems Coordination Reflected Ceiling Plans (IM/IT WAPs, DAS Antennas, Telemetry WAPs, RTLS Beacons)	-	-	-	X	X	X
DAS Riser and System Diagrams	-	-	X	X	X	X
IM/IT Wi-Fi Network Riser and System Diagrams	-	-	X	X	X	X
IM/IT Wi-Fi Network WAP Layout and Heatmaps	-	-	-	X	X	X
Guest Infotainment Riser and System Diagram	-	-	X	X	X	X
Audio-Visual Equipment System Diagrams	-	-	X	X	X	X
Audio-Visual Room Layouts	X	X	X	X	X	X
Nurse Call Riser and System Diagrams	X	X	X	X	X	X
Nurse Call Typical Room Device Layouts	X	X	X	X	X	X
Integration Engine narrative and integration diagrams and sequence of operations	-	-	-	X	X	X
Systems Block Diagrams and Integration Matrix (Including Divisions 25, 27, 28 Systems)	X	X	X	X	X	X
Standard Operating Procedures narrative and scenario examples for each system in editable spreadsheet format	-	-	X	X	X	X
Bill of Materials Spreadsheet Tables						
Communications (Division 27) All Systems		X	X	X	X	-

2.5.8.1 The term “Documents” refers to submittals, technical manuals, supporting materials, warranties and Project Co produced technical drawings, details and illustrations that are to be provided by Project Co to the Owner pursuant to this Schedule.

2.5.8.2 Communications documents will include:

2.5.8.2(1) Sections in sufficient detail to fully describe each material and each item of equipment to be used for each system, including

manufacturers, materials, assembly, functions, features and performance requirements;

2.5.8.2(2) The method of installation, testing, Commissioning and documenting for each material, piece of equipment, system, and interface; and

2.5.8.2(3) Identification of the codes and standards that the materials, equipment, and systems will be provided in accordance with.

2.5.8.3 The term “Drawings” refers to the graphic and pictorial portion of the contract documents showing the design location and dimensions of the services, generally including plans, elevations, sections, details, schedules and diagrams.

2.5.8.4 Communications (Division 27) drawings will be identified as “COM” series (communications) drawings in the approved Construction drawings, separated from “E” (electrical) drawings.

2.5.8.5 All drawings, specifications, submittals and Construction documents will be produced, reviewed and stamped by the RCDD employed by Project Co.

2.5.8.6 The Owner’s construction standard drawings (C-STD) and details can be referenced in PHSA Communications Infrastructure Standards and Specifications

2.5.8.7 The drawings will use industry-standard symbols and legends. Refer to PHSA Communications Infrastructure Standards and Specifications for the Owner-approved symbols.

2.5.8.8 Floor plan layouts will indicate:

2.5.8.8(1) Systems device locations and types;

2.5.8.8(2) The locations of all Communications Rooms and their associated serving zone boundaries;

2.5.8.8(3) All telecommunications outlets identifying types of cables, label details and number of Data Drops per outlet;

2.5.8.8(4) Locations, quantity and sizes of all cable tray, sleeves, risers, junction boxes and pull boxes;

2.5.8.8(5) Backbone cabling pathways including the routes of the telecommunications grounding backbone; and

2.5.8.8(6) Layouts will be to scale providing detail plan views, reflected ceiling plans and elevations of all communications and low voltage components and equipment, racks and enclosures.

2.5.8.8(7) Maintenance and operational clearances;

2.5.8.8(8) Non-telecom related materials, equipment, devices and structures (all dimensions are to be included); and

2.5.8.8(9) Elevation drawings of all walls of each Communications Room, clearly showing the layout of all termination hardware, grounding and bonding components, horizontal pathway penetrations, and wall-mounted equipment cabinets.

2.5.8.9 Provide riser diagrams for each system, including the following details:

2.5.8.9(1) Inter-building and intra-building backbone pathway system including the service Entrance Facilities identifying quantity and sizes of conduits, trays and sleeves;

2.5.8.9(2) Equipment locations in Communications Rooms and typical field devices;

2.5.8.9(3) Power supplies and electrical circuiting details; and

2.5.8.9(4) Inter-building and Intra-building backbone cabling subsystem identifying cross connect locations and type, size, sheath, gauge, length and strand or copper pair count of each cable installed.

2.5.8.10 Public address plans, sections, details will contain:

2.5.8.10(1) Reflected ceiling plans showing locations of all speakers;

2.5.8.10(2) Complete point to point wiring details, schematic diagrams and other information required to demonstrate that the system has been properly designed and coordinated to meet the requirements of the Owner; and

2.5.8.10(3) Layouts of equipment and appurtenances and their relationship to other parts of the work including clearances for maintenance and operation.

2.5.8.11 Audio-Visual room layouts will include:

2.5.8.11(1) Floor layouts (1:50 scale) of each multimedia room identifying quantities and types of cables, endpoint locations, pathways and floor box locations;

2.5.8.11(2) Elevation layouts of each multimedia room identifying locations of all power/data outlets, wall backing for equipment mounts, locations for display screens, control panels and switches, source connection patch panels, cameras, speakers and other AV components; and

2.5.8.11(3) Reflected ceiling plans of each multimedia room identifying location of ceiling mounted AV equipment including projectors,

motorized screens, speakers, microphones and other ceiling devices including sprinkler heads, lighting fixtures, sensors, vents, and grilles.

2.5.8.12 Nurse call drawings will include:

2.5.8.12(1) Floor plans showing zoning, and locations and types of all devices, dome lights, panels and equipment to be installed as part of the nurse call system; and

2.5.8.12(2) Complete wiring details illustrating how each device will connect back to the main panels (including system integrations), and the cable type to be used for each connection.

2.5.8.13 Shop Drawings

2.5.8.13(1) The purpose of shop drawing submittals is to demonstrate Project Co's understanding of the design intent. This understanding is demonstrated by articulating which equipment and material is required, and by what methods of fabrication and installation will be utilized.

2.5.8.13(2) Before installation of any cable, structured cabling component, pathway, firestop assembly or related material, equipment or hardware, Project Co will submit shop drawings and product data sheets for each component supplied to the Owner for review and approval.

2.5.8.13(3) Shop drawings and product data sheets will indicate operating characteristics for each required item and design conditions.

2.5.8.13(4) The submittals will be reviewed for general compliance with the Agreement and not for dimensions, quantities, etc. The submittals that are returned will be used for procurement. The responsibility of correct procurement remains solely with Project Co. The submittal review will not relieve Project Co of responsibility for errors or omissions and deviations from the requirements of this Agreement.

2.5.8.13(5) Equipment and material substitutions are prohibited. If the submittal shows variations from the requirements of this Agreement for any reason, Project Co will provide written detail of each variation in the letter of transmittal.

2.5.8.13(6) Provide shop drawing and bill of material data for all materials including, each system controller, cable, device and user peripherals for those items listed in Section 2.5.2.5(186) through Section 2.5.2.5(198).

2.5.8.14 Maintenance Manuals

2.5.8.14(1) Project Co will provide maintenance manuals that contain the following for each system:

2.5.8.14(1)(a) Narratives and simple diagrams for standard operating procedures and maintenance procedures;

2.5.8.14(1)(b) Set of final reviewed shop drawings;

2.5.8.14(1)(c) A copy of all record drawings;

2.5.8.14(1)(d) Bill of materials list for each system;

2.5.8.14(1)(e) 360 record photos of all Communications Rooms showing each wall and rack elevations with shop drawings embedded as metadata;

2.5.8.14(1)(f) Spreadsheets for horizontal cabling and fibre backbone. Refer to PHSA Communications Infrastructure Standards and Specifications;

2.5.8.14(1)(g) Manufacturer Warranty documents for equipment and workmanship;

2.5.8.14(1)(h) Manufacturer certification and test result printouts;

2.5.8.14.1.(h).1 Fire-stop design and records documentation as set out in PHSA Communications Infrastructure Standards and Specifications; and

2.5.8.14.1.(h).2 Names, addresses, phone numbers and facsimile numbers of Project Co, Project Co's sub-contractors and suppliers used on the work together with a specification reference of the portion of the work they undertook.

2.5.8.15 Record Documentation

2.5.8.15(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.8.15(2) For additional requirements refer to PHSA Communications Infrastructure Standards and Specifications.

2.5.9 Electronic Safety and Security System Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
Legends, drawing list, key plans	X	X	X	X	X	X

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Location, Site - plans, and details	X	X	X	X	X	X
Security Systems Overall Floor plans (IP Video Surveillance, Access Control, Intercom, Intrusion Detection, and Fixed Duress).	-	X	X	X	X	X
Communications Room Layouts and Elevations	X	X	X	X	X	X
Patient Wandering Reflected Ceiling Plans	-	X	X	X	X	X
Patient Wandering Riser and System Diagrams	X	X	X	X	X	X
Fire Alarm Overall Reflected Ceiling Plans	X	X	X	X	X	X
IP Video Surveillance Riser and System Diagrams	X	X	X	X	X	X
IP Video Surveillance Camera FOV Floor plans	-	-	X	X	X	X
Access Control Riser and System Diagrams	X	X	X	X	X	X
Intercommunications Riser and System Diagrams	X	X	X	X	X	X
Intrusion Detection Riser and System Diagrams	X	X	X	X	X	X
Fixed Duress Riser and System Diagrams	X	X	X	X	X	X
Wireless Staff Duress Reflected Ceiling Plans	-	X	X	X	X	X
Wireless Staff Duress Riser and System Diagrams	X	X	X	X	X	X
Integration Engine narrative and integration diagrams and sequence of operations	-	-	-	X	X	X
Standard Operating Procedures narrative and scenario examples for each system in editable spreadsheet format	-	-	-	X	X	X
Bill of Materials Spreadsheet Tables						
Electronic Security (Division 28) All Systems	-	X	X	X	X	-

2.5.9.1 The term “Documents” refers to submittals, technical manuals, supporting materials, warranties and Project Co produced technical drawings, details and illustrations that are to be provided by Project Co to the Owner pursuant to this Schedule.

2.5.9.2 Electronic Safety and Security documents will include:

2.5.9.2(1) Sections in sufficient detail to fully describe each material and each item of equipment to be used for each system, including manufacturers, materials, assembly, functions, features and performance requirements;

2.5.9.2(2) The method of installation, testing, Commissioning and documenting for each material, piece of equipment, system, and interface; and

2.5.9.2(3) Identification of the codes and standards that the materials, equipment and systems will be provided in accordance with.

2.5.9.3 The term “Drawings” refers to the graphic and pictorial portion of the contract documents showing the design location and dimensions of the services, generally including plans, elevations, sections, details, schedules and diagrams.

2.5.9.4 Electronic Safety and Security (Division 28) drawings will be identified as “ESS” series drawings in the approved Construction drawings, separated from “E” (electrical) drawings.

2.5.9.5 Construction Drawings

2.5.9.5(1) The Owner’s Construction Standard Drawings (C-STD) and details can be referenced in PHSA Communications Infrastructure Standards and Specifications.

2.5.9.5(2) The drawings will use industry standard symbols and legends. Refer to PHSA Communications Infrastructure Standards and Specifications for the Owner-approved symbols.

2.5.9.6 Floor Layouts and Site Plans will indicate:

2.5.9.6(1) Locations, quantity and types of all devices, components and equipment required for the Electronic Security Systems;

2.5.9.6(2) Security zoning (interior and exterior);

2.5.9.6(3) Locations, quantity and sizes of all cable tray, risers, junction boxes and pull boxes;

2.5.9.6(4) Location of head-end equipment and storage;

2.5.9.6(5) Overall system riser wiring diagram identifying control units, circuits, terminations, terminal numbers, conductors and raceways;

2.5.9.6(6) Detailed elevation drawings of equipment installed in racks and cabinets. Elevation drawings will include vertical and horizontal wire managers, fiber and copper patch panels, hardware such as shelves and all active equipment regardless of the supplier;

2.5.9.6(7) Control layout, including interconnections between Electronic Security Systems as well as the Owner's Network; and

2.5.9.6(8) Typical electrified door hardware diagrams, indicating hardware devices, conduit, controllers, junction boxes and the responsibility of various trades to ensure operability.

2.5.9.6(9) Camera field of view drawings will include the viewing angle of the camera and a visual indication of where the resolution changes from identification to observation pixel density.

2.5.9.7 Schematic drawings will be provided for the following elements:

2.5.9.7(1) Inter-building and intra-building connections of Electronic Security Systems identifying quantity and sizes of conduits, trays and sleeves.

2.5.9.8 Shop Drawings

2.5.9.8(1) Project Co will provide shop drawings in accordance with Section 2.5.8.13.

2.5.9.8(2) Provide shop drawings and bill of material data for all materials including, each system controller, cable, device and user peripherals for items listed in Sections 2.5.2.5(199) through 2.5.2.5(205) and Section 2.5.2.5(208).

2.5.9.9 Maintenance Manuals

2.5.9.9(1) Project Co will provide maintenance manuals as outlined in Section 2.5.3.17.

2.5.9.10 Record Documentation

2.5.9.10(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.10 Landscape Design and Construction Documents

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Drawing Content						
Keyplan, Showing Overall Site Design	X	X	X	X	X	X
Layout Plans	X	X	X	X	X	X
Grading Plans	X	X	X	X	X	X
Planting Plans	-	X	X	X	X	X
Planting Plans with Utility Overlay	-	-	X	X	X	X
Planting Plans with Sun/Shade Overlay	-	X	X	X	X	X
Green Roof Plans	X	X	X	X	X	X
Irrigation Plans	-	X	X	X	X	X
Detail Enlargement Plans	-	X	X	X	X	X
Construction Details, Sections and Elevations	-	X	X	X	X	X
Site Furnishings Details, Catalog Sheets	-	X	X	X	X	X
Specifications						
Landscape Table of Contents	X	X	X	X	X	-
Landscape Site Grading	-	X	X	X	X	-
Softscape	-	X	X	X	X	-
Hardscape, also Coordinate with other Disciplines	-	X	X	X	X	-
Irrigation	-	X	X	X	X	-
Site Furnishings	-	X	X	X	X	-
Landscape Maintenance	-	X	X	X	X	-

Percentage Complete at Submittal Stages	30%	50%	70%	90%	100%	Record
Sample Board/Presentation						
Update Conceptual Design Presentation Drawings	-	X	-	-	-	-
Colour Board(s) Illustrating Plant Material	-	X	-	-	X	-
Colour Board(s) Illustrating Hardscape and Site Furnishings	-	X	-	-	X	-

2.5.10.1 Plans and Schedules will contain the following:

2.5.10.1(1) Outline of the Facility showing all perimeter doors and windows;

2.5.10.1(2) Hardscape layout and surface treatment;

2.5.10.1(3) Soft landscape treatment (trees, hedges, planting beds, vines, lawn etc.), including vegetation within public road right-of-way;

2.5.10.1(4) Tree retention, removal, and replacement plan if applicable, showing preliminary civil site grading design;

2.5.10.1(5) All landscape structures (fences, trellis, arbours, retaining walls, lighting etc.);

2.5.10.1(6) Location and size of all outdoor spaces, Secure Outdoor Spaces and amenity areas;

2.5.10.1(7) Location of garbage enclosure and all other surface utility structures;

2.5.10.1(8) Preliminary grading information sufficient to determine ramps, special treatment or provisions for retaining elements;

2.5.10.1(9) A sun/shade study for the courtyards and Secure Outdoor Spaces;

2.5.10.1(10) A design key plan at a 1:500 scale complete with enlargement plans of all courtyards, amenity areas and roof gardens;

2.5.10.1(10)(a) Garden and Secure Outdoor Space enlargement plans; and

2.5.10.1(10)(b) A preliminary sign location plan, with draft message schedule of sign content and working scales sufficient to determine the suitability of the sign and its message.

2.5.10.1(11) Irrigation and planting design. Standard details will be incorporated, with site specific details underway;

2.5.10.1(12) Water conservation and irrigation plan prepared by a qualified professional inclusive of a hydro zone plan, landscape water conservation irrigation report (landscape water budget) and an irrigation Design;

2.5.10.1(13) A preliminary plant list of trees, shrubs, perennials and ground covers including quantities, botanical and common names, planting sizes, and on centre spacing;

2.5.10.1(14) Location and species of boulevard trees and preliminary Construction drawings;

2.5.10.1(15) Location, material and preliminary Construction details of all landscape elements and structures including garbage enclosure; and

2.5.10.1(16) Location, material, graphic standards and preliminary Construction details of all exterior signage with revised schedule of sign content.

2.5.10.1(17) Key Plan at 1:500 scale showing the overall site design plan and integration with the streetscape;

2.5.10.1(18) Separate enlargement plans to be at 1:100 or 1:200 scale including Layout Plans, Grading Plan, Planting Plans, and Irrigation Plans illustrating all exterior spaces and referenced to the key plan;

2.5.10.1(19) All landscape Construction plans will be sealed and signed by a Registered Landscape Architect with current membership in the British Columbia Society of Landscape Architects;

2.5.10.1(20) BCSLA landscape schedules by a Landscape Architect registered in British Columbia to be supplied as required at each stage of development;

2.5.10.1(21) All drawings and supplemental material(s) for irrigation systems will be stamped and signed by a Certified Irrigation Designer (CID) - Commercial. This certification will be issued by the Irrigation Association (IA). The certified designer will be in good standing with the association;

2.5.10.1(22) North arrow will be included;

2.5.10.1(23) Include the legal description and site and property line zoning, including bearings and dimensions. If the site has a municipal address, include it in the plan;

2.5.10.1(24) Include utility locations, legal easements, Rights-of-Way, etc.; and

2.5.10.1(25) Include curb lines, sidewalks, utility poles, fences, and any other boundary conditions.

2.5.10.2 Layout Plan[s] to be a separate plan and include the following, at a minimum:

2.5.10.2(1) Outline the extents of all types of hard surface treatments and dimensions as required to facilitate Construction;

2.5.10.2(2) Reference all Construction details to Layout plans;

2.5.10.2(3) Layout Plans to include all exterior features of other disciplines such as lighting, retaining walls, signage, architectural columns and utility infrastructure components; and

2.5.10.2(4) Show the location of proposed structures and features.

2.5.10.3 Planting Plan[s] to be a separate plan and include the following, at a minimum:

2.5.10.3(1) Plans to outline all surface treatments including seed or sodded areas, groundcovers, extent and type of mulches or other surface treatments;

2.5.10.3(2) Outline erosion control treatment where required;

2.5.10.3(3) Major items associated with “Layout” but not including dimensions, i.e. walkways, roads, curbs, hard surface areas, other structures, natural areas;

2.5.10.3(4) Outline of planting beds, plant species and material with crowns at 2/3 maximum size;

2.5.10.3(5) Proposed contours in soft landscape areas;

2.5.10.3(6) Utilities and Rights-of-Way; and

2.5.10.3(7) Include a plant list identifying species (botanical and common name), quantities, sizes, habit, spacing, and specific remarks as required.

2.5.10.4 Grading Plan[s] to be a separate plan and include the following, at a minimum:

2.5.10.4(1) A plan for each area is required to identify all gradients on pedestrian hard surface areas and landscape areas;

2.5.10.4(2) All retaining walls, constructed slopes, planters and structures to be clearly identified and referenced on the Landscape Grading Plan, complete with top and bottom elevations;

2.5.10.4(3) Surface drainage requirements and proposed elevations to be coordinated with other disciplines;

2.5.10.4(4) Major items associated with layout but not including dimensions, i.e. walkways, roads, curbs and other structures;

2.5.10.4(5) Existing contours and proposed contours at 0.5 m contour intervals, and at 0.25 m intervals in detail areas;

2.5.10.4(6) All slopes. Show top and bottom of slope spot elevations for all hard surface slopes over 2%.

2.5.10.4(7) All grades in Geodetic measure and tied to the nearest A.S.C.M. benchmark. A.S.C.M. benchmark number to be indicated on plan;

2.5.10.4(8) Elevations at each break point (top and toe of slope);

2.5.10.4(9) Label property lines and show spot elevations;

2.5.10.4(10) Catch basin rim and invert elevations where required;

2.5.10.4(11) Manhole rim elevations;

2.5.10.4(12) Top of wall, top of curb, and finished floor elevations as required;

2.5.10.4(13) Surrounding grade information affecting Site development;

2.5.10.4(14) Label all concrete gutters and drainage structures; and

2.5.10.4(15) Show all trap lows with their 1:100 inundation area, emergency spill routes and other surface drainage requirements.

2.5.10.5 Irrigation Plan[s] will include:

2.5.10.5(1) Major items associated with Layout Plan (but not including dimensions), such as walkways, structures, fences, play fields, roads, curbs, and natural areas;

2.5.10.5(2) Toned back major items of planting and grading plans;

2.5.10.5(3) Proposed contours at 0.5 m intervals;

2.5.10.5(4) Locations of all lines, sprinkler heads, valves, drains, sleeves, electrical drop-offs, 100 volt wire, 110 volt conduit, and electrical controllers, dimensional from adjacent property lines.

2.5.10.5(5) Demonstrate that the irrigation system is designed so that sprinkler heads do not spray on to hard surfacing or buildings;

2.5.10.5(6) Indicate whether the system will be trenched or “plowed in” and whether the system will be gravity drained, blown out, or a combination;

2.5.10.5(7) Coordinate water services with mechanical and ensure stub out is accessible to landscape areas. Lateral irrigation lines to be set back a minimum of 0.5 m from property lines;

2.5.10.5(8) Include a schedule of materials/products describing sizes, manufacturers and model numbers, pipe fitting method, performance standards, and sources of said materials/products. Approval of the list of materials/products is required prior to the placing of formal orders for them;

2.5.10.5(9) Ensure that the water window time period is justified by vandalism problems and horticultural requirements;

2.5.10.5(10) Coordinate water service pipe size with mechanical and ensure it delivers sufficient service for this size site and indicate static water pressure on the plan; and

2.5.10.5(11) Complete an Irrigation Scheduling Chart to ensure that the irrigation design will function effectively within the practical water window.

2.5.10.6 Construction Details will contain the following, at a minimum:

2.5.10.6(1) Provide Construction details, sections and elevations of all exterior site design elements referenced to the appropriate enlargement plan;

2.5.10.6(2) Provide sections for Construction details of all planting and structures over a roof slab. Coordinate drainage with other disciplines;

2.5.10.6(3) Prepare sections to illustrate the landscape integration with all exterior structures; and

2.5.10.6(4) Provide model number and cut sheet for all catalog items. Provide installation details for all elements.

2.5.10.6(5) Prepare a maintenance plan and one (1) year schedule outlining the levels of maintenance required to establish the proposed landscapes.

2.5.10.7 Urban Design and Landscape Drawing Coordination

2.5.10.7(1) To improve and inform the site design; coordinate the drawings with other disciplines at all Submittal stages. Coordination includes:

2.5.10.7(1)(a) Civil: Coordination on impacts to the site design for rainwater management requirements. Coordinate all planting and structures with the location of deep and

shallow underground Utilities. Provide a drawing showing the overlay of all Utilities with the planting plans;

2.5.10.7(1)(b) Mechanical: Coordinate to ensure all landscape areas including roof areas have access to water for irrigation and maintenance. Coordinate drainage requirements for all exterior spaces including roof areas;

2.5.10.7(1)(c) Electrical: Coordinate all electrical requirements for all exterior spaces. Coordinate street lighting and site lighting requirements;

2.5.10.7(1)(d) Structural: Coordinate requirements for all structures at grade and on roof slabs; and

2.5.10.7.1.(d).1 Wayfinding: Coordinate requirements and locations for all signage and Wayfinding elements.

2.5.10.8 Maintenance Manuals

2.5.10.8(1) Project Co will provide maintenance manuals as outlined in Section 2.5.8.14.

2.5.10.9 Record Documentation

2.5.10.9(1) Project Co will supply a Record Drawing package in accordance with Section 2.5.2.8.

2.5.11 LEED Documentation

2.5.11.1 The 30% Phase Submittal will include:

2.5.11.1(1) An annotated LEED Project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the Project approach to achieve the credit and any risks identified.

2.5.11.1(2) A narrative describing the integrative process outcomes related to the LEED prerequisite and credit associated with Integrative process (if this credit is pursued).

2.5.11.2 The 50% Phase Submittal will include an updated annotated LEED project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the project approach to achieve the credit and any risks identified.

2.5.11.3 The 90% Phase Submittal will include an updated annotated LEED project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the project approach to achieve the credit and any risks identified.

2.5.11.4 The 100% Phase Submittal will include:

2.5.11.4(1) An updated annotated LEED project checklist indicating all of the credits targeted to be achieved, the responsible party who will sign and prepare the LEED documentation for each targeted credit, and a brief description of the project approach to achieve the credit and any risks identified.

2.5.11.4(2) A complete electronic copy of all submission documentation submitted for the Design Stage LEED review submitted to the LEED reviewer. In addition, provide a copy of the LEED Review file as well as written description of the team's approach to address any items raised by the LEED reviewer.

2.5.11.5 Upon completion of the Project, to the Owner's satisfaction, Project Co will submit an electronic copy of all LEED certification submissions, including the final updated Project checklist, all supporting credit documentation, and copies of the LEED Review file.

2.5.12 Energy

2.5.12.1 Refer to Appendix 2D [Energy] and Section 2.5.6.8(3) for submittal requirements associated with Energy Modelling.

2.5.13 Commissioning Documentation

2.5.13.1 The 30% Phase Submittal will include:

2.5.13.1(1) Owner's Project Requirements Review from the Commissioning Authority (CxA).

2.5.13.1(2) Basis of Design Review from the CxA.

2.5.13.1(3) Outline of the Commissioning Plan.

2.5.13.1(4) Project specific Commissioning responsibilities and responsible parties for each major Building System and sub system in accordance with Appendix 3I [Commissioning Roles and Responsibilities].

2.5.13.1(5) Confirmation that the CxA is to provide oversight of the Commissioning of each of those Building Systems and sub systems from design phase to start-up testing, and functional testing.

2.5.13.2 The 50% Phase Submittal will include:

2.5.13.2(1) Commissioning review of the 50% design for all systems included in the Commissioning process.

2.5.13.2(2) Draft of the Division 1 Commissioning Specifications and confirmation that mechanical, electrical, and architectural specifications have been reviewed for consistency with the project commissioning requirements.

2.5.13.2(3) A draft of the Commissioning Plan.

2.5.13.2(4) Sample verification checklists and test procedures.

2.5.13.3 The 90% Phase Submittal will include:

2.5.13.3(1) Commissioning review of the 90% Design and Construction documents for all systems included in the Commissioning process, including back-check of outstanding items from the 50% Design and Construction Documents review.

2.5.13.3(2) Updated draft of the Commissioning Plan.

2.5.13.3(3) Updated verification checklists and test procedures.

2.5.13.3(4) Requirements for systems operations manuals.

2.5.13.3(5) Operational training requirements.

2.5.13.4 The 100% Phase Submittal will include:

2.5.13.4(1) Report from the CxA clarifying how all issues identified in the Commissioning design reviews have been resolved and the next steps for any remaining issues.

2.5.13.4(2) Updated Commissioning Plan that includes a Commissioning schedule identifying commissioning milestones, precedent activities and durations of commissioning tasks.

2.5.13.4(3) Updated verification checklists and test procedures.

2.5.13.5 Construction and Occupancy Phase Submittals

2.5.13.5(1) Provide a copy of each CxA shop drawing review report within one week of report completion.

2.5.13.5(2) Provide regular updates of Commissioning schedule and advance notice of timing for all commissioning meetings.

2.5.13.5(3) Provide regular updates to the Commissioning Plan based on actual equipment and approved control shop drawings and sequences of operation.

2.5.13.5(4) Provide pre-functional check sheets (drafts to be provided in advance of pre-functional checks and completed versions within 2 weeks of pre-functional checks being completed for individual equipment or systems).

2.5.13.5(5) Provide installation check sheets (drafts to be provided in advance of installation checks and completed versions within 2 weeks of installation checks being completed for individual equipment or systems).

2.5.13.5(6) Provide start-up check sheets (drafts to be provided in advance of start-up checks and completed versions within 2 weeks of start-up checks being completed for individual equipment or systems).

2.5.13.5(7) Provide copies of functional and integrated test procedures in advance of functional and integrated testing for each system and provide completed functional and integrated test reporting within two (2) weeks of each system's completion.

2.5.13.5(8) Provide copies of Commissioning meeting minutes,

2.5.13.5(9) Provide regularly updated Commissioning issues logs and confirmation detailing how issues have been resolved.

2.5.13.5(10) Provide Owner’s Training agendas for each system well in advance of planned training date.

2.5.13.6 Fire Safety Plans

2.5.13.6(1) Project Co will retain a professional fire safety consultant. The professional fire safety consultant will provide fire safety plans and all related documentation as required by the Governmental Authority and coordinate in further consultation with the Owner to ensure such documentation meets all applicable Owner standards for Fire Safety Plans and related documentation.

2.6 Mock-up and In-Situ Prototype Rooms

2.6.1 Project Co will, at its cost and as part of the process described in Schedule 2 [Design and Construction Protocols], provide and make available to the Owner for review the mock-ups and in-situ prototype rooms described in this Section.

2.6.2 The timing of the Construction and review of these mock-ups and in-situ prototype rooms to be such that any adjustment to the Design can be accommodated without additional

cost to the Owner or delay to the Project. The fully-constructed mock-up rooms will remain available to the Owner through the course of Construction.

2.6.3 Project Co will provide the hardware, software and supporting services to facilitate 3D design visualization and virtual reality mock ups. The mock up space will include one (1) fixed performance VR-ready workstation with two fixed, large format viewing displays in addition to the workstation operator display.

2.6.4 Project Co will include dates on the Submittal Schedule for Construction of and for the Owner's review of mock-ups and in-situ prototype rooms. The time periods for the Owner review and comments on Submittals set out in Schedule 2 [Design and Construction Protocols] will apply to mock-ups.

2.6.5 By the date set out in the Submittal Schedule, Project Co will provide 1:1 scale paper (using either paper, tape markings on the floor or similar), virtual reality, fully constructed mock-ups and in-situ prototypes that will include all actual materials, dimensions, finishes, location and configuration of Millwork, Modular Casework, services, controls, equipment, Clinical Systems Furniture, Equipment and Furniture included in the design of the room so that the Owner can experience all features of the Design and conduct its reviews and make design decisions.

2.6.6 Mock-ups of the following rooms will be provided:

Ref No	Room Description	Paper	Virtual Reality	Mock-Up Rooms	In-Situ Prototype Rooms
A1.3.10	Care Team Station	X	X	X	
A1.2.1	Resuscitation Room	X	X		
A1.7.3	Exam/Treatment Bay	X	X		
A1.5.1 A1.5.2 A1.5.3	Exam/Treatment Room with anteroom and ensuite	X	X	X	X
A1.1.8	Registration/Triage	X	X		
B2.2.5, B2.2.6, B2.2.7	Patient Room-Critical Care with anteroom and ensuite	X	X	X	X
D.2.2.2	Outpatient Exam Room	X	X		
D3.2.4	Hemodialysis Treatment Station-Bed	X	X	X	
D3.2.5	Hemodialysis Treatment Station-Chair	X			
E2.2.3, E2.2.4	Patient Room-SRMC with ensuite	X	X	X	X
E3.1.4, E3.1.5	Patient Room-NICU with ensuite	X	X	X	

Ref No	Room Description	Paper	Virtual Reality	Mock-Up Rooms	In-Situ Prototype Rooms
F3.4.1.10	Care Team Station	X			
F1.3.10	Care Team Station	X	X	X	
F3.2.1.7, F3.2.1.8	Patient Room-MH with ensuite	X	X	X	
F3.2.1.2, F3.2.1.3	Secure Room with anteroom	X	X	X	
G1.2.3, G1.2.4	Interventional Suite with control room	X	X	X	
G1.3.3, G1.3.4, G1.3.7	Operating Room with scrub station and alcove stretcher	X	X	X	
G1.3.8, G1.3.9	Operating Room-Hybrid with control room	X	X	X	
G2.2.1	Procedure Room-General	X	X	X	X
G1.5.3	ACU Bay	X	X	X	X
I2.3.5, I2.3.6	Imaging-CT with Control Room		X		
I2.4.5, I2.4.6	Imaging-MRI with Control Room		X		
C1.1.2.10, C1.1.2.11	Inpatient Care Team Station including enclosure	X	X	X	
C1.1.2.6, C1.1.2.7	Inpatient Room with ensuite	X	X	X	X
C1.1.3.8	Soiled Utility room	X		X	
C1.1.2.14	Medication Room	X			
C1.1.2.9	Hand Hygiene Station or Alcove	X		X	
C1.1.2.17	Nourishment Room	X			
J4	Lab	Cluster(s) of key space /room relationships	X		
J1	Pharmacy	Cluster(s) of key space /room relationships	X		
O2	MDRD	Cluster(s) of key space /room relationships	X		
H1.2.2	Outpatient Clinic Pod	Cluster(s) of key space	X		

Ref No	Room Description	Paper	Virtual Reality	Mock-Up Rooms	In-Situ Prototype Rooms
		/room relationships			
M6	Roman Catholic Chapel		X		
M7	All-Nations Sacred Space		X		
N3.5, N3.6, N3.7	Clinical Skills Room, enhanced and observation	X	X	X	
	BMS Simulation		X		

2.6.7 Equipment and Furniture may be actual pieces or replicas but will accurately represent the actual physical dimensions.

2.6.8 Project Co will construct mock-ups of each type of Patient service unit, e.g. headwalls (vertical or horizontal), consoles, ceiling columns, booms, telescoping booms, etc.

2.6.9 The purpose of the mock-up is to illustrate the Design. Project Co will update all Design documentation to reflect the mock-up and in-situ prototype rooms, and any input from the Owner, including User Consultation Groups, and will submit all such updated Design documentation to the Owner for review under Schedule 2 [Design and Construction Protocols].

2.6.10 Project Co will construct working mock-ups (at appropriate heights) of hand hygiene sinks and scrub sinks.

2.6.11 Project Co will modify the mock-ups as may be required as the Design develops based on Owner feedback in the process described in Appendix 2C [User Consultation and Design Review].

2.6.12 Project Co to confirm additional mock-up room requirements with the Owner.

2.6.13 Project Co will provide a site in the City for the mock-ups that is acceptable to the Owner. Mock-ups can be at a location either within the Facility as it is under Construction or at another location provided by Project Co near the Facility. In-situ prototype rooms will be provided in the Facility and be made available to the Owner for review at the appropriate stages of Construction.

2.6.14 The mock-up site will include a large, dedicated meeting space suitable for 20 users and provide wired and wireless computer networking infrastructure designed for high-bandwidth and low-latency.

2.7 Requirements During Construction

2.7.1 Site Access During Construction

2.7.1.1 Project Co will provide security and facilities as required to protect the Work from unauthorized entry, vandalism or theft.

2.7.2 Infection Control and Control of Dust and Noxious Odours

2.7.2.1 Project Co will:

2.7.2.1(1) take all reasonable steps (including any specific steps reasonably required by the Owner) to minimize dust and noxious odours (including diesel exhaust) from the Construction (including demolition and preparation of the Site) and to mitigate any adverse effects on the existing neighborhood;

2.7.2.1(2) ensure all diesel equipment will have exhaust purifier scrubbers that comply with all regulations pertaining to concentrations of Carbon Monoxide (CO), Hydrocarbons (HC) and Particulate Matter (PM) exhaust pollutants. Project Co will include appropriate meters to test concentration levels on the Health Campus, as will be required by the Owner from time-to-time

2.7.2.1(3) clean all adjacent buildings, roadways, pathways, and other areas directly affected by the Construction at regular intervals to the satisfaction of the Owner to prevent buildup of dirt and dust caused by the Construction and maintain them in the same condition as found and determined by the pre-condition surveys; and

2.7.2.1(4) without limiting Project Co's obligation under the Section above:

2.7.2.1(4)(a) comply with CSA Z317.13 Infection Control during Construction, Renovation or Maintenance of Healthcare Facilities, at all times during the Construction period and post Service Commencement;

2.7.2.1(4)(b) submit the Infection Prevention and Control Management Plan to the Owner for review and approval and implement prior to commencing any Work;

2.7.2.1(4)(c) ensure every individual who performs Work at the Site is appropriately infection prevention and control trained in either the CSA Group course(s) or acceptable alternative as reviewed by the Owner;

2.7.2.1(4)(d) retain an Infection Control Practitioner to:

2.7.2.1.4.(d).1 Develop the Infection Prevention and Control Management Plan;

2.7.2.1.4.(d).2 Perform infection prevention and control training;

2.7.2.1.4.(d).3 Assist with regular site inspections of relevant Work areas;

2.7.2.1.4.(d).4 Perform regular audits on the implemented infection control risk management system and related protocols, processes and documents;

2.7.2.1.4.(d).5 Assist with monitoring compliance with relevant/applicable sections of the CSA Standard Z317.13-17;

2.7.2.1.4.(d).6 Assist with developing required infection prevention and control procedures, method statements, checklist, records etc., as required; and/or

2.7.2.1.4.(d).7 Perform air monitoring as required.

2.7.2.1(4)(e) perform and record, with internal, trained personnel, minimum daily inspections of all areas including any areas which may be occupied by the Owner post Service Commencement where Construction is occurring, to monitor compliance with CSA Z317.13 on a daily basis during Construction and undertake prompt corrective actions where infection risks have been identified;

2.7.2.1(4)(f) have additional work area inspections performed by Project Co's retained contractors or subcontractors;

2.7.2.1(4)(g) submit to the Owner a monthly Infection Prevention and Control Statistics Performance Report on no later than the 5th business day of the following month, that:

2.7.2.1.4.(g).1 outlines the steps undertaken by Project Co to comply with CSA Standard Z317.13;

2.7.2.1.4.(g).2 confirms Project Co's compliance with CSA Standard Z317.13; and

2.7.2.1.4.(g).3 briefly details non-conformances and corrective actions undertaken to rectify the issue(s).

2.7.2.1(4)(h) perform a hospital-grade terminal clean prior to Service Commencement. Project Co will ensure that areas are clean upon completion of all final deficiency work such that all spaces are available to the Owner for their intended use;

2.7.2.1(4)(i) Submit the inspection form(s) and a final summary report to the Owner for review, prior to Service Commencement; and

2.7.2.1(4)(j) participate in Multidisciplinary team (MDT) meetings regularly and on MDT members request to discuss Infection Control Risk Assessment (ICRA) and disclose any and all changes and problems with preventative measures during scope of this Project.

2.7.3 Demolition and Related Work

2.7.3.1 Basic Requirements

2.7.3.1(1) Project Co is responsible for the demolition of the following:

2.7.3.1(1)(a) Existing Warehouse located on the north edge of the Site;

2.7.3.1(1)(b) All existing buildings, foundations, structures, roads, curbs, parking areas, walkways, landscaping and any other Site improvements;

2.7.3.1(1)(c) All existing Building Systems terminations and cap offs prior to demolition;

2.7.3.1(1)(d) Existing sub-surface elements such as foundations, slabs, pits, sumps, pipes, cables, ducts and underground tanks including related piping;

2.7.3.1(1)(e) Existing Utilities; and

2.7.3.1(1)(f) All demolition that is necessary, above ground and sub surface, for the Construction of the Health Campus.

2.7.3.1(2) Project Co acknowledges and agrees:

2.7.3.1(2)(a) it has received and reviewed a copy of the Geotechnical Reports and Hazardous Substance Reports;

2.7.3.1(2)(b) it is responsible for all management, removal, abatement, containment and disposal of all Hazardous Substances disclosed in or reasonably inferred from the Hazardous Substance Reports and such Hazardous Substances will be Project Co Hazardous Substances;

2.7.3.1(2)(c) any remediation must comply with the Environmental Management Act and Contaminated Sites Regulation; and

2.7.3.1(2)(d) the Owner is not in any way responsible or liable for the completeness, interpretation or accuracy of the Hazardous Substance Reports.

2.7.3.1(3) Project Co will:

2.7.3.1(3)(a) complete a hazardous materials study, at its cost, to determine the extent of existing Hazardous Substances in building and utility elements to be demolished, including; asbestos, lead paint, PCB's, CFC's, radioactive substances, bio-hazards and mercury and all such Hazardous Substances will be Project Co Hazardous Substances;

2.7.3.1(3)(b) take all precautions so that no transmission of Project Co Hazardous Substances and noxious fumes interfere or contaminate the Site and surrounding neighbourhood;

2.7.3.1(3)(c) be responsible for management, removal, abatement, containment and disposal of any underground storage tanks and any underground piping and appurtenances, including any that may themselves constitute Project Co Hazardous Substances;

2.7.3.1(3)(d) complete the management, removal, abatement, containment and disposal of all Project Co Hazardous Substances prior to demolition;

2.7.3.1(3)(e) prior to performing demolition work, submit a report on the protective measures in place for existing buildings to the Owner;

2.7.3.1(3)(f) conform to applicable codes for demolition of structures and provide for the safety of adjacent structures, the erection and maintenance of temporary barriers and security devices;

2.7.3.1(3)(g) obtain City and Owner approvals required to undertake a demolition;

2.7.3.1(3)(h) ensure demolition work does not interfere with, or prevent the Site and neighbouring buildings from operating normally;

2.7.3.1(3)(i)	provide perimeter screen and safety walls to ensure safety and protection of people and objects outside of the demolition area; provide overhead protection from falling debris;
2.7.3.1(3)(j)	schedule hours of operation and plan the traffic flow required for demolition in accordance with the Phasing Plan, referred to in Schedule 2 [Design and Construction Protocols];
2.7.3.1(3)(k)	be responsible for ensuring that fire safety will be in force at all times during demolition;
2.7.3.1(3)(l)	implement a pest control management plan for related areas before, during and post demolition;
2.7.3.1(3)(m)	perform demolition work in accordance with LEED requirements;
2.7.3.1(3)(n)	provide dust control at all times:
2.7.3.1(3)(o)	spray demolition area with water once demolition of structure begins;
2.7.3.1(3)(p)	manage water runoff through the Site;
2.7.3.1(3)(q)	protect all storm drains that could be affected by the demolition work;
2.7.3.1(3)(r)	perform work in accordance with Schedule 2, Control of Noise;
2.7.3.1(3)(s)	secure demolition site 24/7; obtain Owner's approval of Project Co's Security Plan prior to commencing work;
2.7.3.1(3)(t)	conform to applicable regulatory procedures, including WorkSafe BC requirements, during all phases of the demolition and when discovering hazardous or contaminated materials;
2.7.3.1(3)(u)	remove of all demolition materials from the site safely and legally;
2.7.3.1(3)(v)	provide required LEED documentation;
2.7.3.1(3)(w)	disconnect, cap, plug or divert as required existing services;

2.7.3.1(3)(x) accurately record actual locations of capped utilities, subsurface obstructions and/or conditions; and

2.7.3.1(3)(y) be responsible for landfill tipping fees.

2.7.4 Waste Management – Hazardous and Non-Hazardous

2.7.4.1 Project Co will:

2.7.4.1(1) Comply with territorial and municipal Standards with respect to waste management programs on construction sites.

2.7.4.1(2) Manage waste generated from the Site in accordance with City standards.

2.7.4.1(3) Take an active role in implementing environmentally sound business practices and producing goods and services that lessen the burden on the environment in production, use and final disposition. Implement reduction, reuse and recycling strategies and the use of environmentally sound products.

2.7.4.1(4) For the removal and disposal of special waste and hazardous waste, Project Co will only retain contractors pre-approved by the Owner. Removal and disposal of all other special waste and hazardous waste will be by trained personnel or a specialty contractor, as retained by Project Co

2.7.4.1(5) Designate an area or areas for location of bins and source separation of materials. Keep the area(s) clean and organized. If comingled bins are to be used, ensure that off-site sorting company will remain committed to a required waste diversion rate.

2.7.4.1(6) Store and dispose of hazardous waste materials in a manner that is in full accordance with all applicable federal and City requirements and standards.

2.7.4.1(7) Implement waste reduction by reducing or eliminating excessive packaging practices.

2.7.4.1(8) Use, where appropriate, combination of packaging materials such as re-usable containers, blanket wrap or cushioning material provided that all reasonable requirements of materials handling, transportation and storage are observed.

2.7.5 Energy Centre

2.7.5.1 Project Co will demonstrate a fully operational Energy Centre to the Owner that services the Health Campus six (6) months prior to the Service Commencement Date of the Facility.

2.7.5.2 Project Co will ensure that its Phasing Plan allows for a stabilization period for the Energy Centre. The duration of the stabilization period will be no less than one (1) full month and will commence prior to the Energy Centre being handed over to the Owner.

2.7.5.3 Project Co remains responsible for all power necessary for the performance of the Construction.

2.7.5.4 Prior to commencement of the stabilization period, the following general conditions will be met:

2.7.5.4(1) Mechanical and electrical plant and associated Building Systems required to service the Facility will be installed, commissioned, and performing in accordance with the requirements set out in the Agreement;

2.7.5.4(2) Operations and maintenance Staff will be trained and equipped with required documentation to operate and maintain the completed Energy Centre; and

2.7.5.4(3) All the Owner's wired and wireless Information Technology (IT) and communications infrastructure required to commission the Energy Centre and integrate it to the site as well as enable the Facility Management Staff to operate the Energy Centre will be installed, commissioned, and performing in accordance with the Owner's Project Requirements and specifications.

2.7.5.5 The specific list of conditions required to provide an operational Energy Centre are dependent on the specifics of the final Energy Centre design and require input from multiple stakeholders. Project Co and the Owner will work collaboratively to define the specific list of conditions and develop the associated implementation plans and schedules by the completion of the Design and Construction Documents process. Iterative plans, schedules, and associated details will be provided to the Owner for review by Project Co as part of each formal Design and Construction Documents Submittal, starting with the 30% Design and Construction Documents Submittal.

2.8 Future Heliport

2.8.1 General Requirements

2.8.1.1 The Owner plans to install a heliport in future of which the Helipad will be a modular prefabricated aluminum construction, meeting all applicable regulations and design standards, and the requirements for certification by Transport Canada.

2.8.1.2 Project Co will Design the Facility to enable the installation and facilitate certification of the Future Heliport as described in this Schedule.

2.8.2 Heliport Classification and Operational Limitations

2.8.2.1 The Owner plans to install a heliport in future capable of being certified as an H1 Rooftop Heliport in accordance with CARs Standards 305 and 325 and as follows:

2.8.2.1(1) The Future Heliport category will be non-instrument; and

2.8.2.1(2) The Future Heliport classification will be H1.

2.8.3 Project Co will design the Facility for a Future Heliport, which will be able to support the static and dynamic loads imposed by the helicopters detailed in Section 2.8.4.2, for which it will be certified.

2.8.4 The Facility will be designed to accommodate a Future Heliport:

2.8.4.1 for a helicopter having an overall length of 17.6 m; and

2.8.4.2 for the following critical design helicopter mix certified for CAT A operations in Canada:

2.8.4.2(1) Bell 412EP;

2.8.4.2(2) Sikorsky S76 C+; and

2.8.4.2(3) Agusta Westland AW139.

2.8.5 Touch Down and Lift Off Area

2.8.5.1 The Facility will be designed to accommodate the Future Heliport TLOF, which will have an air gap of suitable dimensions and allow for inspection, maintenance and normal repair without removal of the Future Heliport.

2.8.5.2 Project Co will prepare an Air Turbidity Study to determine the size of the air gap and will ensure that the air gap does not create a future confined space for the Owner’s maintenance personnel.

2.8.6 Site Requirements

2.8.6.1 Project Co will provide infrastructure at all Secure Outdoor Spaces along the proposed flight path for an alarm to be installed to notify Staff to move Patients and visitors inside if there is an incoming helicopter arriving at the Future Heliport.

2.8.6.2 Project Co will ensure all landscape materials and site furnishings located on Secure Outdoor Spaces along the proposed flight path are secured and designed to prevent any disturbance or movement due to a helicopter arriving at the Future Heliport.

2.8.7 Architectural Requirements

2.8.7.1 Project Co will Design the Facility such that:

2.8.7.1(1) At least two (2) means of egress from the TLOF will be provided. The egress points will be located at least 90 degrees from each

other as measured from the centre of the TLOF and will be located remotely from each other, not less than 9.1 m apart;

2.8.7.1(2) The Future Heliport will have at least 2 (two) access points that provide rapid access to fire-fighting personnel;

2.8.7.2 Project Co will Design the elevator lobby for least one (1) future ramp to connect the elevator lobby to the Future Heliport TLOF; refer to Section 2.8.8.5.

2.8.7.3 Provide contiguous roof covering the area within 15.2 m of the landing pad edge with Class A fire resistance rating for exterior fire exposure as defined by the NFPA standards.

2.8.7.4 Provide rooftop service rooms sized to allow future installation of sufficient mechanical, electrical and IM/IT equipment to support the Future Heliport, including:

2.8.7.4(1) Electrical distribution transformer(s) and panelboards for circuits associated with the Future Heliport, including for freeze protection, outlets, ground power, IM/IT equipment, exit signs, and lighting. Service rooms or electrical closets will be located on every rooftop that will require obstruction lighting, to allow installation of rooftop panelboards and the associated risers for future circuits;

2.8.7.4(2) IM/IT equipment to support radio, telephone, data, security, nurse call and any other Heliport-associated technology requirements;

2.8.7.4(3) Fire alarm wiring, isolators, and other devices;

2.8.7.4(4) Continuous riser pathways from the rooftop service rooms to electrical and mechanical rooms or shafts below; and

2.8.7.4(5) A glycol snow melt system serving the underpad heating of the Future Heliport.

2.8.8 Elevator and Vestibule Requirements

2.8.8.1 Two (2) Patient Transfer/Staff Service Elevators, with Direct Access to Surgical and Interventional Services and Emergency Services, will extend and service the vestibule for the Future Heliport.

2.8.8.2 The overhead machine room for the two (2) Patient Transfer/Staff Service Elevators designated for the Future Heliport will be built above the Heliport Vestibule to avoid major infrastructure changes and relocation of elevator equipment when the Future Heliport is built.

2.8.8.3 The elevator entrances will be installed at the Future Heliport level/stop for future passenger use.

2.8.8.4 The elevator controllers will accommodate the stop for the Future Heliport. In addition, the elevator car operating panels will be provided with a keyed switch to access the Future Heliport level/stop by authorized personnel. The keyed switch will be designed so that it can be replaced with a functioning button that matches the other buttons when the Future Heliport level/stop is brought into use.

2.8.8.5 Project Co will provide a vestibule directly adjacent to the Patient Transfer/Staff Service Elevators at the same floor elevation as the TLOF for the Future Heliport which includes:

2.8.8.5(1) An unobstructed view of the future TLOF and access ramp area;

2.8.8.5(2) An unobstructed view of all approach and departure path areas;

2.8.8.5(3) Conduit and outlet box rough-ins for power and data for a future workstation suitable for installation of and/or storage of PPE, portable radios, receptacles, telephone for internal and external calls, IP video monitor, document filing and display and writing surface;

2.8.8.5(4) Conduit and outlet box rough-ins for power to allow an aircraft ground power unit to be installed at a later date.

2.8.8.5(5) Vestibule with double doors leading to a landing and stairway down to the roof level.

2.8.8.5(6) Conduit and outlet box rough-ins for nurse call system devices to enable Staff to initiate MEO for the convenience of emergency Staff.

2.8.8.5(7) Lighting, exit signs and any required fire alarm devices including speakers, manual stations, and smoke detectors.

2.8.8.6 The vestibule will be designed to accommodate comfortably two (2) stretchers plus attending personnel.

2.8.8.7 Project Co will provide conduit and outlet box rough-ins for a Future Heliport beacon and status beacons to be installed by the Owner at the elevator overrun / Future Heliport vestibule.

2.8.9 Structural Requirements

2.8.9.1 Project Co will Design the Facility to accommodate, without requiring modification of the primary structure, a Future Heliport with a helicopter static load of 8618 kg times a dynamic factor of 1.5 for landing impact.

2.8.10 Mechanical Requirements

2.8.10.1 The Future Heliport will be equipped with a future fixed location foam fire suppression system sized appropriately for the category of helicopters described above.

2.8.10.2 The Design and installation of the future foam fire suppression system will be in accordance with the applicable Transport Canada Regulations for roof top Heliport installations.

2.8.10.3 For the fixed location foam fire suppression system, provide for all space that will be necessary to house the firefighting equipment and all control and fire alarm devices and all water components necessary for a complete installation. Allow for this space as part of the Facility.

2.8.10.4 The Future Heliport will have a drainage system installed that will be connected to a coalescing plate fuel oil/water separator.

2.8.10.5 The future fuel oil/water separator will be located below the Future Heliport pad but will be set on the existing roof structure. Coordinate with Structural Engineer-Of-Record to ensure that the roof of the Facility can support future fuel oil/water separator weight and will not require future upgrades.

2.8.10.6 The future fuel oil/water separators will be designed to be of sufficient capacity and flow rate to handle storm water and fire suppression output from the entire touchdown and lift off areas of the Future Heliport.

2.8.10.7 The fuel oil components that are drawn off from the future separator will be piped from the roof top location, through the building to a containment tank located below grade level outside of the Facility. Provide this piping as part of the Facility and provide space for the future containment tank.

2.8.10.8 The waste fuel discharge piping from the future fuel oil / water separator will be a 50 mm welded schedule 10 type 304 stainless steel piping system complete with orbitally welded fittings. The stainless-steel piping will be installed for Service Commencement, ready for connection to the Future Heliport systems.

2.8.10.9 A future waste fuel oil storage tank will have a capacity 30% greater than the fuel supply required by the anticipated aircraft and will be a double walled constructed unit that can be buried below grade outside of the Facility. Provide space for the future storage tank.

2.8.10.10 Drainage for the Future Heliport will not be installed in the TLOF area of the Future Heliport and will be designed in accordance with the applicable Transport Canada regulations.

2.8.10.11 All gutters, conveyance plumbing, storage tanks and fuel oil / water separators will be provided with freeze protection.

2.8.10.12 The storm water drainage from the fuel oil / water separator will be connected to the Facility storm water / sanitary drainage system as approved by the

Governmental Authority. Size drainage capacity adequately to allow for the Future Heliport and provide capped connections.

2.8.10.13 Chillers and cooling towers will be designed and located so as not to have an adverse effect on the Future Heliport flight path. Any flammable liquid storage tanks, compressed gas storage tanks, and liquefied gas storage tanks will be located away from the approach and take-off areas with sufficient clearance to meet Transport Canada requirements.

2.8.10.14 Provide valved and capped steam and condensate branches to the future TLOF area, ready for installing a future underpad heating system for the TLOF area and walkway for the Future Heliport.

2.8.10.15 Design Facility discharges including exhaust air, smoke exhaust while under fire alarm, boiler vents and emergency generator exhaust to ensure they do not interfere with the Future Heliport operation.

2.8.11 Acoustic and Vibration Requirements

2.8.11.1 Ensure that vibration levels from Future Helipad operations do not exceed vibration levels specified in the table set out at Section 5.9.6.5(4) of this Schedule.

2.8.11.2 If the Future Heliport helicopter operations are not expected to exceed an average of three (3) flights per day and two (2) flights per week during the nighttime between 10:00 P.M. and 7:00 A.M., the Design of the façade will be such that 95% of helicopter events do not exceed:

2.8.11.2(1) 65 dBA Lmax (fast) in Patient Rooms; and

2.8.11.2(2) 70 dBA Lmax (fast) in all other areas.

2.8.11.3 If Future Heliport helicopter operations are expected to exceed three (3) flights per day or two (2) flights per week during the nighttime between 10:00 P.M. and 7:00 A.M., the design of the façade will be such that 95% of helicopter events do not exceed the dBA ratings for each of the room types listed in Table 6 – Noise Criteria – Maximum Noise Levels Within Various Spaces of Appendix 3C [Acoustic And Noise Control Measures] by more than 15 dB when measured as Lmax (fast). For example, Patient rooms rated 35 dBA should not exceed 50 dBA Lmax (fast). It is expected that the wall and glazing construction requirements for meeting the targets will vary by proximity to the helicopter flight path. Project Co will provide an Acoustic Modelling Report prepared by an Acoustic and Vibration Consultant for review by the Owner that will identify:

2.8.11.3(1) Helicopter flight path(s);

2.8.11.3(2) Expected frequency of helicopter operations, with any amendments to the following anticipated frequency, based on similar urban hospital helicopter operations, where one (1) flight

includes both arrival and departure, and nighttime flights are those occurring after 10 pm:

2.8.11.3(2)(a) Average of four (4) daytime and one (1) nighttime flight(s) per week; and

2.8.11.3(2)(b) Peak of thirteen (13) flights in one week, including ten (10) daytime and three (3) nighttime flights;

2.8.11.3(3) Sound spectrum and levels produced during flight and hover operations for the types of helicopters anticipated for use at the Facility;

2.8.11.3(4) Maximum sound levels for each level and each structural bay of the building façade, as determined by noise modelling using industry standard methods and software, for each flight path and helicopter type;

2.8.11.3(5) Minimum OITC façade ratings (glazing and wall segments) required to meet indoor noise limits noted above for heliport operations;

2.8.11.3(6) Minimum OITC façade ratings (glazing and wall segments) required to meet non-heliport operation criteria (indoor noise limits specified in Appendix 3C [Acoustic and Noise Control Measures]);

2.8.11.3(7) Indicate the locations where indoor sound limits will be met with glazing rated OITC 33 or less;

2.8.11.3(8) Indicate the expected sound levels in spaces where interior sound limits will be exceeded when using OITC 33 glazing; and

2.8.11.3(9) The design of the Facility is to be based upon a maximum OITC 33 rating for glazing. Project Co will provide design options for the Owner to select upgrades to meet or improve noise control in spaces where OITC 33 is insufficient to meet the helipad operations noise targets as indicated in the Acoustic Modelling Report.

2.9 Move In

2.9.1 Project Co will coordinate with the Owner, the date for the move of Staff personnel and Patients to the Facility. The exact timing and sequencing of this phase will involve coordination with the Owner. Refer to Appendix 2E [Equipment and Furniture] for further requirements.

2.9.2 As soon as reasonably practicable, but in any event no later than 180 days in advance of Service Commencement, Project Co will deliver a Move-In schedule in respect of the Facility. It will indicate the anticipated dates when such areas will become available for

occupation by the Owner so as to facilitate and permit the Owner to progressively take up occupation in an efficient manner.

2.9.3 The Owner will advise Project Co of any key or significant moves or Move-In requirements, and Project Co will, as reasonably possible, accommodate the Owner's requirements and requests.

2.9.4 Project Co will assist with the planning and coordination of the move of all other equipment, Furniture, fixtures and fittings with the Owner’s moving company, participating in move planning meetings, keeping the Owner apprised of construction progress and setting firm dates for when the move can occur, relative to the completion of the Facility.

2.9.5 The Facility will have reached Service Commencement prior to the move. Once the completion dates have been agreed and put in place, the Owner will rely on this information in order to plan and execute the move.

2.9.6 Project Co will be responsible for all damage to Furniture, equipment and Facility finishes incurred during the move of any items moved by Project Co.

2.9.7 Project Co will accommodate and assist the Owner to hold any open house and public announcements requested by the Ministry or relevant parties that may be required prior to Service Commencement or Move In.

PART 3. OWNER'S IDENTITY AND DESIGN OBJECTIVES

3.1 The Owner's Identity

3.1.1 Project Co will reflect the Owner's Identity in the Design of the Facility. The Design of the Facility and Health Campus will express, showcase and advance the Owner's identity through the interior and exterior Design elements.

3.1.2 The Owner's Identity is embedded in its Catholic faith-based health care heritage, first witnessed by our founding religious sisters, and its fundamental relationship to the Catholic Church healing ministry of Jesus Christ.

3.1.3 The Owner expresses its identity by serving with compassion and social justice in delivering health care, research, education and teaching for all who suffer health issues. The Owner has a history of providing compassionate care for the most vulnerable and disenfranchised people in the community.

3.1.4 The Owner's Identity is defined by the following:

3.1.4.1 Mission

3.1.4.1(1) Inspired by the healing ministry of Jesus Christ, the Owner is a Catholic health care community dedicated to meeting the physical, emotional, social and spiritual needs of those served through compassionate care, teaching and research.

3.1.4.2 Vision

3.1.4.2(1) Driven by compassion and social justice, the Owner is at the forefront of exceptional care and innovation.

3.1.4.3 Values

3.1.4.3(1) Spirituality, Integrity, Stewardship, Trust, Excellence, and Respect (S-I-S-T-E-R).

3.1.5 Project Co will advance the Owner's identity in the Design of the Facility by;

3.1.5.1 Honouring the organization's heritage and legacy;

3.1.5.2 Creating welcoming, culturally safe and compassionate places for collaboration between Patients, families and Staff; and

3.1.5.3 Accommodating large or small groups in meeting spaces adjacent to Clinical Spaces, for visiting family members.

3.1.6 Heritage of Innovation

3.1.6.1 The Owner prides itself on being an innovative organization, sensitive to cultural shifts, new challenges, and new ways to serve. The ability to adjust and innovate

in its services is the organization's enduring legacy. The Design of the Facility will facilitate innovation and become part of the Owner's legacy.

3.1.7 Commitment to Reconciliation and Indigenous Wellness

3.1.7.1 The Owner is signatory to a Declaration of Cultural Safety and Humility with the First Nations Health Authority. The Owner is committed to advancing the Truth and Reconciliation Commission's Calls to Action and UNDRIP towards improved wellness for Indigenous peoples. The Owner's commitment to reconciliation is part of the organization's culture and identity.

3.2 Design Objectives

3.2.1 The Owner has the following design objectives for the Project:

3.2.1.1 Design, Health and Wellness:

3.2.1.1(1) Provide a Design that is inspired by and reflects the healing traditions of Catholic faith-based health care and also reflects a commitment to indigenous reconciliation, recognizing that the Facility will be located on the unceded, ancestral and traditional lands of the Musqueam, Squamish and Tsleil-Waututh First Nations;

3.2.1.1(2) Provide a Design that is welcoming, accessible and intuitive for a multicultural population of Patients, families and Staff;

3.2.1.1(3) Provide a Design that promotes health, wellness and productivity through features that incorporate elements of nature into the indoor environment, including: natural finishes and textures, appropriate use of colour, and windows for natural daylight and views of nature;

3.2.1.1(4) Provide a Design that incorporates positive enhancements into the built environment, such as art, music and opportunities to participate in traditional Indigenous healing practices;

3.2.1.1(5) Provide a Design that promotes the Owner's Identity;

3.2.1.1(6) Provide a Design that displays and promotes learning activities through views from public areas into collaborative teaching spaces such as conference and meeting rooms, while maintaining privacy and confidentiality; and

3.2.1.1(7) Provide a Design that positions the Facility within the surrounding community as a gateway to positive health outcomes.

3.2.1.2 Flexibility and Adaptability

3.2.1.2(1) Provide a Design that enables the Owner to deliver ongoing clinical excellence through integrated flexible services;

3.2.1.2(2) Provide a Design that maximizes long-term adaptability for service delivery to maintain a high level of space utilization; and

3.2.1.2(3) Clearly organize and separate Patient, public, Staff and service flows within the Facility and demonstrate how these will connect to the Future Expansion, including the CSRC and West Precinct.

3.2.1.3 Collaboration

3.2.1.3(1) Provide a Design that optimizes opportunities for collaboration between Patients, care providers, learners and researchers;

3.2.1.3(2) Provide a Design that includes workplaces designed to enable innovative and collaborative methods of working that incorporate new and emerging technologies, accommodate diverse working styles and optimize flexibility and space utilization; and

3.2.1.3(3) Provide an environment that supports excellence and innovation in the delivery of safe, high quality health care and where Staff, care providers and others will work together collaboratively in promoting Patient health and wellness.

3.2.1.4 Technology

3.2.1.4(1) Provide a Design that enables the Owner's use of technology to improve cost effectiveness, integrate services, and achieve better health outcomes. The Facility infrastructure will enable current and emerging technology to support care, learning, and innovation;

3.2.1.4(2) Provide a Design that supports the role of technology in enhancing Patients' experience of receiving and taking an active role in their treatment and care; and

3.2.1.4(3) Provide a Design where technology is planned in parallel with the clinical work processes to support efficient operations so that Staff can communicate easily, supplies and equipment are readily available, and information is accessible.

3.2.1.5 Wayfinding

3.2.1.5(1) Provide a Design that creates an intuitive Wayfinding experience that simplifies flows for all Patients, visitors and Staff;

3.2.1.5(2) Provide a multi-modal Design that eases Patient, visitor and Staff Wayfinding through the integration of static signage, digital and interactive elements, and human elements;

3.2.1.5(3) Provide signage and other environmental graphics as part of the Design that are simple, legible and intuitive and consider visitors' cognitive, visual or mobility impairments;

3.2.1.5(4) Provide a Design that allows ease of access for Patients and Staff both within the Facility and the Health Campus, and to and from the surrounding public transit, drop-off and parking areas; and

3.2.1.5(5) Provide a Design that locates vertical circulation elements such as stairs and elevators to promote their usage through intuitive, visible and accessible placement.

3.2.1.6 Person- and Family-Centred Design

3.2.1.6(1) Provide a Design that supports and facilitates Person- and Family-Centred Care;

3.2.1.6(2) Provide a Design that will support excellence and innovation in the delivery of safe, quality health care; and

3.2.1.6(3) Incorporate Person- and Family-Centred Care and elder-friendly design concepts to improve the Patient and family experience and enhance Patient safety.

3.2.1.7 Safety

3.2.1.7(1) Provide a Design that creates a welcoming environment for the community of users and includes private treatment spaces in balance with non-clinical use spaces that offer comfort and relaxation.

3.2.1.7(2) Provide a Design in accordance with CPTED principles, having particular regard for theft, mischief and vandalism to mitigate potential adverse events.

3.2.1.7(3) Separation of flows in the circulation system between public, Patient and materials distribution is a desired outcome;

3.2.1.8 Maintenance

3.2.1.8(1) Incorporate efficiencies and innovations that may allow integration of systems to minimize long-term operation and maintenance costs for the Owner;

3.2.1.8(2) Minimize the need for the Owner to undertake work that causes disruption to occupants and business continuity;

3.2.1.8(3) Provide interior and exterior design that supports the Owner’s goal to avoid, reduce, repurpose and recycle waste;

3.2.1.8(4) Minimize overall capital and operating costs for the Facility by designing to enable efficient and economical maintenance, repair and replacement of infrastructure;

3.2.1.8(5) Incorporate the need for Owner to maintain and store critical spares; and

3.2.1.8(6) Maximize the Owner's response time to acquire specialized maintenance, repair and replacement services for critical infrastructure and equipment through design of equipment and infrastructure that have local service capabilities.

3.3 Evidence-Based Design

3.3.1 In undertaking the Design of the Facility, Project Co will apply EBD methodologies to achieve the Project Design Objectives. EBD means that decisions about the Design of the Facility will be based on credible research, information derived from comparable North American projects, and information about the Owner's operations. The goal of EBD is to deliver measurable improvements, for example, in the Owner's associated Patient clinical outcomes, workflow outcomes, productivity, economic and sustainable performance, and Patient satisfaction.

3.3.2 Project Co will provide EBD documentation for the Owner's use to consider, implement, teach, and incorporate into the clinical evaluation of the Project.

3.4 Lean Health Care

3.4.1 Lean Health Care means the application of lean manufacturing principles to health care delivery to reduce the amount of time spent on unnecessary activities, reduce defects in the production of goods or provision of services and promote a framework of continuous process improvement.

3.4.2 Project Co will leverage and review the seven (7) Lean Health Care flows of health services, Information, Patient, Providers, Medications, Supplies, Process Engineering, Equipment, through key Design and operational Cx stages of the Project.

3.4.3 Project Co will design the Facility to:

3.4.3.1 facilitate the delivery of efficient and effective workflows and processes;

3.4.3.2 eliminate waste during the Construction of the Facility as well as within both clinical and non-clinical service delivery processes;

3.4.3.3 facilitate achievement of the Owner's zero waste target to increase waste diversion rates at all new health care construction projects to 90% by 2020;

3.4.3.4 recognize the value to the Owner of Lean Health Care, or equivalent methodologies, in supporting the delivery of Owner activities and accordingly allow the findings from such methodologies to play a key role in influencing design decisions to support the delivery of services within the Facility;

3.4.3.5 include safe, efficient and ergonomic design features throughout all spaces that specifically facilitate the physical activities of Staff and Patients, including appropriate Millwork, handrails, lighting, Patient ceiling lift devices, and Patient assist or equipment manoeuvring space; and

3.4.3.6 serve as an integrated workplace by providing physical environments that

3.4.3.6(1) support innovative and collaborative methods of working, such as a team approach to care, family centred rounds, and team huddles and daily management systems;

3.4.3.6(2) incorporate the Owner's new and emerging technologies;

3.4.3.6(3) incorporate clinical research into daily methods of working; and

3.4.3.6(4) respond to diverse work styles, such as hoteling and job-sharing, and optimize flexibility and space utilization.

3.4.4 Accordingly, Project Co will design workspaces to:

3.4.4.1 include modular, generic, and acuity-adaptable rooms and spaces;

3.4.4.2 include standardized and flexible spaces; co-location options, space-saving strategies, and layouts, Modular Casework and Systems Furniture that facilitate change;

3.4.4.3 provide floor layouts that accommodate teams as well as individuals, and that support mobile Staff who require flexibility and use portable technology;

3.4.4.4 accommodate program, service and equipment changes in the future with minimized impact to utility infrastructure and to the Facility, including downtime; and

3.4.4.5 use digital signage to help people find and explain current events in spaces with changing purpose and function.

3.5 Healing Environment

3.5.1 Project Co will design the Facility:

3.5.1.1 to enable the Owner to provide Person- and Family-Centred Care;

3.5.1.2 to provide a safe, healing and wellness-promoting environment for Patients and their families. The environment will be welcoming for the community of users and provide non-Clinical Spaces for relaxation and stress reduction;

3.5.1.3 to promote cultural safety, reconciliation, healing and wellness for Indigenous Patients and their families, in fulfillment of the Owner's Declaration of Commitment to Cultural Safety and Humility;

3.5.1.4 to provide Patients with control over their environment by giving them access to information, navigational tools, and environmental preferences through the use of technology;

3.5.1.5 to include elements that have been proven to create a therapeutic and low-stress environment;

3.5.1.6 to create a comfortable, functional environment for Staff, Patients and visitors by including features designed to support Patients of all ages and their families;

3.5.1.7 to include design elements that create acoustical comfort, minimize annoyance from noise-producing sources, maximize natural daylight, provide high-quality lighting and lighting control, and use natural materials, colours and lighting colour ranges that are therapeutic;

3.5.1.8 to comprise healthy interiors that reduce Patient, Staff and visitor exposure to chemicals of concern, that is, those products for which there is credible evidence showing that chemicals off-gas or migrate out from the finished product and become airborne;

3.5.1.9 to include design elements that maximize human connection to the outdoors, interaction with nature and views of the exterior environment, including:

3.5.1.9(1) utilizing view corridors;

3.5.1.9(2) situating the Facility to benefit from views of public spaces and natural and landscaped views; and

3.5.1.9(3) minimizing negative visuals such as views to parkades or parking lots, blocked views and unwanted shadows.

3.6 Standardization

3.6.1 Project Co will apply principles of standardization in the Design and Construction of the Facility, including the following:

3.6.1.1 Room configurations will allow for flexibility in use over time;

3.6.1.2 Recurrent Rooms will feature entry points, sinks or other plumbing fixtures, medical gases, Millwork, ceiling lifts, controls, and electrical and communication services positioned similarly;

3.6.1.3 Recurrent Rooms, service spaces and pathways will be stacked vertically, including Electrical Rooms, mechanical shafts, Communications Rooms, soiled holding areas, and food services to achieve service core efficiencies;

3.6.1.4 Variations in standardization will not impact clinical operations;

3.6.1.5 Recurrent Rooms will be same-handed wherever possible;

3.6.1.6 Mirrored room layouts will be considered standardized for all Patient Rooms, ACU Patient Room-Airborne Isolation-Hybrid, ACU Patient Bays, Medical Imaging rooms with shared Control-Imaging rooms between them and Interventional Suites with shared Control-Imaging rooms between them; and

3.6.1.7 Equipment components will use consistent consumables for optimized supply chain management.

3.6.2 By implementing the principles of standardization, Project Co will:

3.6.2.1 promote Patient and Staff familiarity with the layout, design, and systems between areas and from floor-to-floor; and

3.6.2.2 promote a reduction or minimization of Patient injuries and Staff errors.

3.7 Sustainability

3.7.1 In addition to obtaining LEED Gold certification for the Facility, Project Co will

3.7.1.1 meet the applicable requirements of the City's Green Buildings Policy for Rezoning;

3.7.1.2 design the Facility by employing systems thinking and applying design methods, building materials, operational practices, energy, climate and Life Cycle considerations that promote environmental quality, social and health benefits and economic vitality throughout the Construction including by minimizing the Owner's operating costs (for example, in relation to Utilities);

3.7.1.3 implement best practices for health facility sustainability and resilience, which by extension impact health service delivery and ultimately human health and wellness; and

3.7.1.4 ensure the long-term relevance and suitability of all visual and written communications encountered on the Health Campus. Do not use visual, communicative or stylistic elements, including graphics or written language or other communications on signs, artworks, installations or other elements, that will obviously date themselves or otherwise become irrelevant over time.

3.7.2 Project Co will design the Facility:

3.7.2.1 to give priority to efficient use of resources, protection of health and indoor environmental quality;

3.7.2.2 to take advantage of efficiencies and innovations achieved through integration of systems and scheduling of climate resilience measures in accordance with Facility half-life and full-life to minimize operational and lifecycle costs for the Owner (for example in relation to Utilities);

3.7.2.3 to take advantage of alternative sources of energy such as passive solar, and on-site power generation and opportunities for waste heat recovery;

3.7.2.4 to apply a total systems approach to minimize energy consumption and incorporate energy consumption management techniques that are targeted to stabilize and optimize energy flows; and

3.7.2.5 to ensure that no materials are used on the interior of the Facility that are detrimental to human health.

3.7.3 Project Co will achieve the following mandatory LEED credits/points:

3.7.3.1 Enhanced Commissioning (6 points - MBCx + Envelope Cx);

3.7.3.2 Advanced Energy Metering;

3.7.3.3 Water Metering;

3.7.3.4 Enhanced Indoor Air Quality Strategies (at least 1 point);

3.7.3.5 Low-Emitting Materials (3 points);

3.7.3.6 Construction Indoor Air Quality Management Plan;

3.7.3.7 Indoor Air Quality Assessment (at least 1 point); and

3.7.3.8 Construction and Demolition Waste Management (2 points).

3.7.4 LEED Pilot Credit IPpc98: Assessment and Planning for Resilience. The Owner will complete pilot credit IPpc98 with emphasis on extreme heat, wildfire and flooding (e.g. due to precipitation, sea level rise, storm surge, sewer overflow) as high priority hazards.

3.7.5 Project Co will achieve at least 16 points from at least 9 of the following LEED credits:

3.7.5.1 Rainwater Management;

3.7.5.2 Places of Respite;

3.7.5.3 Direct Exterior Access;

3.7.5.4 Outdoor Water Use Reduction;

3.7.5.5 Indoor Water Use Reduction;

3.7.5.6 Cooling Tower Water Use;

3.7.5.7 PBT Source Reduction – Mercury

3.7.5.8 PBT Source Reduction – Lead, Cadmium, and Copper

3.7.5.9 Design for Flexibility;

3.7.5.10 Thermal Comfort;

3.7.5.11 Interior Lighting;

3.7.5.12 Daylight;

3.7.5.13 Quality Views;

3.7.5.14 Acoustic Performance;

3.7.5.15 Pilot Credit - Designing with Nature, Biophilic Design for the Indoor Environment;

3.7.5.16 Pilot Credit - Design for Enhanced Resilience;

3.7.5.17 Pilot Credit - Passive Survivability and Back-up Power During Disruption; and

3.7.5.18 Innovation - Green Building Education (1 point).

3.7.6 Project Co will not include any points or credits that require any action by or on behalf of the Owner without the Owner's prior written consent, which may be granted or withheld at the Owner's discretion. If the Owner consents to the inclusion of points or credits that require any action by the Owner, the Owner will take reasonable steps, consistent with the nature of the Facility, to cooperate with Project Co in respect of its achievement of such LEED points and credits, provided that such cooperation will not require that the Owner incur any liability, cost or expense.

3.7.7 The following LEED credit points are not permitted for the Project:

3.7.7.1 Water Efficiency Credit – Outdoor Water Use Reduction: A permanent irrigation system is required for this Project. Any approach towards achieving this credit will include a permanent irrigation system for all vegetated areas; and

3.7.7.2 Energy and Atmosphere Credit – Green Power and Carbon Offsets.

3.7.8 Use the standards and guidelines listed in Section 2.4 Standards as references in undertaking the sustainable Design and Construction initiatives. The selection of LEED credits outlined in Sections 3.7.3, 3.7.4, 3.7.5, and 3.7.7 above incorporates feedback from the LMFM Energy and Environmental Sustainability design Guidelines – New Construction and Major Renovations, which has been listed in Section 2.4 for reference purposes only.

3.8 Climate Resilience

3.8.1 Climate resilience guiding principles:

3.8.1.1 Utilize the best available climate science for the site to inform the Design and Construction. Refer to the Site Level Climate Resilience and Risk Assessment for the New St Paul's Hospital report, Pinna, 2019; Moving Toward Climate Resilient Health Facilities for Vancouver Coastal Health, LMFM, 2018; City of Vancouver climate projections; and City of Vancouver Bylaw CD-1;

3.8.1.2 Ensure climate projections inform decision making and key design elements (including orientation, exposure, building envelope and materials selection) and renewal strategies for Facility half-life and end-life. (see Climate Resiliency Design Guidelines, NYC, 2019);

3.8.1.3 Specify climate-related assumptions and risk thresholds that underpin the proposed Design and Construction;

3.8.1.4 Prioritize visual and physical access to green spaces and urban forests for health and climate co-benefits by using green space design interventions: visibility, entrances, nearby nature, maintain the mature, create the refuge, connectivity, enough green space.

3.8.1.5 Integrate green and grey infrastructure to reduce extreme flood and heat risks on site and off site (e.g. community programs) in alignment with the City of Vancouver Rain City Strategy (e.g. green infrastructure strategy) and Metro Vancouver's Climate 2050 Strategic Framework.

3.8.1.6 The Design Life will exceed 50 years starting at the date of Service Commencement. Table 3.8.2 indicates the Design Life, in years, of major building components and systems. The indicated timeframes are to be used as a guideline for quality.

3.8.1.7 This section will be read in conjunction with Appendix 2D [Energy], which contains further details regarding energy modeling requirements.

3.8.1.8 Conduct a full scope Climate Vulnerability & Risk Assessment as per City rezoning conditions related to climate resilience to prioritize design strategies and adaptation pathways that reduce climate risks and increase resilience to Facility end life.

3.8.1.9 Engage a sustainability or climate risk professional who can provide direction on establishing a vulnerability rating for the baseline impact statements provided prior to the City required Climate Vulnerability & Risk Assessment Workshop. Medium to high vulnerability ratings will be reviewed, validated and adjusted if required based on the collaboration and feedback during the workshop.

3.8.1.10 In conducting the Climate Vulnerability & Risk Assessment, utilize an approach aligned with the International Council for Local Environmental Initiatives (ICLEI) Building Adaptive and Resilient Communities Program (BARC) framework as described in the 5 Milestones of the ICLEI document titled Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation.

3.8.2 Design Life Table

Design Life Table		
CATEGORY	**Major Components/Systems**	**Design Life Years**
SITE	Hardscaping	20+
	Landscaping	15+
	Site lighting	20+
	Exterior IP Video Surveillance/security	15+
	Exterior signage	10+
	Site furnishings	7+
STRUCTURE	Facility structure	50+
	Underground parking	50+

Design Life Table		
CATEGORY	**Major Components/Systems**	**Design Life Years**
EXTERIOR BUILDING	Facility façade finish	50+
	Canopies/sun shades/balconies	20+
	Glazing systems	30+
	Roof finish	30+
	Eaves, soffits, fascia	30+
	Exterior door and hardware	15+
	Chimney and flues	30+
VERTICAL MOVEMENT	Elevator cable	25+
	Elevator	25+
	Elevator finishes	15+
INTERIOR FINISHES	Floor finishes	10+
	Ceiling finishes	15+
	Wall finishes	7+
	Wall protection	10+
	Interior door and hardware	20+
	Furnishings	5+
	Signage (interior)	10+
	Millwork (Casework/counters)	15+
	Millwork (Casework/counters - stainless steel)	20+
EQUIPMENT	OR Equipment	10+
	Pneumatic tube	18+
	Equipment (other)	5+
ELECTRICAL	High voltage Switchgear and Service Entrance Equipment	40+
	Emergency Generator Set	30+
	Dry type transformers	30+
	Low voltage switchgear	40+
	Automatic transfer switch	30+
	UPS system	20+
	UPS system batteries (lithium ion)	10+
	Power distribution and lighting/receptacle panels	30+
	Light fixtures and lighting control	20+
	Fire alarm system	30+
COMMUNICATIONS, SAFETY AND SECURITY	Nurse call system	10+
	IP Video Surveillance/security	10+
	Infant protection system	10+
	Patient wandering system	10+
	Panic duress	10+
	Access control system	10+
	Intrusion detection	10+
	Structured cabling system	25+
	Multimedia systems	10+
	Public address system	15+
	Intercommunications system	15+
	Distributed antenna system	10+
MECHANICAL	Heating systems	30+
	Cooling systems	30+
	Plumbing	30+
	Plumbing fixture	15+
	Air handling units and associated equipment	30+
	Medical gas systems	25+
	Major equipment	35+

3.9 Technology

3.9.1 Project Co will design the Facility:

3.9.1.1 as an Advanced Digital Hospital and a state-of-the-art health care Facility that utilizes technology to improve the Patient experience, increases cost effectiveness, improves the physical working conditions for Staff, enables the achievement of clinical outcomes and workflow enhancements, integrates services, and achieves better health and security outcomes; and

3.9.1.2 on a technology foundation that is designed, engineered, and implemented to enable the Owner's vision for Person- and Family-Centred Care and clinical model as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]. Key attributes to be built into the solution architecture will include:

3.9.1.2(1) Resiliency, redundancy, and high availability;

3.9.1.2(2) High performance;

3.9.1.2(3) Scalability;

3.9.1.2(4) Security;

3.9.1.2(5) Adaptability; and

3.9.1.2(6) Interoperability.

3.10 Adaptability and Flexibility

3.10.1 Design and construct the Facility in accordance with the following principles:

3.10.1.1 The Facility will accommodate the rapid cycle of innovation and change to support development and implementation of new clinical and non-clinical work processes and technological change; and

3.10.1.2 The Facility will accommodate program, service and equipment changes in the future with minimized impact to utility infrastructure and to the Facility, including downtime, ensuring that Clinical Spaces are acuity adaptable

3.10.2 To support Future Expansion of Components and of capacity as a whole, Project Co will:

3.10.2.1 plan Components for future growth by providing floor zoning that allows for expansion of programs or services by, for example, locating administrative and other non-clinical functions adjacent to Clinical Spaces;

3.10.2.1(1) provide a loose-fit Design to optimize functionality within a given floor area; and

3.10.2.1(2) create multi-use adaptable space.

3.10.3 Provide infrastructure that incorporates excess systems capacity, includes systems and components that support Future Expansion with minimized disruption to daily operation and allows for upgrades in Owner technology or technological progression.

3.10.4 Accommodate connections for Staff, Patients and services between the Facility and future developments including the Health Campus to CSRC links, Future Expansion and Future Heliport.

3.11 Accessible Design

3.11.1 Project Co will incorporate the following philosophies into the Design to address barriers to equitable access to health care resulting from cultural and linguistic diversity, gender and gender diversity, and cognitive, functional and physical capability:

3.11.1.1 Equitable use – the Design will be easy to use by people with diverse abilities;

3.11.1.2 Flexibility in use – the Design will accommodate a wide range of individual preferences and abilities;

3.11.1.3 Simple and intuitive – the Design will be easy to understand, regardless of the user's experience, knowledge, language skills, or cognitive abilities;

3.11.1.4 Perceptible information – the Design will communicate necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities;

3.11.1.5 Tolerance for error – the Design will minimize hazards and the adverse consequences of accidental or unintended actions;

3.11.1.6 Low physical effort – the Design can be used efficiently and comfortably and with a minimum of fatigue; and

3.11.1.7 Size and space for approach and use – the Design will provide appropriate size and space for approach, reach, manipulation and use regardless of the user's body size, functional capabilities or physical ability.

3.12 Sacred Spaces

3.12.1 Project Co will design and construct two sacred spaces as part of the Facility, the Roman Catholic Chapel as described in Section 3.13.2 and the All Nations Sacred Space as described in Section 3.14.6, such that they have the following relationship:

3.12.1.1 The sacred spaces will be designed to complement rather than compete with one another;

3.12.1.2 The sacred spaces will coexist in a relation of mutuality and reciprocity; and

3.12.1.3 The collocation of the sacred spaces, preferably across the Enclosed Atrium from one another, will reflect cultural safety and humility and a spirit of reconciliation.

3.13 Owner's Catholic Identity and Health Care Mission

3.13.1 Design Guidelines for Catholic Design

3.13.1.1 The Owner's commitment to its mission, vision and values, as described in Section 3.1. The Owner's Identity, is essential to the Design of the Facility and Health Campus.

3.13.1.2 The Facility should reflect and represent the Owner's Catholic faith-based Health Care Mission and Identity. As appropriate, this will include delicately nuanced and invitational expressions of the Mission throughout the Facility. Explicit references to the Mission will be required in specified designated locations.

3.13.1.3 Crosses and Sacred Objects

3.13.1.3(1) A cross will be located visibly on the upper elements of the Facility's exterior. It should be visible from a distance and from the Facility Main Entrance.

3.13.1.3(2) An appropriate cross will be located in the Enclosed Atrium; it could be physical, a motif, or stained glass.

3.13.1.3(3) Removable crosses will be hung in all Staff, public, clinical, and meeting areas.

3.13.1.3(4) A small sacred spot, such as a recessed shelf, will be provided in every Patient Room to hold a sacred object provided by the Patient. Ensure this spot is cleanable. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs.

3.13.1.4 Explore the use of backlighting to accentuate elements such as stained glass and crosses, which may incorporate a candle motif.

3.13.1.5 Explore the use and incorporation of modern contemporary stained-glass features in Wayfinding, both in signage and in environmental graphic design.

3.13.1.6 Explore the use of Catholic faith-based motifs in environmental graphics, such as murals or graphics wall treatments, to create landmarks.

3.13.1.7 The Enclosed Atrium will feature the legacy of the founding Sisters; which may be represented as an iconographical or motif-based commissioned art piece to be procured by the Owner as set out in Section 5.12.6 Artwork.

3.13.1.8 The Design of the Facility will express the Good Samaritan story, conveying a sense that hospitality is offered to all.

3.13.1.9 Architecture and location will represent a commitment to reconciliation and improved wellness for indigenous people, made by the Owner, a Catholic faith-based health care institution.

3.13.2 Roman Catholic Chapel Design Requirements

3.13.2.1 Project Co will retain a Liturgical Architect to design the Roman Catholic Chapel. The Liturgical Architect will meet the following requirements:

3.13.2.1(1) Have demonstrated experience in the design of churches; and

3.13.2.1(2) Understand the following literature and concepts:

3.13.2.1(2)(a) The history and documents of the Catholic Church on sacred spaces;

3.13.2.1(2)(b) Other pertinent writings of the Popes regarding worship spaces; and

3.13.2.1(2)(c) The manner in which space serves the liturgy of Mass as well as other community and individual church prayer and devotional practices.

3.13.2.2 In collaboration with the Liturgical Architect, Project Co will design and construct the Roman Catholic Chapel as a Catholic sacred space in accordance with the following design objectives:

3.13.2.2(1) Be open and welcoming to all, without becoming a generic spiritual space;

3.13.2.2(2) Be prayerful and inspirational for Patients, their families and Staff;

3.13.2.2(3) Embody the Catholic heritage of the Facility and advance its healing mission;

3.13.2.2(4) Provide a lasting legacy of a religious message compatible with and inspired by the celebration of the Eucharist;

3.13.2.2(5) Comply with the Archdiocese of Vancouver's Guidelines for the Building and Restoration of Church Edifices, which provide both rules and general guidance for church and chapel design; and

3.13.2.2(6) Have a presence within the Enclosed Atrium as a visible symbolic and architectural anchor for the space.

3.13.2.3 In collaboration with the Liturgical Architect, Project Co will design and construct the Roman Catholic Chapel to meet the following requirements:

3.13.2.3(1) Have a minimum Ceiling Height conforming to the requirements of Section 5.6.7.17;

3.13.2.3(2) Be accessible for Persons with Disabilities;

3.13.2.3(3) Be finished with quality materials;

3.13.2.3(4) Straddle an exterior wall, with a portion of the Roman Catholic Chapel located within the Enclosed Atrium;

3.13.2.3(5) Have an architecturally impressive and inviting entrance within the Enclosed Atrium, finished with exterior cladding;

3.13.2.3(6) Have an Entrance Foyer with doors and trim work that are consistent with the nave design and continue into the nave in such a manner that the Roman Catholic Chapel may be fully open to the Facility Main Entrance areas and Enclosed Atrium for special occasions;

3.13.2.3(7) Have a nave or main body with walls and ceiling contributing to an upward articulation of space to create an inspiring and uplifting experience, generally in accordance with the following parameters:

3.13.2.3(7)(a) The walls will include vertical forms supporting a vaulted ceiling structure with perforated and illuminated sail-like curved surfaces;

3.13.2.3(7)(b) The walls will include painted or treated curved surfaces and supports for fourteen (14) works of art depicting the Stations of the Cross;

3.13.2.3(7)(c) In proximity to the sanctuary, the nave will have two (2) alcoves for statuary;

3.13.2.3(7)(d) The nave will comprise at least eight (8) stained-glass windows, with four (4) on each side of the nave;

3.13.2.3(7)(e) The stained-glass windows will be protected by a hard, clear protective surface; and

3.13.2.3(7)(f) Half of the seating in the nave will consist of comfortable single-unit pew-like moveable chairs, each comprising a built-in kneeler for the chair behind it. The other half of the nave will be accessible and comprise seating options for Persons with Disabilities.

3.13.2.3(8) Have a sanctuary, which will include a tabernacle, a Chapel Altar, fixed seating for up to three (3) people and an ambo following

Roman Catholic liturgical custom. The sanctuary will be finished in painted GWB or plaster;

3.13.2.3(9) Have a Sacristy, which will include sacristy cabinets, racks for liturgical garments, and a sacristy sink, or sacrarium. The water from the sacrarium will drain directly into the ground, not into the sewer. A small washroom will be included in the Sacristy;

3.13.2.3(10) Have a floor that includes mosaic artwork. Vinyl flooring and carpet tiles are not acceptable. The floor leading from the Enclosed Atrium into the Roman Catholic Chapel will consist of materials and artwork compatible and consistent with the design concept of the Roman Catholic Chapel;

3.13.2.3(11) Have lighting that is consistent with the design concept of the Roman Catholic Chapel and is adjustable and dimmable. Backlighting will be provided for any stained glass window not located on an exterior wall. Lighting will also be designed to illuminate statuary, Furniture and liturgical items;

3.13.2.3(12) Have sufficient acoustic separation between the Facility and the Roman Catholic Chapel to prevent activities in each space from interfering with one another;

3.13.2.3(13) Have audio-visual systems for the Roman Catholic Chapel that are separate from those for the Enclosed Atrium and accommodate independent or combined usage for both spaces.

3.13.2.3(14) Have an HVAC system with separate controls for the Sacristy and the rest of the Roman Catholic Chapel. Acoustic treatments for the spaces within the Roman Catholic Chapel will meet the requirements set out in Appendix 3C [Acoustic and Noise Control Measures].

3.13.3 Meditation Space

3.13.3.1 Provide a universal space that is welcoming to all faiths.

3.13.3.2 Provide a quiet, meditative, and tranquil space, located away from a high traffic area. Ensure privacy for those praying.

3.13.3.3 Include a clear floor area having a rubberized surface suitable for exercise and prayer.

3.13.3.4 Provide a footbath and shoe rack at the entry.

3.13.3.5 Provide an open, well-lit space, preferably with Direct Natural Light or Borrowed Light. There is the potential for architecture to play a strong artistic role in this space.

3.13.3.6 Provide the following requirements for Muslim prayer, at a minimum:

3.13.3.6(1) Construct the meditation space in such a way that the long side of the space faces Mecca (Qiblah), which is marked on the wall (Mihrab); and

3.13.3.6(2) Provide a storage zone within the room for chairs or seating and prayer mats and coat hooks.

3.14 Respecting the Owner's Commitment to Reconciliation and Cultural Safety and Humility

3.14.1 Project Co will engage an Indigenous Consultation Advisor. Consultation with Musqueam, Squamish and Tsleil-Waututh First Nations will be part of the Design process and output.

3.14.2 In acknowledgement of the Owner's Commitment as a signatory to the *Declaration of Commitment to Cultural Safety and Humility in Health Services Delivery for First Nations and Aboriginal People in British Columbia*, Project Co, with assistance from the Indigenous Consultation Advisor, will incorporate the following key planning and design principles into the Design of the Facility:

3.14.2.1 The Facility and Health Campus are located on unceded lands of the Musqueam, Squamish and Tsleil-Waututh First Nations, and the spirit of this place, along with its Indigenous cultures and values, including the Seven Sacred Teachings of wisdom, love, bravery, respect, honesty, humility and truth, will be reflected in the planning and Design of the Health Campus as a whole, including the All Nations Sacred Space, the Facility and the associated exterior spaces, in a delicately nuanced and invitational way, explicit only in a few designated locations.

3.14.2.2 Incorporate Indigenous perspectives and priorities into the Design. Both the collaborative process and the resulting Design will provide opportunities to inform relationships between Indigenous and non-Indigenous people.

3.14.3 With assistance from the Indigenous Consultation Advisor, Project Co will design the Facility to demonstrate respect for Indigenous culture and traditional healing practices primarily associated with Southwest Coastal BC First Nations, inclusive of Musqueam, Squamish and Tsleil-Waututh and to express a holistic approach to health through the following design approach:

3.14.3.1 The natural environment of the Facility will be celebrated and enhanced. The Design will reflect the interconnections of people, land, animals, and a respect for life and all that is required to sustain it. This objective includes a stronger acknowledgement of key natural features and ecosystems and the exploration of 'working landscapes' that have uses beyond the aesthetic such as wellness, education, growing, healing, and engaging people;

3.14.3.2 Visible representation of the Indigenous cultures including those of the Musqueam, Squamish and Tsleil-Waututh First Nations, integrated with Catholic mission-driven elements, will be incorporated into the Design of the Facility and the Site in a delicately nuanced and invitational way. This includes the following:

3.14.3.2(1) Use of natural elements, such as wood, water and living plants;

3.14.3.2(2) Use of Indigenous interior and exterior design characteristics, such as curves and circles, including existing and new artwork by Indigenous artists; and

3.14.3.2(3) Inclusion of artwork that reflects the natural environment such as mountains, water, forests and sacred animals, and the presence of Indigenous Peoples, with an emphasis on design elements of the Musqueam, Squamish and Tsleil-Waututh First Nations.

3.14.3.3 Site landscaping, pedestrian walkways, roof gardens and plazas will incorporate Indigenous cultural elements such as wood sculptures, wood poles, and indigenous plants; and

3.14.3.4 There will be a demonstrated commitment to protecting natural resources through recycling schemes and green technology, where appropriate and possible.

3.14.4 The Design will:

3.14.4.1 Strive to increase a sense of belonging for everyone. In particular, the Health Campus will be an environment in which Indigenous Patients, Staff, and visitors can see themselves and feel that they belong. It will be a place where Indigenous groups and individuals can not only feel at home, but also feel free to be part of the wider hospital community, as opposed to feeling isolated or segregated; and

3.14.4.2 Embrace a seven-generations view, which is an Indigenous way of being that looks seven generations forward and seven generations back, while being rooted in our present generation. Based on this perspective, the Health Campus will be an expression of our own time, learning from history and those who came before us while taking into account the generations to come.

3.14.5 Cultural and Ceremonial Requirements

3.14.5.1 Interior programmatic spaces will be designed and situated appropriately to allow for cultural and ceremonial activities, such as:

3.14.5.1(1) Extended and multigenerational family involvement in care;

3.14.5.1(2) Ability to perform ceremonies, such as drumming, singing and smudging in Patient rooms and in other rooms as described in this Schedule, with features including:

3.14.5.1(2)(a) Capability to shut-off individual/section smoke detectors in designated public and Patient areas; and

3.14.5.1(2)(b) Capability to modulate light levels, such as by means of dimmable wall-mounted sconce lighting;

3.14.5.1(3) Amenities for the preparation of food, as an integral cultural component of Indigenous ceremonial activity and culture.

3.14.5.2 Yuwipi ceremonies will take place in in a designated conference room as set out in Appendix 3A [Clinical Specifications and Functional Space Requirements]. This conference room will meet the following requirements

3.14.5.2(1) Accommodate evening use. Ceremonies are held in the evening, and can extend later into the evening;

3.14.5.2(2) Accommodate the ability to smudge in this space for the duration of the ceremony;

3.14.5.2(3) Have a flat floor with movable Furniture, allowing people to be seated on the floor during the ceremony. Fixed Furniture or tiered seating is not acceptable;

3.14.5.2(4) Have Convenient Access to handwashing sinks, public washrooms and an area to host a ceremonial feast;

3.14.6 Provide an All Nations Sacred Space and Traditional Medicine Garden as follows:

3.14.6.1 An All Nations Sacred Space and an adjacent exterior Traditional Medicine Garden are part of the design requirements for the Facility.

3.14.6.2 The All Nations Sacred Space is comprised of the rooms described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

3.14.6.3 The All Nations Sacred Space Ceremony Room will have dimmable LED lighting.

3.14.6.4 Interior Finishes of the All Nations Sacred Space

3.14.6.4(1) Wood will be used to articulate support beams and walls. Materials and colours used in the space will be selected from a natural colour palette.

3.14.6.4(2) The design will incorporate cedar into the finishing work and Millwork. Other species of wood can be considered such as pine and fir, but cedar will be the primary material.

3.14.6.4(3) The medicine wheel with four (4) colours will form part of the design to enable participants to orient themselves for ceremonies. The four (4) sacred directions will be painted on the ceiling of the room and in 200 mm strips along the top of each wall representing the four (4) sacred directions and the four (4) sacred colours:

3.14.6.4(3)(a) White – North

3.14.6.4(3)(b) Red – East

3.14.6.4(3)(c) Black – West

3.14.6.4(3)(d) Yellow – South

3.14.6.4(4) Mounting hooks for prayer ties will be provided on each of the four (4) walls; and

3.14.6.4(5) A mounting bracket to hold cedar branches will be affixed above the Patient entrance to the All Nations Sacred Space and designed for easy access by Staff.

3.14.6.5 Main Hospital Entrance Exterior Design Guidelines

3.14.6.5(1) Provide a layout and space for one or more House Posts or Totem Poles at the entry to the Health Campus. Refer to Part 4 for House Post and Totem Poles guidelines.

3.14.6.6 Main Hospital Entrance Interior Design Guidelines

3.14.6.6(1) Provide a Design that reflects the Owner's commitments in its Declaration of Cultural Safety and Humility.

3.14.6.6(2) Consider integrating Indigenous design features that reflect and represent the Musqueam, Squamish and Tsleil-Waututh First Nations in a delicately nuanced and invitational way.

3.14.6.6(3) Consider including representation of the four elements and directions in the Design: North – air, East – fire, South – water, West – earth.

3.14.6.6(4) Consider integrating into the Design appropriate colours that reflect the Musqueam, Squamish and Tsleil-Waututh First Nations.

3.14.6.6(5) Incorporate input into the Design from Indigenous working groups, including Elders and traditional healers.

3.14.6.6(6) Engage local Indigenous artists, designers and architects.

3.14.6.7 Clinical Space Design Guidelines

3.14.6.7(1) In a delicately nuanced and invitational way, integrate Indigenous design features in the following Components, where a significant proportion of the Patient population is Indigenous:

3.14.6.7(1)(a) Maternity Centre;

3.14.6.7(1)(b) Mental Health Areas;

3.14.6.7(1)(c) Urban Health Acute Care Unit;

3.14.6.7(1)(d) Emergency Services; and

3.14.6.7(1)(e) Mental Health entrances.

3.14.6.7(2) Critical Care Complex

3.14.6.7(2)(a) Provide a consultation space on the Critical Care Complex floorplate for use by the Spiritual Care Team and the Indigenous Health and Wellness Team for spiritual, emotional and ceremonial support of families with a loved one in the Critical Care Complex. This consultation space will have an integrated design that is inclusive of Indigenous and other cultural perspectives.

3.15 Quality of Daylight

3.15.1 Recognizing the positive health benefits to Patients and Staff, Project Co will provide Quality Daylight for all spaces that require Direct Natural Light.

3.15.2 Provide windows and glazing that account for the shape and use of the room or space. Windowsill height, header height, and window width and glazing will be configured to provide daylight that supports the activities within the specific type of room.

3.15.3 Windows and glazing that are exposed to sunlight and oriented to the south, east or west direction will be provided with means such as overhangs, canopies, brise-soleils or other shading devices to control solar heat gain and glare.

3.15.4 The Facility will include lightwells, skylights, clerestory windows, concourses or equivalent type areas and devices as strategies for bringing daylight into the Facility and circulation areas.

3.15.5 Light shelves and interior finishes/treatments such as translucent interior glazing and/or transparent interior glazing with shading devices will be provided to facilitate bringing daylight into the Facility.

3.15.6 Provide windows in the restricted clean corridors, Operating Rooms and Operating Room-Hybrids to provide views to the exterior. Windows in the Operating Rooms will be placed either above the Alcove-Scrub Station, Alcove-Stretcher or other location as required for the Owner's functional requirements and include laser ready, integral blinds.

3.16 Infection Prevention and Control

3.16.1 Design the Facility to minimize the transmission of micro-organisms. Provide the necessary spaces to support routine infection prevention and control practices.

3.16.2 Design the Facility in such a way that maintenance and repair can be performed without entering Clinical Spaces, refer to Section 7.1.1.9.

3.17 Use of Wood

3.17.1 As contemplated by the *Wood First Act* (British Columbia), Project Co will incorporate wood products into the Design as permitted by Appendix 3B [Wood First Appropriate Use Matrix].

3.17.2 Consider innovative opportunities to expand the use of wood beyond the applications seen in recent health care projects, including through the incorporation of engineered wood applications;

3.17.3 Urea-formaldehyde content in Furniture or any composite wood products, laminating adhesives and resins, and thermal insulation is limited to 100 ppm.

3.17.4 Incorporate wood into design elements such as structural columns and beams in the Main Entrance and Public Services component, including the Main Entrance Lobby, exterior canopies and waiting areas, as well as in the Conference Centre, Learning Commons, All Nations Sacred Space, as well as exterior entrances to the Urban Health and Integrated Mental Health and Substance Use Component and in public spaces.

3.17.5 The term “Alternative Solution” used in this section and in Appendix 3B [Wood First Appropriate Use Matrix] specifically refers to this term as described in the VBBL.

3.17.6 Use wood as a featured material in both the interior and exterior of the Facility. Wood will be used where indicated as “Appropriate” in Appendix 3B [Wood First Appropriate Use Matrix]. Wood will not be used where indicated as “Inappropriate”.

3.17.7 Provide rough carpentry, wood backing materials, backing boards for mechanical rooms and Electrical/Communications Rooms, copings, cant strips, finish carpentry and architectural woodwork, including exterior fascias, cabinets, and casework, which is included in Division 6), frames, paneling, ceiling battens, trim, installation of doors and hardware, and other wood-related products and applications as required and permitted for wood products exposed to view in finished interior and exterior installations.

3.18 Healthy Buildings

3.18.1 Environmental Quality

3.18.1.1 Design the Facility to convey the sense that it is a Catholic faith-based health care institution, with deep historical roots, a clear commitment to social justice, and innovation evident throughout.

3.18.1.2 Design the Facility so that Patients, families, visitors and Staff will experience the Health Campus and Facility as welcoming, safe, and compassionate, including by

3.18.1.2(1) ensuring that common destinations such as the Main Entrance Lobby and Enclosed Atrium will be easily accessible and welcoming to visitors, as they are often the locations where first impressions are made;

3.18.1.3 Create an interior design that aligns with the Owner's clinical strategies and service models and gives priority consideration to Person- and Family-Centred design, clinical and academic research and teaching, best practice infection control standards, safety for Patients, families, the public and Staff, LEAN techniques and LEED;

3.18.1.4 Include ergonomic design features throughout all spaces in the Facility that specifically facilitate the physical activities of Staff, and Patients, and of pediatric Patients in the ED, Maternity Centre and Main Entrance Lobby, including appropriate Millwork, Modular Casework, Furniture, active workstations, lighting, lift devices, and Patient assist or equipment manoeuvring space;

3.18.1.5 Support the physical, psychological, spiritual, cultural and social health and well-being of the Facility's occupants by providing a healing environment that includes elements that have been proven to create therapeutic, low-stress and comfortable functional environments for Patients, their families, and Staff that are

3.18.1.5(1) safe and secure, and be a backdrop for people of varying ages, abilities and cultures;

3.18.1.5(2) designed to encourage Patients to arrange their space to suit their individual needs;

3.18.1.5(3) reflective of the Owner's commitment to Reconciliation with Indigenous Patients, families and communities; and

3.18.1.5(4) acknowledging of ethnic diversity.

3.18.1.6 Design the Facility to include environmentally responsible and resource-efficient building concepts in addition to integrating health, wellness, and the human experience, including by

3.18.1.6(1) creating sufficient opportunities for human-nature interaction, producing an environment that ties the surrounding landscape and interior environments together; and

3.18.1.6(2) using natural materials, such as wood and stone, as much as possible throughout public areas.

3.18.1.7 Incorporate into the Design of the Facility a comprehensive and interdisciplinary approach to address the factors of the physical environment that impact the day-to-day health and productivity of the occupants and the interactions between those environmental factors, including by

3.18.1.7(1) designing spaces that leverage aesthetics, technology and the environment to ensure the wellbeing and comfort of Patients, families, and Staff;

3.18.1.7(2) designing the Site and Facility to form a gradual continuum from public to private areas; and

3.18.1.7(3) including an easily legible configuration for Facility circulation and an indoor Wayfinding and signage system that is simple, intuitive, and fully coordinated throughout the Health Campus and the Facility.

3.18.1.8 Design the Facility to create an atmosphere that supports a healthy mental state by employing design elements that mediate between stress and anxiety, and address mental and emotional challenges or trauma, including by

3.18.1.8(1) minimizing the potentially intimidating nature of the typical institutional setting for Patients and visitors entering the Health Campus who may be disoriented or anxious and for younger Patients who may be overwhelmed by the experience;

3.18.1.8(2) designing highly technical areas to be visually and acoustically isolated; and

3.18.1.8(3) designing the environment so that Patients, visitors and Staff will perceive it as open and accessible rather than regimented and intimidating.

3.18.1.9 Design the Facility to significantly reduce the sources of physiological disruption, distraction and irritation to prevent stress and injury and on enhancing acoustic, ergonomic, olfactory and thermal comfort to improve overall comfort, productivity and well-being, including by

3.18.1.9(1) providing spaces that are sufficiently adaptable to working, concentration, collaboration and respite, as needed, and that enable individuals to adjust their environments and choose their degree of engagement with others;

3.18.1.9(2) including features such as sound and music, colour, pattern, air quality, nature and views of nature, and art and aesthetic forms as means for creating an environment that supports and engages Patients and families, but does not negatively impact Staff safety or performance; and

3.18.1.9(3) enriching the interiors of the Facility with play corners, recreation areas, colourful signage, and artwork to create an environment that is more residential than clinical for the comfort of Patients and their families;

3.18.1.10 Encompass in the Design of the Facility a wide range of concepts and applications that promote human health, including;

3.18.1.10(1) construction practices;

3.18.1.10(2) design features;

3.18.1.10(3) healthy interiors;

3.18.1.10(4) VOC reduction;

3.18.1.10(5) occupant engagement;

3.18.1.10(6) personal control;

3.18.1.10(7) indoor environmental quality;

3.18.1.10(8) limited exterior noise intrusion;

3.18.1.10(9) reduced interior noise disruption;

3.18.1.10(10) speech privacy;

3.18.1.10(11) daylighting;

3.18.1.10(12) artificial lighting with quality colour rendering abilities;

3.18.1.10(13) biophilic design;

3.18.1.10(14) access to potable water;

3.18.1.10(15) healthy dining options and mindful eating;

3.18.1.10(16) visual and physical ergonomics;

3.18.1.10(17) exercise in the workplace; and

3.18.1.10(18) smoking and vaping restrictions.

3.18.2 Healthy Entrances

3.18.2.1 Occupants often track harmful contaminants indoors, including bacteria, heavy metals and lawn and agricultural pesticides, among other toxins. In addition, as occupants walk through entry doors, potentially polluted air can enter the Facility. Both of these modes of introducing outdoor pollutants to the indoor environment highlight the need for measures, including the installation of appropriate materials, which minimize or prevent the introduction of potentially harmful substances into indoor spaces.

3.18.2.2 Provide permanent recessed entrance mats to minimize the introduction of pollutants into indoor air at Facility entrances; refer to Section 5.6.3.1(25).

3.18.3 Drinking Water Requirements

3.18.3.1 It is important to promote the consumption of water by making high-quality drinking water easily accessible to occupants.

3.18.3.1(1) Provide filtered, chilled bottle-fill stations with integrated water collection at minimum in the following areas:

3.18.3.1(1)(a) A minimum of three (3) per floor within regularly occupied floor space, distributed such that they are not adjacent to Nourishment Centres that have water dispensers;

3.18.3.1(1)(b) M1.1 - Main Entrance Lobby; and

3.18.3.1(1)(c) N2 - Conference Centre.

3.18.4 Interior Fitness Circulation

3.18.4.1 Provide easily accessible, safe, and visually appealing stairs, entryways, and corridors to encourage intermittent bouts of physical activity and reduce sedentary behaviour.

3.18.4.2 Exit and Convenience Stair Access

3.18.4.2(1) At a minimum, include stairs meeting the requirements of Sections 5.6.3.2 and 5.6.1.3.1.(c).16.

3.18.4.3 Stair Location

3.18.4.3(1) Locate stairs that can be accessed by the public in an area that is equally as prominent as or more prominent than elevators.

3.18.4.3(2) Ensure stairs are clearly visible from the Main Entrance Lobby or main entry Reception or located to be seen before any elevators are visible upon entry into the Main Entrance Lobby.

3.18.4.4 Stair Design

3.18.4.4(1) Implement active design strategies in the stair design such as:

3.18.4.4(1)(a) Posting motivational signs;

3.18.4.4(1)(b) Installing creative lighting;

3.18.4.4(1)(c) Installing integrated artwork;

3.18.4.4(1)(d) Painting walls with bright colours;

3.18.4.4(1)(e) Incorporating biophilic elements;

3.18.4.4(1)(f) Providing daylighting using windows or skylights of at least 1 NSM in size; and

3.18.4.4(1)(g) Providing view windows to the outdoors or between spaces within the Facility.

3.18.4.5 Stair Signage

3.18.4.5(1) Present Wayfinding signage and point-of-decision prompts throughout the Facility to encourage stair use (at least one sign per elevator group).

3.18.4.5(2) For enclosed stairwells, provide stairwell signage both on the wall adjacent to the stairwell door, and on an overhead signage element projecting perpendicularly into the corridor.

3.18.4.5(3) Refer to Appendix 3G [Wayfinding and Signage] for additional guidance regarding stairwell signage.

3.18.4.6 Stair Visibility for Public Use

3.18.4.6(1) Increase visibility of non-exit stairs by implementing the following strategies:

3.18.4.6(1)(a) Unenclosed stairs with full-height guardrails;

3.18.4.6(1)(b) Use of glass partitions for stair enclosure; and

3.18.4.6(1)(c) Maximized glazing in stair doors.

3.18.5 Design Aesthetic

3.18.5.1 The incorporation of aesthetically pleasing design elements and artwork into a space can bring a measure of comfort or joy to the occupants, add complexity to the visual field and create a calming environment with the potential to improve occupant mood.

3.18.5.2 To create spaces that are unique and culturally rich, Project Co may include features in the Project that are intended to foster:

3.18.5.2(1) Human delight;

3.18.5.2(2) Celebration of culture, including history and identity;

3.18.5.2(3) Celebration of spirit and humanity;

3.18.5.2(4) Celebration of place;

3.18.5.2(5) Celebration of the Owner’s vision of compassion, social justice, innovation and care; and

3.18.5.2(6) Meaningful integration of public art.

3.18.5.3 Consideration will be given to how signage and Wayfinding Assets are located around artworks, and the two will not visually compete.

3.18.6 Connection with Natural Surroundings

3.18.6.1 Project Co will design the Facility to provide views and images of nature in support of the Owner's intention to help speed healing and recovery time, boost positive feelings and reduce negative ones.

3.18.6.2 Project Co will incorporate design elements into the Facility to nurture the innate human-nature connection with the Facility, as follows:

3.18.6.2(1) Provide environmental design elements, lighting and space layouts that incorporate nature within the Facility;

3.18.6.2(2) Provide design elements that create place-based relationships to uniquely connect people to the climate, culture and identity of place;

3.18.6.2(3) Incorporate minimally processed materials and elements from nature into the Facility to reflect the local ecology or geology to create a distinct sense of place;

3.18.6.2(4) Provide nature-inspired design elements that enhance the experience of connection to nature through greater diversity and frequency of exposure, as follows:

3.18.6.2(4)(a) use nature's patterns and forms to create a visually preferred environment that enhances cognitive performance while helping to reduce stress;

3.18.6.2(4)(b) generate such forms and patterns as symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature; and

3.18.6.2(4)(c) avoid the overuse of forms and patterns that may lead to visual toxicity.

3.18.6.2(5) Provides opportunities as part of the Design for human-nature interactions within the Facility and external to the Facility within the Health Campus.

3.19 Education and Learning

3.19.1 Project Co will design the Education and Learning Component to accommodate the requirements of UBC and other learning providers as described in this Schedule and Appendix [3A Clinical Specifications and Functional Space Requirements].

3.20 Clinical Operations Centre

3.20.1 Basic Requirements:

3.20.1.1 Design and construct M5.1 Command Centre/EOC as a single operations centre having two modes, as follows:

3.20.1.1(1) during normal operations, it will operate as a meeting room and be dedicated entirely to Command Centre functions, with both operator workstations and technological capabilities available for use for those functions, as either a main workstation or a backup; and

3.20.1.1(2) during emergency operations, it will accommodate a functional split into separate Command Centre and EOC functions, with one (1) operator workstation dedicated to each function, and each operator workstation individually equipped to use all technological capabilities separately and simultaneously, allowing normal operations and emergency operations to be carried out concurrently.

3.20.1.2 Provide and install all infrastructure required for the Clinical Operations Centre as set out in Section 7.9.6.2(3)(j) Type 6 Multimedia Rooms, which will service items and equipment required at Service Commencement as well as for future fit-out and installation, including workstations, emergency equipment and supplies, large wall-mounted video monitors and network connectivity, wall-mounted TV monitors with cable/wired and wireless connectivity, internet, audio services, printing, smartboards, critical internal applications access, and critical third-party monitoring systems, and provide redundant electrical power, network/computing access and physical security access.

3.20.1.3 All cabling required for the Clinical Operations Centre use-cases will adhere to the requirements outlined in Section 7.9.3 IM/IT Structured Cabling.

3.20.1.4 The Clinical Operations Centre will require access to all internal critical systems and applications, including CST (Cerner), Vocera, HVAC/SCADA, IM/IT/Cybersecurity, IP Video Surveillance, video/audio-conferencing, RTLS, DAS, HR/workforce management systems. The Owner will be responsible for security access to internal applications/systems content. The Owner will be responsible, where necessary, for all software licensing and subscription services costs to ensure critical systems/applications content is available in the Clinical Operations Centre.

3.20.1.5 Command Centre/EOC operator workstations will be height adjustable and will each accommodate infrastructure and be designed for future installation of eight (8) desktop displays, mounted in a configuration four (4) monitors wide by two (2) high, and four (4) computers. Provide power and data to connect all Facility technology to the Clinical Operations Centre equipment, including to the operator workstations, as required under Section 7.9.6 Audio-Visual Systems.

3.20.1.6 Each operator workstation will be configured to control the video wall, which will consist of infrastructure and space for future installation of eight (8) wall-mounted monitors arranged contiguously to form a panel four (4) monitors wide and two (2) monitors high, on the wall facing the operator workstations. There will be (2) workstations each with control of eight (8) wall-mounted monitors for a total of

sixteen (16), which will have the capability to function as one contiguous video wall. The video wall will meet the requirements set out in Section 7.9.6 Audio-Visual Systems.

3.20.1.7 In addition to the Clinical Operations Centre operator workstations, the Clinical Operations Centre will be furnished with workstations and infrastructure to interchangeably accommodate future installation of either computers or laptops with dual monitors. All workstations will have data and VoIP connectivity, as required under Section 7.9.6 Audio-Visual Systems.

3.20.1.8 Project Co will provide additional cabling or components set out by vendor or manufacturers specifications as required to provide system and application performance acceptable to the Owner acting reasonably.

3.20.1.9 Project Co will provide redundant wireless network service (e.g. LTE/4G/5G, Wi-Fi) to accommodate a minimum capacity of 25 people in M5.1 Command Centre/EOC.

3.20.1.10 Project Co will be responsible for the costs of power, cabling, connectivity and installation. TV service and cabling/wiring will support connectivity to a primary provider such as Shaw and a secondary provider such as Telus TV. The Owner will arrange and facilitate the installation of any rooftop equipment (e.g. satellite dish) and will be responsible for these costs to ensure TV connectivity is available.

3.20.1.11 Project Co will provide and install the physical infrastructure required for mounting the video wall monitors, wall-mounted computer and TV monitors, including power, cabling and network connectivity (e.g. SVGA/HDMI/DVI) for wired and wireless connections, monitor brackets, mounts and reinforcements, appropriate termination, face places and electrical outlets.

3.20.1.12 Physical security controls to the Clinical Operations Centre endpoints will be required for entry and exit; redundant or offline access will be required in the event of an electrical outage.

3.20.2 Performance Requirements:

3.20.2.1 The Clinical Operations Centre will be wired to support redundant connectivity for electrical power.

3.20.2.2 The Clinical Operations Centre will be wired to support redundant internal and external network and infrastructure-related connectivity, such as LAN/WAN and Internet access.

3.20.2.3 The Clinical Operations Centre will be wired to support redundant TV providers.

3.20.2.4 The Command Centre/EOC will be wired to support a large-format video wall and video wall control/processing system.

3.20.2.5 The Clinical Operations Centre will be wired to support 2 wall-mounted smart boards.

3.20.2.6 The Clinical Operations Centre will be wired to support 2 wall-mounted video-conferencing systems.

3.20.2.7 All wiring for wall-mounted systems will have reinforced wall structures capable of supporting at least 114 kg. These wall-mounting locations will have all wiring and conduits hidden and run through the walls, not surface mounted.

PART 4. SITE DEVELOPMENT REQUIREMENTS

4.1 General Requirements

4.1.1 Project Co will perform an overall site planning analysis to understand the site context and opportunity, to validate the Facility's location on the Health Campus, and provide a Design which is well integrated with the surrounding street network.

4.1.2 While a prototype approach to the Design for a health care facility is desirable, tailoring prototypes to the specifics of an existing site is critical for the success of the Design. Accordingly, Project Co will adapt any desirable prototypes to all existing Site constraints, infrastructure, and unique context

4.1.3 Project Co will:

4.1.3.1 Facilitate the delivery of clinical and non-clinical support services across the Health Campus by including in the Design the provision for efficient physical links from the Facility to Future Expansion and the Clinical Support and Research Centre (CSRC);

4.1.3.2 Account for the existing topography of the Site and locate entrances and access points to minimize slopes and promote accessibility;

4.1.3.3 Integrate the Design such that it responds to new and existing public transit routes around the Site and promotes access for those using public transportation systems;

4.1.3.4 Support community access and include a highly visible entry point into the Main Entrance Lobby directly accessible from Healthcare Boulevard and designed with high profile architectural scale and features; and

4.1.3.5 Include the needs of Facility Management in the Design and placement of site services including ease of access and maintenance.

4.2 Master Planning

4.2.1 Project Co will Design the Facility and surroundings:

4.2.1.1 To comply with the Wayfinding requirements described in Appendix 3G [Wayfinding and Signage];

4.2.1.2 To create a vibrant, health-oriented precinct;

4.2.1.3 To have a strong urban presence and a comprehensive, legible public realm;

4.2.1.4 To reflect the Owner's values and role as the major centre for health in the community;

4.2.1.5 Be a good neighbour, support community access and be respectful of other uses and activities in and around the Site through contextually responsive architecture;

4.2.1.6 To reflect logical planning principles and demonstrate clarity of circulation systems;

4.2.1.7 To comply with all applicable design guidelines of the City, including the New St. Paul's Healthcare Campus (NSPHC) CD-1 Guidelines; and

4.2.1.8 Provide an integrated Health Campus, complete with functional connections both operational and physical, to accommodate strategies for Future Expansion including:

4.2.1.8(1) Locating the Facility and Utilities to maximize the Owner's ability for Future Expansion on the Site, and include stub outs for connecting to Future Expansion;

4.2.1.8(2) Providing pedestrian access to the Facility from Future Expansion and their planned entry points;

4.2.1.8(3) Effectively and efficiently integrating all Utilities with Future Expansion; and

4.2.1.8(4) Integrate IM/IT Infrastructure seamlessly with Future Expansion as required by this Schedule.

4.2.2 Project Co will ensure all Design decisions enhance the Site and its context.

4.3 Master Site Plan

4.3.1 Project Co will develop and submit to the Owner a Master Site Plan for the Site, based on the master planning principles and the Site development requirements described in this Schedule.

4.3.2 The Master Site Plan will illustrate the Site context and development opportunities to validate the Facility siting.

4.3.3 The Master Site Plan will:

4.3.3.1 Ensure that each component of the Facility as described in Section 2.1 Project Overview, is an integrated part of the Site and Future Expansion, facilitating the delivery of clinical and non-clinical support services (for example though efficient physical links and Utility connections between the Facility and CSRC and West Precinct), enhancing the ability of these to function in a cohesive manner;

4.3.3.2 Align with the Owner's Identity and Design Objectives as described in Part 3;

4.3.3.3 Indicate the access provisions needed for replacing major equipment required for the Facility, as well as for adding major equipment at a future date; and

4.3.3.4 Include direct and logical pedestrian and vehicular connections between the interface pathways and the Facility entrances.

4.4 Connections to the Energy Centre, Future Expansion and Services

4.4.1 Project Co will design the Facility to maximize opportunities for connections to any Future Expansion and enhance the ability for the Future Expansion and the Facility to function in a cohesive manner.

4.4.2 The Facility will be designed to connect:

4.4.2.1 To the future CSRC on all floors of the Facility which contain Outpatient Diagnostic and/or Special Clinics (which includes Renal Outpatient) and Generic Outpatient Clinics or at a minimum of 2 levels:

4.4.2.1(1) With Convenient Access to the CSRC links, provide convenience stairs to one (1) floor level above and one (1) floor level below each CSRC link;

4.4.2.1(2) The Renal Outpatient clinic may be located one (1) storey above or one (1) storey below a CSRC link connection.

4.4.2.2 To the future CSRC at one (1) level of the underground parking for a Back of House corridor connection meeting the width requirements set out in Section 5.6.3.3 Corridors;

4.4.2.3 To the Energy Centre, if designed as a standalone building. Provide connections to facilitate efficient Back of House travel path from the FMO operations and logistics centre components and the Energy Centre for movement of Staff and materials.

4.4.3 The Design of the Facility will include all structural provisions and building envelope knock-out panels required to minimize any future work by the Owner to complete future renovations and connections between the Facility and other developments, as follows:

4.4.3.1 Future Expansion;

4.4.3.2 Health Campus to CSRC links; and

4.4.3.3 Facility underground parking level to the CSRC.

4.4.4 Connections will be effective, contiguous and integrated and will be designed to provide for ease of visitor, Staff, and Patient movement and material distribution between the Facility and the Future Expansion(s).

4.4.5 For corridor width requirements refer to Section 5.6.3.3 Corridors.

4.4.6 Where required, the Design will allocate area(s) for future buildings, as follows:

4.4.6.1 Be designed with elements that can easily be removed in the future by the Owner.

4.4.6.2 Not contain trees in the future building footprint but in the perimeter of the interim area(s); and

4.4.6.3 Include landscape elements that are easy to remove, easy to relocate and be reusable or recyclable.

4.5 Urban Design and Site Development

4.5.1 Project Co will:

4.5.1.1 Minimize the impact the Facility has on adjacent neighbours and land uses. Preserve visual privacy and sunlight for adjacent properties and buildings, and include features that will give the Facility an identity consistent with its overall urban context;

4.5.1.2 Consider the micro-climatic effects arising from the location and configuration of parking, walkways and buildings on the Health Campus, including effects of Facility entrance orientation on Patient, Staff and visitor comfort and safety;

4.5.1.3 Reinforce the physical relation of the structures to foster a strong sense of place and identity, and to ease vehicular and pedestrian movement into the Site;

4.5.1.4 Label and name drop-off areas with signage in accordance with the Wayfinding requirements/strategy (e.g. Drop-off ‘A’);

4.5.1.5 Mitigate the nearby noise from adjacent roadways and Facility building equipment through the use of appropriate exterior glazing and other acoustic screening; and

4.5.1.6 Create meaningful open spaces for the benefit of diverse Patients, visitors and Staff that provide opportunities for recreation and contribute to an inclusive, healthy community; capitalize on opportunities for outdoor areas of respite and repose to aid in providing a healing environment.

4.6 Pedestrian and Vehicular Connections

4.6.1 Project Co will:

4.6.1.1 Create a high-quality, vibrant, pedestrian-friendly environment, that includes connecting the pedestrian sidewalks and bicycle pathways to existing sidewalks and pathways adjacent to the Site, and use signage to help connect exterior and interior pathways;

4.6.1.2 Design for the functional separation of uninterrupted routes for ambulance vehicles, visitors, Staff and service vehicles, and to minimize public and service vehicle traffic interference with ambulance vehicle access to the Site;

4.6.1.3 Integrate vehicular circulation with layout of pedestrian walkways and bicycle pathway to provide visible connections, promote safe travel, and to minimize conflict between vehicles and other modes of travel. Ensure pedestrian walkways and bicycle pathways are distinct and separated to ensure safety.

4.6.1.4 Use signage to clearly distinguish between pedestrian and cycle-specific routes and lanes. Design the driveways and layby aisles to provide connections between

the surrounding roads and the Facility entrances including the Main Entrance Lobby, Emergency Department, C4HA Outpatient Clinics Entrance, Mental Health IPU Shared Entrances, and Energy Centre.

4.6.1.5 Design vehicular service entrances so that they are integrated into the Facility design with minimal visual impact;

4.6.1.6 Provide safe pedestrian crossings that are clearly designated using pavement markings and signage. In areas where a high volume of pedestrian crossings is expected, provide for changes in surface material (such as from asphalt to Portland cement, for example);

4.6.1.7 Provide safe access for the mobility impaired (including people with strollers) by providing paths of travel minimum 3.0 m wide to allow for two people walking side by side and someone passing and for wheelchairs or scooters;

4.6.1.8 Provide curb let-downs in appropriate locations to facilitate convenient and Direct Access for Persons with Disabilities. Align curb-let-downs to pedestrian crossings and to the Facility entrances;

4.6.1.9 Provide safe pedestrian refuge spaces behind all sidewalk wheelchair ramps;

4.6.1.10 Provide clear, direct pedestrian routes that are unimpeded by parked or moving vehicles; and

4.6.1.11 Provide traffic calming measures including curb bulges and raised crosswalks to minimize roadway pavement width at pedestrian crosswalks.

4.6.2 Sidewalks and pathways will incorporate landscape treatments with trees and benches, lighting (including pedestrian-scale lighting), distinct paving where appropriate to further identify and enhance the pedestrian movement, and tactile strips for the visually impaired wherever required.

4.6.3 All walkways and other paved areas will have positive drainage to shed rain water quickly to a storm drainage facility.

4.6.4 Flooding/ponding are not permitted on-site except in designated storm water detention facilities designed with an overflow to a storm system with adequate capacity.

4.7 Public Realm and Open Space

4.7.1 Project Co will:

4.7.1.1 Perform the Design and Construction of the Facility to ensure the legibility, quality and consistency of the overall treatment of the public realm, including public open space, pedestrian corridors and streets, to achieve the design objective for a unified and attractive built environment.

4.7.1.2 Provide a hierarchy of open spaces as follows:

4.7.1.2(1) Public open spaces;

4.7.1.2(2) Private open spaces; and

4.7.1.2(3) Achieve segregation between different open spaces through landscape barriers including hedges and planting that discourage people to walk into/through the hedging, and do not permit hiding or seclusion.

4.8 Site Wayfinding and Exterior Signage

4.8.1 Project Co will:

4.8.1.1 Provide a signage master plan for review; and

4.8.1.2 Use a multi-modal approach combining landscape features, art objects, features, installations and signage that promotes Wayfinding while expressing the brand and creating a distinct sense of place.

4.8.2 Urban design and landscape elements will be coordinated with the design of Wayfinding requirements as outlined in Appendix 3G [Wayfinding and Signage].

4.8.3 Arrange pedestrian walkways and bicycle pathways to ease Wayfinding and create an amenable environment for pedestrians and cyclists through the use of coordinated methods of Wayfinding that inform people of routes through the Site to specific buildings and entries or to the major street and transit nodes. Encourage pedestrians and cyclists to avoid unsafe vehicle roads by providing well-signed alternative routes.

4.8.4 Provide visually connected pathways to facilitate Wayfinding.

4.8.5 Provide external Wayfinding signage that:

4.8.5.1 Is located at each Site entry location, at key nodes and regularly along roads and pathways;

4.8.5.2 Clearly identifies the Facility and its Components including the Main Entrance, and Main Entrance drop off area; and all other entries to the Facility;

4.8.5.3 Clearly indicates points of access for the public, parking areas and restrictions for various vehicle types and restrictions to ‘after-hours’ access;

4.8.5.4 That are modifiable so they can accommodate change and additions in directions and as additional developments are constructed on the Health Campus;

4.8.5.5 Is well illuminated, and easily visible at night; Signage design will be backlit, reflective or high contrast;

4.8.5.6 Minimizes light spillage.

4.8.6 Supplement entry signs with free standing signage structures intended for pedestrian use, located to provide overall direction within the Site.

4.8.7 Provide a logical, easy to remember hierarchy of names for gates, entrances, parking areas and other spaces against which directions can be given.

4.8.8 Provide all necessary exterior illuminated signage to direct traffic from the access streets. Design and construct such signage so that it is visible for drivers of vehicles to identify at a far enough distance so that they will safely slow down and follow the signage to enter the Facility and the parking areas.

4.8.9 Overall parking signage is required to follow consistent design intent for the Site.

4.9 Gateway Elements

4.9.1 Project Co will:

4.9.1.1 Provide gateway elements located strategically throughout the Site to aid in Wayfinding and add to the urban fabric of the neighbourhood.

4.9.1.2 Provide gateway elements at the edges of the Site to identify and announce the Facility and the Health Campus.

4.9.1.3 Coordinate the gateway design features with the streetscape elements and integrate into the landscape design.

4.9.1.4 Coordinate the gateway design and requirements with Appendix 3G [Wayfinding and Signage]

4.10 Plaza

4.10.1 Project Co will provide a Plaza to meet the following requirements:

4.10.1.1 The Plaza will reflect and incorporate all adjacent future developments.

4.10.1.2 The Plaza will provide a gateway to the Site. Provide a pedestrian pathway and visual connection to the Main Entrance Lobby to the Facility.

4.10.1.3 The size of the Plaza will be per the City of Vancouver requirements.

4.10.1.4 The Plaza will have attractive and comfortable spaces for relaxing and socializing. In the hierarchy of outdoor spaces, the Plaza will be designed as the primary outdoor space for the public and will serve as the main civic gathering space.

4.10.1.5 The scale of the Plaza will permit programming for various functions such as press conferences, health-related events, celebrations such as the St. Paul's Hospital Foundation 'Lights of Hope' display, fundraising events, and other community engaging events.

4.10.1.6 The Plaza will include space for four (4) future house posts. Provide a clear area of 2.4 m in diameter at each house post. Clearance zones may overlap up to 1 m.

4.10.1.7 Provide clear visibility through the Plaza to the Facility's Main Entrance Lobby.

4.10.1.8 Provide clear visibility through the Plaza as one approaches the Health Campus from adjacent streets and Thornton Park.

4.10.1.9 Landscape planting and paving patterns will create subtle directionality towards the Main Entrance Lobby to the Facility.

4.10.1.10 Public art, landscape features or other signature elements to mark gateways into the Facility and health care area. Natural vegetation, seating areas and finer details are to draw the public into the spaces for public art in the Design. Provide natural vegetation, seating areas and unique architectural details to draw the people into the space.

4.10.1.11 The Design of the Plaza will include a mixture of hardscape surfaces, seating areas for passive use and native gardens with strolling paths.

4.10.1.12 Provide hardscape areas for café outdoor seating and for temporary vendors such as a small cafe pavilion.

4.10.1.13 Provide the electrical infrastructure as required for the Owner's program activities and events.

4.10.1.14 No water fountain or water features will be permitted, except as required by Section 7.4.4.12(10)(g).

4.11 Wellness Walkway

4.11.1 Project Co will provide a Wellness Walkway to meet the following requirements:

4.11.1.1 Provide a continuous pathway for pedestrians which encompasses the Health Campus and the CSRC;

4.11.1.2 Respond to the special needs of those with challenges posed by illness, disability or age;

4.11.1.3 Include gateway and Wayfinding elements;

4.11.1.4 Provide shade trees, consistent curb letdowns, and smooth wide sidewalks for wheelchairs, regularly-spaced seating, and points of beauty;

4.11.1.5 Provide paving, interpretive signage, and opportunities for public art that celebrate the legacy and culture of Indigenous Peoples and the historic False Creek shoreline;

4.11.1.6 Provide native plantings and natural systems such as rain gardens in a safe setting accessible to persons of all ages and abilities. Create separations between the roadway, bicycle pathway, and pedestrian areas using plantings.

4.11.1.7 Provide a variety of seating elements and seating nodes.

4.11.1.8 Provide safe and logical pedestrian and bicycle circulation at all the intersections and where the pedestrian and bicycle circulation intersect.

4.11.1.9 Provide pedestrian surfacing at crosswalks that is highlighted at all vehicular intersections.

4.11.1.10 Provide street lighting which is coordinated with the overall Site lighting requirements and landscape features.

4.11.1.11 Provide elements and features that promote Patients' use for physical activity and connection to nature to promote the healing process.

4.12 Healing Corridor

4.12.1 Project Co will provide a Healing Corridor to meet the following requirements:

4.12.1.1 In the hierarchy of outdoor spaces, provide a Healing Corridor that serves as the secondary main outdoor space for the public, Patients and Staff.

4.12.1.2 Provide a variety of seating options including more private spaces, offering quieter areas for Staff and visitors to gather in smaller groups.

4.12.1.3 At minimum, the Healing Corridor will have the following areas:

4.12.1.3(1) Permanent space: 950 NSM; and

4.12.1.3(2) Consider temporary space for potential Future Expansion

4.12.1.4 Connect the Healing Corridor to the Wellness Walk through a series of natural features, art and landscape treatments that evoke the historic shoreline and cultural experiences.

4.12.1.5 Provide a continuous Design theme which transitions between the outdoor spaces including the Healing Corridor, Plaza and Traditional Medicine Garden to the Facility's interior and Enclosed Atrium.

4.13 Outdoor Food Court Seating

4.13.1 Provide outdoor seating for the Food Court shaped by planted landforms. Outdoor seating will be an extension of interior Food Court seating and will be affixed to the ground. Outdoor seating will have Direct Access to the interior area M2.1.6 Food Court Seating.

4.13.2 Provide a minimum of ten (10) tables of durable material with maximized seating at each table. The tables and chairs will accommodate small events, gatherings and activities and have a minimum of six (6) seats each.

4.13.3 Provide a means by which the Owner can control access and restrict the public from entering after hours through such means as a decorative fence and lockable gates which provide aesthetic appeal and transparency, while balancing access control requirements.

4.14 Healthcare Boulevard

4.14.1 Project Co will provide a Healthcare Boulevard to meet the following requirements;

4.14.1.1 Provide a roadway for public vehicle access for the Facility which connects New High Street with National Avenue.

4.14.1.2 Provide paving cues to create a threshold for the Facility entry sequence that will serve as the ceremonial and functional entry point to the Facility.

4.14.1.3 Provide for functional separation of pedestrians, bicycles and vehicles.

4.14.1.4 Provide layby parking stalls for pick-up and drop-off zones as required by this Schedule.

4.14.1.5 Provide pedestrian connections through the Health Campus connecting the Healthcare Boulevard with outdoor spaces including the Plaza, Healing Corridor and Wellness Walkway.

4.14.1.6 Provide paving surfaces that serve as a traffic calming measure, and to establish the character of the Facility as the primary approach to the Main Entrance Lobby.

4.14.1.7 Design pedestrian walkway and bicycle pathway circulation to be logical with clear sight lines for safety and security. Incorporate safe roadway crossings at logical points and use landscape features to direct pedestrians and cyclists to safe crossing locations.

4.14.1.8 Provide sheltered public seating located such that it is available for persons awaiting transportation adjacent to the layby stalls and pick-up and drop-off areas.

4.14.1.9 Define each entrance and exit to the Healthcare Boulevard, and the entire length of the Healthcare Boulevard by street tree planting. Utilize the landscape planting to identify and separate pedestrian, bicycle and vehicular circulation routes.

4.14.1.10 Provide safe bicycle circulation pathways from the perimeter City bicycle lanes to the Facility's bicycle storage facilities as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

4.14.1.11 Provide nodes at places where people and transportation routes congregate including where Healthcare Boulevard intersects with New Local Street and the Wellness Walk.

4.14.1.12 Provide a pedestrian connection along the Healthcare Boulevard and an east-west link to the Wellness Walkway.

4.15 Spiritual Garden

4.15.1 Project Co will provide a Spiritual Garden to meet the following requirements:

4.15.1.1 Provide an inspiring, all-faith based garden, accommodating universal spiritual processes, where people can feel spiritually connected.

4.15.1.2 Provide a quiet, meditative, and tranquil space that is publicly accessible at all times and adjacent to a public entrance with clear sight lines for visual monitoring.

4.15.1.3 Provide porous separation between the Spiritual Garden and adjacent active areas.

4.15.1.4 Provide public seating which is shaded and protected from the elements.

4.15.1.5 Provide a continuous or looped walking circuit or garden labyrinth that is accessible to Persons with Disabilities. Use textures to indicate path rather than ridges.

4.15.1.6 Provide design elements to create a healing environment such that natural textures, colours, light, views of nature, art, music and various displays are appreciated by those utilizing the space and foster participation in alternative activities.

4.15.1.7 Provide space for three (3) statues or works of art at locations as determined in consultation with the Owner. The works of art will be Owner-supplied.

4.15.1.8 Provide a design which features spiritual storylines and eco-theology. Comprise inspiring garden spaces, including plant species that reference spiritual storylines.

4.15.1.9 Share attributes that encompass and are incorporated into the landscape design of the entire Site;

4.15.1.10 Provide plantings that are low maintenance and can be cared for by a volunteer group.

4.15.1.11 The Spiritual Garden will have a minimum area of 140 NSM.

4.16 Traditional Medicine Garden

4.16.1 Project Co will provide a Traditional Medicine Garden to meet the following requirements:

4.16.1.1 The Traditional Medicine Garden will have Direct Access to the All Nations Sacred Space.

4.16.1.2 The Traditional Medicine Garden will have a minimum area of 50 NSM and:

4.16.1.2(1) Be secured, and accessible to visitors only through the All Nations Sacred Space Ceremony Room, except for maintenance access, which will be provided through Back of House circulation within the Facility;

4.16.1.2(2) Be provided with a decorative fence that provides transparency and prohibits exterior public access to the space;

4.16.1.2(3) Include space for growing traditional healing plants used by Indigenous Peoples and managed by the Owner's indigenous health team at the Facility;

4.16.1.2(4) Include an area that provides protection from the elements; and

4.16.1.2(5) Provide storage for equipment that is required for activities and maintenance.

4.16.1.3 The plant palette surrounding the Traditional Medicine Garden will consist of plants indigenous to BC as determined in consultation with the Owner's Indigenous subject matter experts.

4.17 Secure Outdoor Spaces

4.17.1 Project Co will provide Secure Outdoor Spaces to meet the following requirements:

4.17.1.1 The Secure Outdoor Spaces will not have Direct Access to grade and will not provide views into private spaces including Patient rooms or where treatment is being administered.

4.17.1.2 The selection and placement of outdoor plantings and furnishings in all Secure Outdoor Spaces will be safe for Patients and will not allow for opportunities of hiding. Plants that are sharp, poisonous, climbable, or otherwise dangerous, or that can potentially cause allergic reactions are not permitted.

4.17.1.3 Plantings within all Secure Outdoor Spaces will be irrigated by a permanent, high efficiency, automatically timed and condition controlled, irrigation system.

4.17.2 Mental Health Inpatient Unit Exterior Courtyard

4.17.2.1 The Mental Health Inpatient Unit Exterior Courtyard will provide safe and appropriate landscape plantings that support spaces for gathering, quiet contemplation, gardening, walking, exercising and other therapeutic activities.

4.17.2.2 The Mental Health Inpatient Unit Exterior Courtyard(s) will be directly accessible from the Mental Health Inpatient Unit. Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for adjacency requirements.

4.17.2.3 The Mental Health Inpatient Unit Exterior Courtyard(s) will have a minimum area of 650 NSM and will include the following requirements:

4.17.2.3(1) Provide external views across the City;

4.17.2.3(2) Provide shade in the form of a weather-proof trellis-like free standing structure that gives the feeling of an outdoor room;

4.17.2.3(3) Raised garden beds;

4.17.2.3(4) Individual seating areas for groups of 1 or 2 people;

4.17.2.3(5) Continuous walking circuit or wandering loop;

4.17.2.3(6) Gathering nodes with group seating areas for 4-6 people;

4.17.2.3(7) Covered, multi-use area with a minimum area of 60 NSM for flexible gathering /activity space. Include rubberized sports flooring for 50 NSM exercise area;

4.17.2.3(8) Be safe with clear lines of sight which are designed to eliminate any hiding spots or areas where Staff vision of the Patients is obscured;

4.17.2.3(9) Paving will be of an even, slip-resistant surface such as sandblasted concrete, articulated by features such as saw cut joints and coloured concrete. Loose and hard granular materials such as pea gravel will not be permitted.

4.17.2.3(10) Will have no sharp edges. Edges will be rounded to minimum 6 mm radius;

4.17.2.3(11) Materials including sealants will not pose ingestion or choking hazards;

4.17.2.3(12) Ensure that all materials used cannot be thrown or wielded in a way that will cause bodily harm, damage to the Facility;

4.17.2.3(13) Removable hardware elements, including electrical receptacles, will be Tamper Resistant;

4.17.2.3(14) All overhead structures will be designed to be Ligature Resistant and non-climbable;

4.17.2.3(15) Potential head and neck entrapments will be avoided in all designed elements;

4.17.2.3(16) Planters or other structures will not be placed within 2.0 m of secure screens or safety guards;

4.17.2.3(17) All hose bibs will be secured, concealed, and designed such that they can only activated by Staff;

4.17.2.3(18) Will not be located at-grade or have exposure for items to be thrown on to the space from above.

4.17.2.3(19) Enclosed by a continuous glass security screen that will:

4.17.2.3(19)(a) Be designed in accordance with VBBL post-disaster importance factor;

4.17.2.3(19)(b) Have a design service life of thirty (30) years;

4.17.2.3(19)(c) Be transparent with a 3 mm polycarbonate layer laminated between 6 mm fully tempered glass and 6 mm fully tempered glass;

4.17.2.3(19)(d) Be designed to prevent escape or unauthorized entry;

4.17.2.3(19)(e) Be non-climbable, including restrictions at corners, junctions and interfaces with other structures;

4.17.2.3(19)(f) Be of minimum 3.7 m AFF or full height (to underside of structure above); and

4.17.2.3(19)(g) Be Ligature Resistant.

4.17.2.4 The Owner will consider the division of the Mental Health Inpatient Unit Exterior Courtyard into a number of separate courtyards, provided that the design meets or exceeds the requirements of this Schedule 3 and its Appendices.

4.17.3 Therapy Roof Garden

4.17.3.1 Project Co will provide a Therapy Roof Garden designed to provide Patients experiencing physical challenges with a unique and varied setting in which to experience the outdoors and rehabilitate.

4.17.3.2 The Therapy Roof Garden will be located to meet the adjacency requirements as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and have a minimum area of 600 NSM.

4.17.3.3 The Therapy Roof Garden will include the following requirements:

4.17.3.3(1) Variety of tactile surfaces including synthetic turf, stepping stones, and resilient safety surfacing ;

4.17.3.3(2) Continuous looping perimeter path designed for Persons with Disabilities with connections to a variety of flat and sloped inclined surfaces;

4.17.3.3(3) Covered seating areas for 4-6 people;

4.17.3.3(4) Raised garden beds;

4.17.3.3(5) Tree bosque for north wind protection;

4.17.3.3(6) Resilient safety surfacing area; and

4.17.3.3(7) Continuous glass security screen to meet the requirements of the Mental Health Inpatient Unit Exterior Courtyard.

4.17.3.4 Therapy Roof Garden will be primarily accessed by Patients of the Rehabilitation Centre and requires controlled access. There will be at least one access (1) route to the Therapy Roof Garden that does not require travel through Assessment/Treatment areas (or other areas where Patient privacy is required) to enable access for Patients from other Components.

4.17.4 Critical Care Roof Garden

4.17.4.1 Project Co will provide a Critical Care Roof Garden designed to provide critically ill Patients and their families with an area of respite and Convenient Access to the outdoors.

4.17.4.2 The Critical Care Roof Garden will be located to meet the adjacency requirements as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and have a minimum area of 70 NSM.

4.17.4.3 The Critical Care Roof Garden will include the following requirements:

4.17.4.3(1) Covered seating areas for 4-6 people;

4.17.4.3(2) Raised garden beds;

4.17.4.3(3) Medical gas connections as described in Appendix 3K [Medical Gas Matrix]; and

4.17.4.3(4) Continuous glass security screen to meet the requirements of the Mental Health Inpatient Unit Exterior Courtyard.

4.18 FMO Maintenance Enclosure

4.18.1 Provide a minimum 114 NSM exterior area enclosed by a minimum 2.4 m high fence with lockable two (2) leaf gate for FMO storage of bobcats, maintenance materials and equipment. Provide within the enclosure:

4.18.1.1 A minimum 40 NSM concrete equipment pad for storage of equipment and vehicles; and

4.18.1.2 A minimum 34 NSM concrete pad and unconditioned weatherproof enclosure to serve as an exterior flammable storage area for at least the following items:

4.18.1.2(1) One (1) flammable storage container;

4.18.1.2(2) Four (4) pallets for storage;

4.18.1.2(3) Two (2) large medical gas containers;

4.18.1.2(4) Two (2) small dewars; and

4.18.1.2(5) Two (2) 600 mm diameter containers for chemical spill response kits; and

4.18.1.3 A back-in area with lockable double panel gate, sized to approximately three (3) LSU parking stalls, for the storage of de-icing supplies, including salt.

4.18.2 Enclosure will be constructed of materials consistent with the Facility exterior.

4.18.3 Enclosure will be located with Convenient Access to the FMO Component and the Energy Centre.

4.18.4 The Owner will consider a below-grade enclosure otherwise meeting the requirements of Section 4.18.1 to be acceptable, provided that:

4.18.4.1 A separate enclosure will be located at grade to accommodate the flammable storage container described in Section 4.18.1.2(1) and the storage of de-icing supplies described in Section 4.18.1.2(5); and

4.18.4.2 The access requirements set out at Section 4.18.3 are maintained for the below-grade enclosure.

4.19 Personal Belongings and Shopping Cart Storage Area

4.19.1 Provide a minimum 20 NSM exterior area enclosed by a minimum 2.4 m high fence with lockable two (2) leaf gate for storage of patient belongings including bike trailers and carts.

4.19.2 Enclosure will provide weather protection and be constructed of materials consistent with the Facility Exterior.

4.19.3 Enclosure will be located with Convenient Access to the Emergency Department, in a discrete location.

4.20 Accessibility Requirements

4.20.1 Project Co will Design the Facility to meet the following requirements:

4.20.1.1 The primary pedestrian systems, public open spaces, primary walkways and all entrances to the Facility will be accessible for Persons with Disabilities.

4.20.1.2 Access, egress routes, entrances and all exterior courtyards, gardens, patios or similar outdoor spaces will be accessible for persons requiring assistive mobility equipment, including people with strollers.

4.20.1.3 Provide pedestrian surfaces that are suitable for use by wheelchairs, strollers, and small wheeled medical devices. Asphalt, wide expanses of pavers or crushed rock surfaces will not be permitted for outdoor surfaces.

4.20.1.4 Provide leveling strips at the point of access to the Facility to ensure continuous smooth level surfaces for traversing entryways. The leveling strips will be designed for simple adjustment to compensate for Facility settlement if required.

4.20.1.5 Provide walkways and ramp surfaces that are slip resistant.

4.20.1.6 Provide walkways and ramps with sufficient space between handrails to allow two wheelchairs to pass, and provide landings having a minimum length of 1.625 m at the bottom and top of all ramps. Ensure corners are a minimum of 1.22 m wide to allow for turning of a wheelchair or walker.

4.20.1.7 Separate pedestrian walkways and ramps from service areas with a barrier at least 100 mm high in a colour suitable to distinguish it from paths and grass.

4.20.1.8 Construct exterior stairways and convenience stairs with a maximum of 10 risers per flight followed by a landing.

4.20.1.9 The Owner encourages rest areas and seating opportunities be provided a minimum of every 9 m.

4.20.1.10 Design features that segregate circulation, areas and uses for Persons with Disabilities from typical public usage are discouraged, except where required due to reasons of safety or due to space limitations.

4.20.1.11 Locate parking stalls for Persons with Disabilities directly adjacent to each entrance and Parking Passenger Elevator lobby.

4.21 Exterior Safety and Security

4.21.1 All entrances to the Facility will be either controlled by a reception point or secured by IP Video Surveillance / access control. Where external spaces are accessible to the public they will be regularly patrolled and controlled using IP Video Surveillance cameras that reply back to the main security station of the Facility.

4.21.2 All exterior spaces including the Plaza, Wellness Walkway, Healing Corridor, Healthcare Boulevard, Spiritual Garden, Traditional Medicine Garden and Secure Outdoor Spaces will be designed with clear sight lines for safety.

4.21.3 Exterior spaces will be designed to eliminate hiding places or areas of obscured vision. Provide circulation and sight lines through which are free of obstructions, clear and designed to limit confusion with direction and Wayfinding.

4.21.4 Exterior spaces will have planting, benches and other site elements which are average height of 0.5 m or below to provide clear visibility throughout and a sense of safety. Taller accent elements may be acceptable.

4.21.5 The selection and placement of outdoor planting, benches and other Furniture will be safe for Patients, Staff and the Public and will not allow for opportunities of hiding or entrapment.

4.21.6 Landscape elements will not comprise plantings or structures that create hiding spaces, block sightlines and hide litter.

4.21.7 Design the Site to meet CPTED principles, having particular regard for discouraging theft, mischief, vandalism and reducing opportunities for hiding spaces.

4.21.8 Provide lighting to enable 24-hour public and Staff accessibility and safety.

4.21.9 Provide lighting for roadways, walkways and parking areas within the Site to ensure safe movement of vehicular, bicycle and pedestrian traffic with respect to collisions, personal safety, and building access and egress.

4.21.10 All external foliage will not interfere with exterior camera views and any required external sightlines.

4.21.11 Eliminate entrapment spots and incorporate barriers that permit visual access without loss of privacy which include providing glazing in exterior lobby doors and stairwells.

4.21.12 Promote the visual observation of the Site by the Facility occupants through placement of windows and doors.

4.21.13 Protect all Facility entrances from errant vehicles through the use of decorative bollards and barricades which keep vehicles away from a facility. Barriers will stop 6800 kg (15,000 lbs) vehicles traveling 32km/h (20 m/hr) or larger vehicle(s) to suit the type of traffic that could reasonably access a particular area of the Facility. Provide set back distances for all parking stalls that protect the Facility entrances. Design of bollards, barricades and set back distances will be as determined in consultation with the Owner and the Facility Threat and Risk Assessment.

4.22 Community Noise Protection

4.22.1 Orientate Facility entrances so that the noise impact of emergency and service vehicles, and new traffic routes to the surrounding community will be minimized.

4.22.2 Strategically locate and design mechanical and electrical equipment, outside air intake and discharge openings to meet the requirements of Appendix 3C [Acoustic and Noise Control Measures].

4.23 Site Lighting

4.23.1 Provide LED lighting for public outdoor spaces that creates an unobtrusive, human scale lighting concept, with a hierarchy of fixture types designed according to functional and security needs (including CPTED) and reflecting the hierarchy of pedestrian corridors.

4.23.2 Lighting on pedestrian walkways and bicycle paths, including those leading to transit connections, will illuminate the path and spill over to illuminate several metres adjacent to the path.

4.23.3 Lighting will be strategically placed as to not disrupt Patient sleep and will be dark-sky compliant.

4.24 Off-Site Infrastructure

4.24.1 Project Co will provide all off-site infrastructure, third-party Utility, and roadwork as described in Appendix 3D [Site Services Diagram] and Appendix 3H [Preliminary Roadway Drawings].

4.24.2 All off-site works required for excavation, exposing, backfill and surface restoration of all proposed water mains, storm and sanitary sewers, as well as the connection of each service to the municipal systems, will be the responsibility of Project Co.

4.24.3 All off-site works required for the Design and Construction of all storm sewer, sanitary sewer, water main, and roadwork infrastructures will be the responsibility of Project Co.

4.24.4 All off-site works will be designed and constructed in accordance with the latest edition of the Master Municipal Construction Documents (MMCD), the City's Engineering Design Manual, and the City's Standard Detail Drawings.

4.24.5 Water Main

4.24.5.1 Provide three (3) sets of combined domestic and fire water service connections, including valves, metering and backflow prevention, as described in Appendix 3D [Site Services Diagram]. Refer to Section 7.3.1.1.

4.24.5.2 The extent to which provision for on-site pumping from the proposed water connections will be required (to suit either domestic demand or fire-fighting demand, or both) and will be determined, in part, by the final Facility floor area and height.

4.24.5.3 Project Co will ensure that City access to municipal fire hydrants is not encumbered at any time. All existing hydrants will remain active during the Construction.

4.24.5.4 Off-site water system upgrades will be required in accordance with the requirements of the City. Project Co to provide water demands and FUS calculations to the City for analysis and confirm sizing.

4.24.5.5 All new water mains to be seismically resilient Kubota ductile iron pipe per City specifications.

4.24.5.6 Provide new water mains on New High Street, Station Street, National Avenue, New Local Street, Road A, and Malkin Avenue as shown on drawing KP1 in Appendix 3D [Site Services Diagram].

4.24.5.7 Provide connections to existing water main on Prior Street, National Avenue, Station Street, and Malkin Avenue to complete the required looped system. These connections will satisfy the City's resilient design requirement.

4.24.5.8 Provide off-site fire hydrants per City spacing and specifications.

4.24.5.9 Provide two (2) combined domestic and fire water service connections for future CSRC building.

4.24.5.10 Provide one (1) combined domestic and fire water service connection per parcel to the North Precinct and South Precinct, and two combined water service connections to the West Precinct.

4.24.6 Sanitary Sewer

4.24.6.1 Sanitary sewer video inspections will be required upon installation.

4.24.6.2 The Facility requires four (4) sanitary service connections as described in Appendix 3D [Site Services Diagram].

4.24.6.3 Off-site sanitary sewer upgrades will be required in accordance with the requirements of the City.

4.24.6.4 Connect existing sanitary sewers on Prior Street at Gore Avenue and Dunlevy Avenue and re-direct existing flows downstream through new sanitary sewers along New High Street and Station Street to the existing Thornton Park Pump Station. Project Co to coordinate with the City on design requirements, provide, calculations and confirm sizing to the satisfaction of the City.

4.24.6.5 Provide new sanitary sewers along New Local Street and National Avenue.

4.24.6.6 Abandon existing sanitary sewer following the City's pipe abandonment specifications after new sanitary sewer is in place.

4.24.6.7 Provide one (1) sanitary service connection for each of the North Precinct, South Precinct and West Precinct.

4.24.7 Storm Sewer

4.24.7.1 Storm sewer video inspections will be required upon installation per MMCD and the City's requirements.

4.24.7.2 The Facility requires four (4) storm service connections as described in Appendix 3D [Site Services Diagram].

4.24.7.3 Connect existing storm sewers on Prior Street at Malkin Avenue, Dunlevy Avenue, and Gore Avenue and re-direct existing flows downstream through new storm sewers and drainage collection facilities along Prior Street, New High Street and Station Street and connect to the existing sewer on Terminal Avenue. Project Co.

to coordinate with the City on design requirements, provide calculations, and confirm sizing to the satisfaction of the City.

4.24.7.4 Provide new storm sewers and drainage collection facilities on Road A, New Local Street, and National Avenue.

4.24.7.5 Remove all existing gravity storm sewer through the existing right of way at 310 Prior Street.

4.24.7.6 Remove all existing gravity storm sewer through the existing right of way at 456 Prior Street.

4.24.7.7 Remove all existing gravity storm sewer through the existing right of way at 1002 Station Street.

4.24.7.8 Provide one (1) storm service connection to the North Precinct, South Precinct and West Precinct.

4.24.7.9 Provide a rainwater management plan to comply with applicable municipal requirements. The rainwater management will adhere to the following requirements:

4.24.7.9(1) Provide green infrastructure to retain off-site the first 24 mm of rainfall from all pervious and impervious surfaces by means of ground infiltration or evapotranspiration to the greatest extent practical;

4.24.7.9(2) Treat the next 24 mm of rainfall for a total of 48 mm per day for high polluting surfaces such as driveways and roadway, equivalent to the 6-month return period storm. Treatment standard is 80% TSS removal by mass; and

4.24.7.9(3) Refer to the City's Engineering Design Manual and the Rezoning Conditions for further details.

4.24.8 Road Works

4.24.8.1 Project Co to design and construct off-site roadways as per the preliminary roadway drawings presented in Appendix 3H [Preliminary Roadway Drawings]. Project Co to coordinate with the City on design requirements.

4.24.9 Street Lighting and Traffic Signal

4.24.9.1 Project Co to design and construct street lighting and traffic signal for all off-site roadways. Project Co to coordinate with the City on design requirements.

4.24.10 Adjacent Precincts

4.24.10.1 Project Co will provide the following for the North, West and South Precincts:

4.24.10.1(1) A 2.4 m high chain-link fence with lockable two (2) leaf gate to secure each Precinct;

4.24.10.1(2) Appropriate erosion and sediment control (ESC) measures as per City of Vancouver's ESC Bulletin 2002-003-EV for large lot development, where soils have been disturbed.

4.24.10.1(3) Transitions from the edge of adjacent sidewalk will conform to City's Engineering Design Manual requirements including maximum cut slope for boulevard will be 2:1 and maximum fill slope will be 4:1.

4.24.11 Power and Telecom Utilities

4.24.11.1 All civil works associated with relocation and/or undergrounding of existing power and telecom utilities to accommodate off-site infrastructure will be the responsibility of Project Co. Civil works to include earthworks, duct bank installation, concrete pad and pullbox installation, and patching for relocation and/or undergrounding of:

4.24.11.1(1) Existing utility infrastructure within the footprint of the off-site roadworks that conflicts with the roadwork requirements; and

4.24.11.1(2) Existing BC Hydro manhole within the future West Precinct area, to be relocated outside of the West Precinct (see drawing KP2 in Appendix 3D [Site Services Diagram]).

4.24.11.2 Power and telecom utility fees for relocation and/or undergrounding of infrastructure within the footprint of the off-site roadworks, and relocation of the West Precinct manhole, to be paid by Project Co as per Schedule 8 [Payments], excluding costs for associated civil works by Project Co. Coordination of the relocation design and construction with the utilities and the City is the responsibility of Project Co.

4.24.11.3 Responsibility for power and telecom services to the Health Campus will be as per Schedule 8 [Payments] and Section 4.25.9.1.

4.25 On-Site Infrastructure

4.25.1 All on-site works will be designed and constructed in accordance with the latest edition of the Master Municipal Construction Documents (MMCD), the VBBL, CD-1 (-) Bylaw, the City's Engineering Design Manual, and the City's Standard Detail Drawings.

4.25.2 Project Co will provide all on-site infrastructure and third-party Utilities as described in Appendix 3D [Site Services Diagram].

4.25.3 Earthworks

4.25.3.1 Excavate, backfill and grade to provide levels and elevations for foundations, Facility access, exterior improvements including underground parking structure,

roadways, walkways, service trenching and other required improvements. Site grading to include waste removal, stripping, clearing, grubbing, trenching, backfilling, embankment, controlled density fill, dewatering and compaction.

4.25.3.2 Provide soil remediation to construct the Facility. See Section 2.7 for details.

4.25.3.3 Site grading to meet with the proposed grades of the adjacent road network.

4.25.3.4 Earthwork requirements will meet the recommendations provided by Project Co's geotechnical engineer.

4.25.3.5 Soil Remediation will meet the recommendations provided by the Stage 2 Preliminary and Detailed Site Investigation Report prepared by PGL Environmental Consultants dated April 2019.

4.25.4 Sanitary Sewer System

4.25.4.1 Provide sanitary sewers of a diameter, grade and depth to safely convey all effluent from on-site.

4.25.4.2 The sanitary sewer system will include the pipes, manholes and all other required appurtenances to comply with applicable municipal and provincial standards.

4.25.4.3 Sanitary sewer video inspections will be required upon installation per MMCD and the City requirements.

4.25.5 Storm Sewer System

4.25.5.1 Provide storm sewers and rainwater management design for major and minor events to meet the City's bylaws and requirements.

4.25.5.2 Where “minor system” refers to a piped storm conveyance system and “major system” refers to the combination of piped systems, channels, retention or detention basins, roadways and overland flow routes, the systems will:

4.25.5.2(1) Be of a size, grade and depth to safely manage and convey all storm water on-site to the receiving off-site system;

4.25.5.2(2) Include storm water/oil and grit separation devices or other water quality treatment devices, capturing and treating runoff from all paved traffic and parking areas;

4.25.5.2(3) Provide grit separation treatment for roof water run-off before it enters the piped on-site conveyance network. Oil/water separation is not required for roof water;

4.25.5.2(4) Provide storm sewer video inspections upon installation; and

4.25.5.2(5) Provide best management practices for the capture, treatment and retention of storm water runoff.

4.25.5.3 Provide a rainwater management plan to comply with applicable municipal and/or LEED requirements. Project Co will ensure that neighbouring properties are protected from flooding and nuisance runoff issues. The rainwater management will adhere to the following requirements:

4.25.5.3(1) Post-development 10-year flow rate from on-site discharged to the off-site storm sewer will be no greater than the 10-year pre-development flow rate. The pre-development estimate will utilize the 2014 IDF curves, whereas the post-development estimate will utilize the 2100 IDF curves to account for climate change. This requirement is separate from the rainwater management obligations from the Rezoning Policy for Sustainable Large Developments, which requires rainwater treatment and management for the 1:2 year, 24-hour event;

4.25.5.3(2) Provide green infrastructure to retain on-site the first 24 mm of rainfall from all pervious and impervious surfaces by means of ground infiltration, evapotranspiration, and/or re-use on-site;

4.25.5.3(3) Treat the next 24 mm of rainfall for a total of 48 mm per day for high polluting surfaces such as driveways, parking lots, and loading zones, equivalent to the 6-month return period storm;

4.25.5.3(4) Treat 90% of the average annual rainfall volume from effective impervious areas;

4.25.5.3(5) The practices used to treat runoff will be capable of 80% TSS removal in accordance with the ISO 14034 ETV certification standards;

4.25.5.3(6) On-site runoff will not be directed to any green infrastructure area off-site. Treat on- and off-site runoffs separately; and

4.25.5.3(7) Refer to the Citywide IRMP, the Rezoning Policy for Sustainable Large Developments, and the City's Engineering Design Manual for detailed rainwater management requirements.

4.25.5.4 Provide adequately sized water quality/sediment control components, before discharging to the on-site retention systems, groundwater recharge facilities or the off-site drainage system.

4.25.6 Water Main System and Appurtenances

4.25.6.1 Provide a water main system of diameter, grade, and depth to safely meet domestic demand and fire flow requirements.

4.25.6.2 The water main system will include the pipes, valves, hydrants, fittings and all other required appurtenances to comply with applicable municipal and provincial standards.

4.25.6.3 Firefighting volumetric demands are to be calculated using the Fire Underwriters Survey (FUS) method, unless alternates are otherwise approved by the applicable Governmental Authority.

4.25.6.4 If required to meet the FUS fire flow demands, Project Co will provide back-up, permanent fire-fighting equipment.

4.25.6.5 The water main system will include approved reduced-pressure backflow preventers necessary to protect the municipal system and on-site facilities from contaminants based on the hazard level of the Facility.

4.25.6.6 Provide water meters and 100% redundant premise isolation backflow prevention stations inside the Facility, per clause 7.4.1.1(2). Water meter and isolation valve assembly to be installed in accordance with the City of Vancouver's Standard Design Requirements and Drawings.

4.25.7 Road Works

4.25.7.1 All on-site road works will meet the requirements of the standards and guidelines of the Geometric Design Guide for Canadian Roads, as published by the Transportation Association of Canada.

4.25.7.2 Design and construct on-site roadways, including the pavement, curbs and gutters, sidewalks, walkways, signage, pavement markings, and traffic calming devices. Sidewalks and walkways will be accessible to Persons with Disabilities and provide safe passage between parking areas and layby stall areas to the corresponding Facility entrance points.

4.25.7.3 Pavement structure will meet the recommendations of Project Co's geotechnical engineer.

4.25.7.4 All roadways will accommodate fire truck access in accordance with the VBBL requirements or the requirements of the municipality's fire department, whichever is more stringent.

4.25.7.5 Use surfacing materials that will meet intended use and minimize the 'heat island' effect, where possible.

4.25.7.6 Provisions for on-site roadways will be required to account for snow removal machinery and methods in winter snowfall months.

4.25.7.7 Roadways and paved areas will have positive drainage to shed rain water quickly to a storm drainage facility.

4.25.7.8 Access road above underground chambers will be waterproofed to prevent water seepage and flooding of the chambers

4.25.7.9 No surface ponding is permitted within on-site roadways.

4.25.8 Street Lighting

4.25.8.1 Provide lighting for on-site roadways, walkways and parking areas to ensure safe vehicle and pedestrian traffic with respect to collisions, personal safety, and Facility access/egress. Provide lighting sympathetic to all neighbouring properties.

4.25.9 Third-Party Utilities

4.25.9.1 Project Co will:

4.25.9.1(1) For FortisBC:

4.25.9.1(1)(a) Coordinate both on-site and off-site underground civil with FortisBC as per Section 7.4.1.1(4). FortisBC will supply and install both on-site and off-site gas utilities.

4.25.9.1(2) For underground NEU:

4.25.9.1(2)(a) Project Co is responsible for trenching, backfill, and coordination with the City for the off-site NEU utilities. Materials and mechanical installation will be provided by the City.

4.25.9.1(2)(b) Supply and install on-site underground NEU utilities to the Facility. Supply and install Facility NEU piping as per Section 7.5.2.13.

4.25.9.1(2)(c) Refer to Appendix 3T [NEU Piping] for additional requirements.

4.25.9.1(3) For Telco:

4.25.9.1(3)(a) Coordinate and provide services as per Section 7.9.2.2(2).

4.25.9.1(4) For BC Hydro:

4.25.9.1(4)(a) Coordinate and provide services as per Section 7.8.3.

4.25.9.2 Liaise with relevant Utility suppliers and owners for the design and construction of the new third-party Utilities.

4.25.9.3 Resolve all conflicts between third-party Utilities and other existing and proposed municipal infrastructures with relevant suppliers and owners.

4.25.9.4 Ensure all necessary permits in connection with the Utility work are obtained.

4.26 Parking Requirements

4.26.1 All parking stalls and vehicle ramps will meet the City bylaw requirements.

4.26.2 Each parking stall designed for Persons with Disabilities will count as one parking stall only.

4.26.3 Project Co will provide the following minimum number of at-grade parking and layby stalls:

4.26.3.1 Ten (10) short-term surface parking stalls located adjacent to the ED. Provide two (2) layby stalls adjacent to the ED Entrance Vestibule-Walk-in;

4.26.3.2 Three (3) surface parking stalls and three (3) service vehicle layby stalls directly adjacent to the Energy Centre. The three (3) service vehicle layby stalls will be Class A vehicle loading bays;

4.26.3.3 Five (5) stalls for police vehicles located as follows; three (3) located adjacent to the ED and two (2) located adjacent to the dedicated Mental Health entrance (Entrance Vestibule-VPD/BCEHS);

4.26.3.4 Twelve (12) ambulance vehicles in a back-in arrangement. Minimum six (6) fully enclosed in the Ambulance Garage, four (4) located adjacent to the Ambulance Garage and two (2) located adjacent to the dedicated Mental Health entrance (Entrance Vestibule-VPD/BCEHS);

4.26.3.5 Eight (8) public layby stalls for vehicles with sufficient room for elderly and Persons with Disabilities to manoeuvre safely and located adjacent to the Main Entrance and C4HA Outpatient Clinics Entrance. A minimum of four (4) public layby stalls will be located at grade. Any below-grade public layby stalls will be directly adjacent to the Parking Passenger Elevators and easily accessible from the public underground parking vehicle entrance. Stalls will be designed with clear public Wayfinding and appropriate sightlines for drivers and pedestrians to manoeuvre safely. Any public layby stalls configured in a back-in arrangement will be sized as an accessible stall, at minimum;

4.26.3.6 Four (4) layby stalls for hospital transfer vehicles located adjacent to the Main Entrance and C4HA Outpatient Clinics Entrance sized to accommodate the largest type hospital transfer vehicle occupying each space simultaneously; and

4.26.3.7 Four (4) layby stalls for taxi and courier vehicles adjacent to the Main Entrance and C4HA Outpatient Clinics Entrance.

4.26.4 Project Co will provide the following minimum number of underground parking stalls:

4.26.4.1 One thousand, one hundred and seventy (1170) public parking stalls;

4.26.4.2 Ten (10) motorcycle parking stalls;

4.26.4.3 One (1) enclosed Sally-Port for a hearse vehicle;

4.26.4.4 Three (3) hospital transfer vehicle stalls to be located adjacent to the Patient Transfer/Staff Service Elevators; and

4.26.4.5 Two (2) ambulance stalls to be located adjacent to the Patient Transfer/Staff Service Elevators.

4.26.5 Layby Stalls for Pick-up and Drop-Off

4.26.5.1 Project Co will provide the following layby pick-up and drop-off layby parking stalls:

4.26.5.1(1) Provide protection from inclement weather through the use of canopies or a porte cochere extending the full length of the layby pick-up and drop-off layby parking stall area and projecting a minimum distance of 300 mm beyond the curb.

4.26.5.1(2) Provide a sheltered pedestrian walkway leading from exterior parking areas and layby stalls to Facility entry points.

4.26.5.2 The Owner's ambulance vehicles include:

4.26.5.2(1) Ambulance Type II (W / L / H). 1.9 m / 5.9 m / 2.4 m

4.26.5.2(2) Ambulance Type III (W / L / H). 2.8 m / 7.0 m / 2.4 m

4.26.5.2(3) Ambulance Mini Pod (W / L / H). 2.5 m / 6.5 m / 2.4 m

4.26.5.3 The Owner's hospital transfer vehicles include:

4.26.5.3(1) Accessible Bus (W / L / H). 2.2 m / 6.2 m / 2.8 m

4.26.5.3(2) Accessible/ Stretcher Min-Van (W / L / H). 2.0 m / 5.2 m / 1.7 m

4.26.5.3(3) Pro-Master - SWB (W / L / H). 2.1 m / 5.4 m / 2.3 m

4.26.5.3(4) Pro-Master - LWB/Hi Roof (W / L / H). 2.1 m / 6.0 m / 2.6 m

4.26.5.4 Provide vertical clearance over all stalls and vehicle paths in the drop-off and pick-up area to accommodate the design vehicles including ambulances and fire truck for future flexibility.

4.26.5.5 Provide adequate space at all layby drop-off and pick-up parking stalls for additional assistive equipment.

4.26.5.6 Project Co will coordinate all requirements for car share parking as determined in consultation with the Owner.

4.26.5.7 Layby stalls for hospital transfer vehicles will be sized to meet the larger space requirements of either:

4.26.5.7(1) City Class B loading bay, or

4.26.5.7(2) Clear space on either side of the vehicle for a lift or ramp plus 1.2 m and clear space at the rear of the vehicle of 3.0 m.

4.26.6 Valet Parking

4.26.6.1 The Owner will provide valet services at the Facility outside the Main Entrance Lobby and ED entrance. Project Co will provide all required Wayfinding signage, exterior lighting and valet stand.

4.26.7 Parking Requirements for Service Vehicles

4.26.7.1 Provide space for service vehicles to deliver potable water, medical gas (refer to Section 4.26.7.4(1)) and remove sewage waste, refer to Section 5.2.4.1.

4.26.7.2 Project Co will plan separate space for each service vehicle, which will not impact any other loading bay or parking stall required by this Schedule.

4.26.7.3 Space for service vehicles will be located away from the public entrances.

4.26.7.4 The Facility will accommodate the following minimum type and dimensions of service vehicles:

4.26.7.4(1) Two (2) separate locations for WB-20 - Medical Gas Truck (W / L) 5.0 m / 25.0 m layby parking spaces; one (1) at the building's exterior wall and one (1) at designated bulk oxygen site;

4.26.7.4(2) One (1) location for HSU - Grease Trap Truck (W / L) 2.6 m / 11.5 m vehicle parking space located in proximity to Facility Central Food Production kitchen, which will be an enclosed parking space if it is located underground;

4.26.7.4(3) One (1) location for HSU - BC Hydro Truck (W / L / H) 2.6 m / 11.5 m / 3.3 m parking space located adjacent to BC Hydro switchgear vault (Vista switch room) access doors; and

4.26.7.4(4) Two (2) locations for HSU - Fuel Truck (W / L / H) 2.6 m / 11.5 m / 3.3 m parking spaces: one (1) adjacent to generator fuel tanks and one (1) adjacent to boiler fuel tanks. Fuel tanks located adjacent to one another can be serviced by one (1) vehicle position.

4.26.8 Parking Layout and Circulation

4.26.8.1 Lay out parking in an orderly and logical design to minimize confusion and excessive Internal Circulation.

4.26.8.2 Lay out parking such that it does not require a vehicle to back up for more than 10 m.

4.26.8.3 The minimum vertical clearances within the underground parking will accommodate hospital transfer vehicles based on the highest design vehicle described in Section 4.26.5.2. All other levels of underground parking where hospital transfer vehicles are not required to access, will have a minimum vertical

clearance over all stalls and drive aisles of 2.2 m or additional as required by the City bylaw. No pipes, sprinklers or other fixtures are permitted to encroach on this minimum clearance.

4.26.8.4 Maximum allowable slope or cross-fall is 5%, applicable to both the parking stalls and access aisles.

4.26.8.5 Traffic flow will be designed to reduce car speed and traffic calming measures will be provided to slow cars down to encourage safe traffic speed. Traffic calming measures include landscape features, raised crosswalks, road textures and speed humps.

4.26.9 Drivers' Visibility

4.26.9.1 Provide unobstructed visibility between parking areas and elevator lobbies, exit stairwells and entrance points to the Facility through glazed vestibule entrance doors, windows and door sidelights. Windows in exit stair doors are to be provided in addition to windows in demising walls and/or full height door sidelights.

4.26.9.2 Do not use interior walls that obstruct drivers' visibility to drive aisles.

4.26.10 Security in Parking Areas

4.26.10.1 Minimize hiding spaces in the Design of parking areas. Design parking areas in accordance with CPTED principles.

4.26.10.2 A method will be provided for users to readily summon help if in distress or danger both in exterior parking areas and in the underground parking; refer to Section 7.10.6 Fixed Duress System.

4.26.10.3 Provide underground parking that is capable of being secured and locked when not in use.

4.26.10.4 Provide card reader access control and timer control function at all overhead rolling security gate locations. Overhead rolling security gates are required for after-hours Staff access at the following locations, at a minimum:

4.26.10.4(1) All exterior access points to the underground parking; and

4.26.10.4(2) Within the underground parking between Level P1 and lower levels of parking. The exact location and areas of these separations will be as reviewed by the Owner based on the Design.

4.26.10.5 Provide a man-door with electronic access control directly adjacent to any overhead rolling security gate for after-hours access to and from the underground parking by authorized persons.

4.26.10.6 Provide adequate provision for ingress and egress to all parking spaces to ensure ease of mobility, ample manoeuvring clearances, and safety of vehicles and pedestrians.

4.26.10.7 Provide anti-graffiti coatings on all exposed concrete walls surfaces throughout the underground parking area.

4.26.11 Demarcations, Barriers and Painting

4.26.11.1 Number all parking stalls in a specific contiguous numbering sequence that is mutually exclusive. Parking stall numbering will be proposed by Project Co and determined in consultation with the Owner.

4.26.11.2 Provide all stall lines and stall numbers. Parking stall lines and stall numbers will be painted in white. Stall numbers will be painted on the pavement and on the wall at a height visible to the driver when in the vehicle. Parking spaces will be delineated by double line paint markings.

4.26.11.3 Paint all exterior pick-up and drop-off layby parking stalls in yellow.

4.26.11.4 Provide bent steel plate protective covers painted yellow and suitably fastened to adjacent substrate at the required height to collect all vehicle bumpers at all exposed vertical rainwater leaders, other miscellaneous piping and fixtures as required to protect from any potential vehicular impact damage throughout.

4.26.11.5 Provide painted pedestrian pathways that are clearly marked.

4.26.11.6 Use lead-free paint for all demarcations on the floor such as stall stripes, numbers, and traffic markings.

4.26.11.7 Provide concrete-filled domed steel bollards painted yellow and suitably fastened to adjacent substrate to protect the jambs of overhead doors, glazed screens, lobbies, vestibules, service rooms, bicycle storage areas, walls, sprinkler pipes and all fixtures within vehicular access as required to protect from any potential vehicular impact damage throughout.

4.26.11.8 Provide wheel stops for all front-to-back parking stall locations.

4.26.12 Parking Wayfinding

4.26.12.1 Use Wayfinding strategies, including signage, to allow each underground parking level to be identifiable and distinct to assist in orientation and ease of finding/identifying parking stalls. Coordinate width, height and location of stall numbers with horizontal banding. Refer to Appendix 3G [Wayfinding and Signage] for acceptable strategies.

4.26.12.2 Provide a direct route for pedestrians to navigate from each parking area or underground parking level to the nearest Facility entry point, including Parking Passenger Elevators and parking convenience stairs.

4.26.12.3 Delineate pathways to Facility entry points with illuminated Wayfinding signage that includes the names of services reached most immediately from each entrance.

4.26.12.4 Provide all traffic control signage as required by local regulations.

4.26.13 Vehicle Access

4.26.13.1 Project Co will determine the following in consultation with the Owner:

4.26.13.1(1) Location of all vehicle entry points to the Site;

4.26.13.1(2) Location of vehicle access and egress from the underground parking areas;

4.26.13.1(3) Location of on-site roadways and access to surface parking;

4.26.13.1(4) Locations of layby stalls; and

4.26.13.1(5) Access to all departments located at grade.

4.26.13.2 Underground Parking Requirements

4.26.13.2(1) Access to underground parking will be clearly marked with Wayfinding signage;

4.26.13.2(2) Provide clear delineation of all entry points and exits from the underground parking; and

4.26.13.2(3) All floors of the underground parking will be contiguous. Vehicles will be able to access all floors of the underground parking without having to leave the underground parking and re-enter.

4.26.13.2(4) For all exterior vehicular ramps, provide reveals in a herringbone pattern for additional traction.

4.26.14 Ambulance Parking

4.26.14.1 Project Co will;

4.26.14.1(1) Provide an at-grade, fully enclosed Ambulance Garage for six (6) ambulance vehicles with a back-in arrangement and overhead fabric rolling doors;

4.26.14.1(2) Comply with Ambulance Station Design Standards, BCAS, BC Emergency and Health Services, including minimum vertical clearance;

4.26.14.1(3) Access to the underground ambulance parking stalls will be provided with all required clearances (height, width and length) for these vehicles. The minimum Ceiling Height at the dedicated underground ambulance parking stalls and to access those stalls will be 3.0 m. Within the underground ambulance parking stalls, the minimum clearance all around each vehicle will be sufficient so that a stretcher, in its fully extended position with clinical Staff around it, can be manoeuvred between the closest underground parking enclosure (e.g., walls, doors, windows) and the doors of the vehicle in their fully open position;

4.26.14.1(4) Provide an enclosed, dedicated Sally-Port for a hearse or ambulance in the underground parking with convenient and discreet access. Access to the Sally-Port will be provided with all required clearances (height, width, and length) for the largest of these vehicles. Inside the Sally-Port, the minimum clearance all around the vehicle will be sufficient so that a stretcher, in its fully extended position with clinical Staff around it, can be manoeuvred between the closest Sally-Port enclosure (e.g., walls, doors, windows) and the doors of the vehicle in their fully open position. The dedicated Sally-Port will have Direct Access to the morgue;

4.26.15 Automated Parking Payment System

4.26.15.1 The Facility will include an unattended Automated Parking Payment System through pay-by-stall or pay-by-License plate real time PCI-compliant coin/credit card pay stations.

4.26.15.2 The Owner will install the Automated Parking Payment System with its vendor. Project Co will be responsible for coordinating of the installation of the Automated Parking Payment System and the following at each location:

4.26.15.2(1) Appropriate clearances for access and servicing;

4.26.15.2(2) All infrastructure necessary to support the system, including power and data. Provide CAT6A Ethernet cabling from the system to the appropriate room in the Facility; refer to Section 7.9 Communications (Division 27);

4.26.15.2(3) IP Video Surveillance camera coverage;

4.26.15.2(4) Paint striping around the area for safety;

4.26.15.2(5) Concrete filled steel bollards for safety; and

4.26.15.2(6) Securing the system with bolts to concrete. The system will not be bolted to asphalt;

4.26.15.3 The Automated Parking Payment System will meet the requirements of the Luke II Installation Guide for electrical power.

4.26.15.4 Automated Parking Payment System will be provided at the following locations in the Facility:

4.26.15.4(1) Minimum six (6) parking payment machines; two per floor in the underground parking at close proximity to the Parking Passenger Elevator lobbies;

4.26.15.4(2) Minimum two (2) parking payment machines in the Main Entrance Lobby;

4.26.15.4(3) Minimum one (1) parking payment machine in the Emergency Department waiting area;

4.26.15.5 Provide the Automated Parking Payment System in exterior surface parking area locations distributed throughout to provide ease of access.

4.26.15.6 Automated Parking Payment System will be located to facilitate efficient payment by users without requiring back-tracking and return trips.

4.26.15.7 Final locations for the Automated Parking Payment System will be as determined with the Owner to ensure pay stations are located in safe and secure areas and are provided in sufficient quantities to avoid delay and queuing for paying users.

4.26.16 Real-Time Parking Count System

4.26.16.1 General Requirements

4.26.16.1(1) Project Co will provide a real-time parking counting system for the Facility underground parking areas.

4.26.16.1(2) Real-time parking counting system will count the number of vehicles as they enter and exit the underground parking areas.

4.26.16.1(3) Provide parking display information by means of LED signage located at strategic points, including all vehicle entrances to underground parking to alert drivers to the parking availability status. LED signage to be coordinated with Wayfinding signage and use the visual language of the Wayfinding sign program.

4.26.16.1(4) Parking display information to include the following:

4.26.16.1(4)(a) Total number of public and Staff parking spaces in each underground parking area and level;

4.26.16.1(4)(b) Real-time number of public and Staff parking spaces available in each underground parking area,

which will take into account parking spaces accessible to Persons with Disabilities; and

4.26.16.1(4)(c) Integration with perimeter pylon signage.

4.26.16.1(5) The display of real-time information will be in coordination with the Wayfinding requirements of this Schedule.

4.26.16.2 Performance Criteria

4.26.16.2(1) Real-time parking counting system sensors will be Tamper Resistant, weather-proof and installed at all entrance and exits of all underground parking areas.

4.26.16.2(2) The real-time parking counting system will include auditing and reporting functionality that will be accessible via the network by authorized Staff.

4.26.16.2(3) Parking count system will be centrally supported to reset the parking count remotely.

4.26.16.2(4) Real-time parking counting system will have the capability to provide counting for all site-parking locations in the future as part of a Health Campus parking counting system.

4.26.16.2(5) Real-time parking counting system will have the capability to send real-time parking count information to a future Owner web-based system such as web-based portal information.

4.26.16.2(6) Cabling will follow requirements of structured cabling as per Section 7.9 Communications (Division 27).

4.26.16.2(7) Cabling will be run in conduit and be rated as outside cable plant.

4.26.16.3 Programming

4.26.16.3(1) The real-time parking counting system will be programmable and flexible, allowing the Owner to make future changes to the ratio of Staff and public parking stalls by floor in the underground parking.

4.26.16.3(2) Project Co is responsible for all programming of the real-time parking counting system, in accordance with the system manufacturer.

4.26.16.3(3) System programming is to be completed in coordination with and to the satisfaction of the Owner.

4.26.17 Bicycle Parking and Cycling Amenities

4.26.17.1 Project Co will:

4.26.17.1(1) Provide cycling amenities, bicycle parking and storage in accordance with the requirements of this Schedule and the following;

4.26.17.1(1)(a) City's bylaw requirements.

4.26.17.1(2) Minimum Cycling Amenities, Short-Term and Long-Term (or Class A) bicycle parking facilities are as follows:

4.26.17.1(2)(a) Long Term - provide a minimum of 200 Class A bike stalls;

4.26.17.1(2)(b) Short Term – provide a minimum of 20, secured, indoor Class B bike stalls located adjacent to the cycling amenities; and

4.26.17.1(2)(c) Short Terms - a minimum of 20 spaces at each public entrance.

4.26.17.1(3) Cycling amenities will include the following, as described in the IPS Transportation Demand Management and Commuter Services Design Guidelines – Bicycle Parking Facilities:

4.26.17.1(3)(a) Shower/Change Room (Change Room-Staff may be included as shower/change room for bike facilities, where approved by the City);

4.26.17.1(3)(b) Water Closets;

4.26.17.1(3)(c) Wash Basins;

4.26.17.1(3)(d) Hand dryer;

4.26.17.1(3)(e) Clothing and equipment Locker;

4.26.17.1(3)(f) Bike Self-Repair/ Maintenance;

4.26.17.1(3)(g) Bench; and

4.26.17.1(3)(h) Lounge.

4.26.17.1(4) Locate the secured bicycle parking and storage for Staff at grade or on Level P1 of the underground parking only.

4.26.17.1(5) Bicycle parking and storage for Staff will be located adjacent to where Staff are expected to use the elevators.

4.26.17.1(6) Provide a slip-resistant finish on cyclist and pedestrian circulation areas into and within the underground parking that provide access to bicycle parking and storage areas.

4.26.18 Electric Vehicle Charging

4.26.18.1 Provide and commission AC Level 2 EV charging stations (208V single phase, 40A EVSE) in a quantity equal to 10% of all underground public parking stalls described in Section 4.26.4.1, for general use, capable of a maximum 6.6kW continuous charge rate. EV charging stations will use load sharing capabilities at the branch panelboard, feeder, and transformer levels with a nameplate-to-peak power ratio of 3:1 (e.g. 33% demand factor) to minimize the size of the required upstream infrastructure. Branch circuit-level load sharing is not permitted.

4.26.18.2 All EV charging stations for general use to be located near the Parking Passenger Elevators, equally distributed on each parking level.

4.26.18.3 In addition to general use EV charging stations, provide and commission an AC Level 2 EV charging station (208V single phase, 40A EVSE) on vital or delayed vital power for ambulance use at each of the four (4) stalls adjacent to the Ambulance Garage, two (2) stalls adjacent to the dedicated Mental Health entrance, and two (2) ambulance stalls adjacent to the Patient Transfer/Staff Service Elevators. EV charging stations to have a demand factor of 100% (no load sharing).

4.26.18.3(1) Provide a 20A outlet on a dedicated vital or delayed vital circuit for ambulance equipment charging, in addition to the EV charging stations, at each of the parking stalls noted in Section 4.26.18.3. Outlet configuration to be determined in consultation with the Owner.

4.26.18.4 Provide dedicated transformers for EV charging to be fed directly from conditional 600V CDPs, with ambulance EV charging transformers fed directly from delayed vital 600V CDPs. Integrate all EVSE with the Facility's central load management system to allow load shedding.

4.26.18.5 All EVSE will be networked with point-of-payment features, fault alert notifications and usage rules with complete remote management capabilities. Alerts will be integrated with the IBMP system, and ongoing charger management services (e.g. network operation, user authentication, payment processing, customer support, maintenance) will be available through the Owner's third-party EV charging service provider (Electrum).

PART 5. FACILITY DESIGN REQUIREMENTS

5.1 Adaptability, Flexibility and Maintainability

5.1.1 Adaptability and Flexibility

5.1.1.1 Project Co will:

5.1.1.1(1) Provide a Design that will accommodate changes to uses and functions in the Facility with minimal impact to the Facility's structure and Building Systems.

5.1.1.1(1)(a) Provide a Design that will accommodate changes to circulation and flows of Staff, Patients and services with minimal impact to the Facility's structure and Building Systems resulting from connections to future developments, including the

5.1.1.1(1)(b) Health Campus to CSRC links;

5.1.1.1(1)(c) Health Campus to Future Expansion; and

5.1.1.1(1)(d) Future Heliport.

5.1.1.1(2) For the spaces listed below, Project Co will provide the required infrastructure, including medical gases as described in Appendix 3K [Medical Gas Matrix]. Medical gases will be brought to the nearest zone valve for the Owner's future use. Refer to Part 7 of this Schedule for additional infrastructure requirements.

5.1.1.1(3) Project Co will include and demonstrate the following provisions for Future Expansion, as identified in Appendix 3A [Clinical Specifications and Functional Space Requirements]:

5.1.1.1(3)(a) Design and construct G1.2.15 and G1.2.14 Store-Interventional Supplies to serve, respectively, as a future CT imaging room, its imaging control room and its technical room, as required under G – Surgical and Interventional Services Future Expansion, having proportions and Clinical Space adjacencies corresponding to those of G1.2.3 Interventional Suite, G1.2.4 Control-Imaging, and G1.2.5 Technical Room-Imaging and being provided with the infrastructure required for CT room equipment;

5.1.1.1(3)(b) Design and construct G3.1 Workstation-General to serve as six (6) future operating rooms with their respective touchdown/charting alcoves and

stretcher alcoves, together with shared alcoves for scrub stations and lead aprons, as required under G3 – Surgical and Interventional Services General Workstations, having proportions and Clinical Space adjacencies corresponding to those of G1.3.3 Operating Room, G1.3.4 Alcove-Scrub Station, G1.3.5 Alcove-Lead Apron, G1.3.6 Alcove-Touchdown/Charting and G1.3.7 Alcove-Stretcher and being provided with the infrastructure required for operating room equipment;

5.1.1.1(3)(c) Design and construct E6.1 Workstation-General to serve as five (5) future SRMC Patient rooms and their respective ensuite washrooms, as required under E6 – Maternity Centre General Workstations, having proportions and Clinical Space adjacencies corresponding to those of E2.2.3 Patient Room-SRMC and E2.2.4 Washroom/Shower-Inpatient Ensuite and being provided with the infrastructure required for the plumbing and equipment in those rooms;

5.1.1.1(3)(d) Design and construct I2.1.9 Office-6 shared to serve as one (1) future digital radiography room, as required under I – Medical Imaging Future Expansion, having proportions and Clinical Space adjacencies corresponding to those of I2.1.7 Imaging-Digital Radiography and being provided with the infrastructure required for digital radiography equipment;

5.1.1.1(3)(e) Design and construct I2.2.8 Office-3 Shared to serve as one (1) future ultrasound imaging room, as required under I – Medical Imaging Future Expansion, having proportions and Clinical Space adjacencies corresponding to those of I2.2.6 Imaging-Ultrasound and being provided with the infrastructure required for ultrasound imaging equipment;

5.1.1.1(3)(f) Design and construct I2.3.10 Conference/Meeting Room to serve as one (1) future CT imaging room, its control room and its technical room, as required under I – Medical Imaging Future Expansion, having proportions and Clinical Space adjacencies corresponding to those of I2.3.5 Imaging-CT, I2.3.6 Control-Imaging and I2.3.7 Technical Room-

Imaging and being provided with the infrastructure required for CT imaging equipment;

5.1.1.1(3)(g) Design and construct I2.4.10 Conference/Meeting Room to serve as one (1) future MRI imaging room, its control room and its technical room, as required under I – Medical Imaging Future Expansion, having proportions and Clinical Space adjacencies corresponding to those of I2.4.5 Imaging-MRI, I2.4.6 Control-Imaging and I2.4.7 Technical Room-Imaging, being provided with the infrastructure required for MRI equipment and taking into account the future installation of shielding in the walls, slab and ceiling so as to minimize disruption to other spaces in the Facility at such time as the future MRI installation is carried out;

5.1.1.1(3)(h) Design and construct I2.5.37 Imaging-Nuclear Medicine-Large to serve as the future Imaging-PET/CT-Future Expansion, as required under I – Medical Imaging Future Expansion, maintaining proportions and Clinical Space adjacencies corresponding to those of I2.5.37 Imaging-Nuclear Medicine-Large and being provided with the infrastructure and shielding required for PET/CT imaging equipment;

5.1.1.1(3)(i) Design and construct I5.1 Workstation-General to serve as two (2) future conference/meeting rooms, as required under I5 – Medical Imaging General Workstations, having proportions corresponding to those of I1.7 Conference/ Meeting Room-Large-Dividable and being provided with the infrastructure required for conference/meeting room equipment;

5.1.1.1(4) Utilize Building Systems and Components that facilitate changes in the Facility configuration and changes in servicing;

5.1.1.1(5) Minimize the need for the Owner to undertake maintenance that requires special safe work procedures and hazardous classifications;

5.1.1.1(6) Provide a Design that accommodates program, service, work and equipment changes with minimized Utility infrastructure and impact;

5.1.1.1(7) Locate permanent elements, such as stairs, elevators, duct shafts and mechanical and electrical risers to minimize constraints on future changes to the Facility;

5.1.1.1(8) Ensure that columns will not impact the functionality and intended use of any room or area;

5.1.1.1(9) Provide a Design that does not use interior shear walls or interior cross-braces; locate shear walls to cores to minimize impact on Clinical Spaces;

5.1.1.1(10) Provide adaptability and flexibility in highly technical areas, such as recovery areas, that contain many small rooms with stringent functional and ergonomic requirements affecting the placement of Furniture and equipment;

5.1.1.1(11) Provide additional capacity in mechanical and electrical services, including the following, as set out in Section 7.1 and 7.8:

5.1.1.1(11)(a) Vertical and horizontal risers;

5.1.1.1(11)(b) Distribution shafts;

5.1.1.1(11)(c) Equipment space in service rooms;

5.1.1.1(11)(d) Equipment capacity; and

5.1.1.1(11)(e) Plenums.

5.1.1.1(12) Ensure that additional capacity will accommodate service system improvements, new equipment, digitization, PACS, and current and future technologies;

5.1.1.1(13) Accommodate the vertical and horizontal distribution of electrical and mechanical services to allow maintenance and changes to occur, including increasing capacity and lifecycle replacement of systems such as drains and domestic water piping, with no interruptions to Health Campus operations, particularly where the need for service flexibility is highest;

5.1.1.1(14) Provide building service systems and operations designed to minimize service disruptions to areas adjacent to Facility maintenance and renovation areas;

5.1.1.1(15) In an accessible location below the Ceiling Height on each floor of the Facility, provide a convenient means within the design of the exterior building envelope whereby the Owner can easily open or remove and reinstall panels from inside the Facility for the connection of portable negative pressurization ventilation units for future renovations. The operable or removable window panels or

opaque panels within the exterior building envelope will be provided in reasonable quantities, sizes and distribution as to provide flexibility for future renovations. Panel opening will be a minimum of 600 mm x 600 mm in size. Provide one (1) opening per 350 NSM and a minimum of eight (8) openings per floor. Openings will be distributed appropriately around building perimeter with final locations to be determined in consultation with the Owner. The panels will be lockable, Tamper Resistant and designed such that they can only be removed or opened by maintenance Staff; and

5.1.1.1(16) Provide a system of raceways for power and communications wiring above and below surgical suites for future equipment. For Operating Rooms, provide one (1) 35 mm power conduit from each panel serving the room and one (1) 53 mm communications conduit from the cable tray to junction boxes in the ceiling space above the room. For Interventional Suites, provide one (1) 35 mm power conduit from each panel serving the room and one (1) 53 mm communications conduit from the cable tray to junction boxes in the ceiling space above the room, and a set of identical conduits to junction boxes in the ceiling space below the room at the patient table location.

5.1.2 Maintainability

5.1.2.1 Project Co will:

5.1.2.1(1) Demonstrate to the Owner all equipment replacement, shipping and rigging routes, including how the strategic location of I-beams, lifting rigs and lifting eyes provided by Project Co will enable the Owner to perform maintenance activities;

5.1.2.1(2) Provide crane plans for equipment requiring removal / replacement by external crane;

5.1.2.1(3) Construct the Site to support the crane plus load weight as indicated by the crane lift plans;

5.1.2.1(4) Provide adequate equipment installation pathways and maintenance access clearances;

5.1.2.1(5) Provide access for the replacement of equipment due to failure or life-cycle replacement without disruption to adjacent equipment and systems;

5.1.2.1(6) Conduit in concrete slabs is not permitted. Provide a system or strategy to support equipment where conduit is not imbedded into the slab, to allow for ease of servicing to security stations, control

rooms and medical equipment. Raised access flooring is not permitted;

5.1.2.1(7) Provide at all equipment locations, a minimum of 1.5 m floor space clearance or comply with the manufacturers service clearance requirements, whichever is greater, at all locations where maintenance is to be performed;

5.1.2.1(8) Ensure all equipment will be capable of being removed and replaced without the need to move other equipment. Location of mechanical services and equipment will be coordinated with other trades to ensure that access clearances are maintained;

5.1.2.1(8)(a) Domestic water piping, services and infrastructure will be arranged in the ceiling plenum to ensure maintenance and lifecycle replacement access clearances are maintained and future flexibility of the space is optimized. To the maximum extent possible, domestic water piping will be located in the lower parts of the ceiling space.

5.1.2.1(9) Ensure that operable components are accessible without the use of additional equipment or ladders wherever possible. Locate all gauges and monitoring interfaces in a convenient location for ease of access and visual monitoring.

5.1.2.1(10) Provide access to the ceiling space for Building Systems maintenance only from corridors, mechanical rooms or CSA Type III spaces as classified by CSA Z317.2. Access will be secure but convenient. If ceiling tiles are used, provide the ceiling tile layout such that access to the ceiling space requiring a maintenance and inspection cube in the corridor below will not reduce the clear corridor to less than half the required width, or require a temporary negative pressure room. Refer to Section 7.1.1.9 for additional requirements.

5.1.2.1(11) Provide knock-out panels to allow for the installation, servicing and future replacement of any specialized equipment including future MRI and CT scanners. The Design will enable servicing and replacement of one (1) MRI or CT Equipment while allowing the other units to remain in service 24 hours/day, 7 days/week.

5.1.2.1(11)(a) Knock-out panels will:

5.1.2.1.11.(a).1 provide adequate clear width based on equipment requirements;

5.1.2.1.11.(a).2 accommodate the opening with minimal impact on the Facility building envelope by designing systems such as cladding, air

vapour barriers and flashings to easily accept removal and reinstatement;

5.1.2.1.11.(a).3 be designed structurally with all components and reinforcement to accommodate the opening without requiring structural retrofit of the surrounding structure; and

5.1.2.1.11.(a).4 If within concrete, be delineated by a linear indentation by using a V-shaped chamfer strip on either side of the panel.

5.2 Post-disaster

5.2.1 Design the Facility, including the underground parking, to meet VBBL post-disaster requirements and the CD-1 (-) Bylaw.

5.2.2 Design the Facility, including the underground parking, so that:

5.2.2.1 The need to protect the life safety of all Facility occupants and the need for continuing services following an earthquake or other disaster are considered and provided.

5.2.2.2 The Facility will remain operational and usable by the Owner for its intended functions both during and immediately after an event in order to minimize impact to Patients or ongoing critical and non-critical procedures, with the exception of non-essential services including underground parking, loading/waste management, morgue and food services and as approved by the Owner.

5.2.2.3 The requirements set out in Section 7.8.4.2(2) are satisfied.

5.2.2.4 Unless the design includes a seismic base isolation system reviewed by the Owner, when the Design is assessed in accordance with FEMA publication P-58 or an alternative assessment method or rating system reviewed by the Owner, the following results or equivalent or better results in such alternative assessment method or rating system, are achieved:

5.2.2.4(1) Under the action of an earthquake having a probability of occurrence of 2% in 50 years, as defined in VBBL:

5.2.2.4(1)(a) The median repair cost, defined as the median cost to restore damaged components to their pre-earthquake condition, expressed as a percentage of the replacement value of the Facility, is no greater than 7%; and

5.2.2.4(1)(b) The median repair time, defined as the median time required to restore damaged components to their pre-earthquake condition when repair work is conducted in parallel throughout the Facility, is no greater than 30 days.

5.2.2.4(2) Under the action of an earthquake having a probability of occurrence of 10% in 50 years, as determined by Natural Resources Canada:

5.2.2.4(2)(a) The median repair cost, defined as the median cost to restore damaged components to their pre-earthquake condition, expressed as a percentage of the replacement value of the Facility, is no greater than 3%-5%.

5.2.2.4(3) Under the action of an earthquake having a probability of occurrence of 40% in 50 years, as determined by Natural Resources Canada:

5.2.2.4(3)(a) The median repair cost, defined as the median cost to restore damaged components to their pre-earthquake condition, expressed as a percentage of the replacement value of the Facility, is no greater than 1%.

5.2.2.4(3)(b) The median repair time, defined as the median time required to restore damaged components to their pre-earthquake condition when the repair work is conducted in parallel throughout the Facility, is no greater than 10 days.

5.2.2.5 If a FEMA P-58 assessment, or equivalent assessment as reviewed by the Owner, is carried out, the following requirements are met:

5.2.2.5(1) The performance assessment calculates and reports the following results:

5.2.2.5(1)(a) All results for which targets are set in 5.2.2.4;

5.2.2.5(1)(b) The median repair time, when the repair work is conducted in parallel, under the action of an earthquake having a probability of occurrence of 10% in 50 years; and

5.2.2.5(1)(c) The corresponding 90th percentile results for all median results in 5.2.2.5(1)(a) and 5.2.2.5(1)(b).

5.2.2.5(2) The performance assessment includes all structural and non-structural components for which performance and cost data are available in the FEMA P-58 database. Quantities are based on the Design. Performance and cost data are based on the FEMA P-58 database.

5.2.2.5(3) Medical Equipment is included in the assessment.

5.2.2.5(4) Non-medical Equipment that is included in the Design, including mechanical and electrical equipment, is included in the assessment. Quantities are based on the Design. Performance and cost data are based on the FEMA P-58 database.

5.2.2.5(5) The total replacement cost for the purpose of the assessment is based on year 2026 construction cost and is limited to the cost of construction-related elements, including excavation (including dewatering), temporary shoring, basement construction (including Tanked Foundation), superstructure, services, cladding, fit-out, non-medical equipment and medical equipment. The total replacement cost for the purpose of the assessment does not include the costs of mobilization, financing, approvals and consultant fees. The total replacement cost does not include the cost of medical or non-medical equipment for which repair cost and repair time are not included in the assessment of the total repair cost and repair time.

5.2.2.5(6) The following assumptions are used in the assessment:

5.2.2.5(6)(a) Region cost multiplier of 1.3 is assumed;

5.2.2.5(6)(b) Date cost multiplier of 1.6 is assumed to be applicable to the 2011 FEMA cost database;

5.2.2.5(6)(c) Date cost multiplier of 1.0 is assumed to be applicable to the cost of medical Equipment listed by the Owner at year 2026 values. It is acceptable to use the same date cost multiplier as in (b) and scale the input cost data for medical equipment accordingly, if the assessment software is limited to a single value of date cost multiplier applicable to all components and equipment;

5.2.2.5(6)(d) Maximum workers per square foot of 0.001 is assumed;

5.2.2.5(6)(e) Peak number of occupants per 1000 ft2 of 5 is assumed;

5.2.2.5(6)(f) Population dispersion of 0.2 is assumed;

5.2.2.5(6)(g) The assessment type used is intensity-based;

5.2.2.5(6)(h) Non-directional conversion factor of 1.2 is assumed; and

5.2.2.5(6)(i) Repair time is reported using parallel time assumption.

5.2.2.6 Unless the design includes a seismic base isolation system reviewed by the Owner, a seismic post-disaster occupancy and functionality assessment is carried out, including:

5.2.2.6(1) under the action of earthquakes having probabilities of occurrence of 2%, 10% and 40% in 50 years and for all reporting levels (median and 90th percentile) a break-down of FEMA P-58 damage and repair time results;

5.2.2.6(2) a discussion of how components of the building relate to hospital service operation and critical hospital functionality;

5.2.2.6(3) a rationale as to how the design strives to meet the intent of NBC 2015, stated in the structural commentary on this code, including the intent to ensure immediate occupancy after the event of an earthquake having a probability of 2% in 50 years;

5.2.2.6(4) a demonstration that damage is cosmetic only and does not impede function in the event of an earthquake having a probability of occurrence of 40% in 50 years; and

5.2.2.6(5) a demonstration of how the Design and Construction are managed to ensure that critical non-structural components and equipment comply with VBBL Clause 4.1.8.18, including the management of any design delegation or construction inspection delegation to supporting registered professionals or other parties.

5.2.2.7 The Facility's structure, structural components, non-structural components, anchorages, and equipment are designed and constructed to post-disaster standards in accordance with VBBL.

5.2.2.8 Essential services including the electrical and communications systems, HVAC, steam, domestic water, fuel supply, sanitary drainage, storm systems, medical gases and fire protection will be designed and constructed to post-disaster standards as defined in VBBL. These services will continue to function post-disaster. Locate and secure services in structures and enclosures that meet post-disaster standards as defined in VBBL and CSA S832-14 Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

5.2.3 Emergency Operations Centre

5.2.3.1 The Emergency Operations Centre will serve the Health Campus and be designed and constructed as a Type I space under CSA Z317.2 and in accordance with CSA Z8000-18 requirements. Refer to Section 3.20 and Appendix 3A [Clinical Specifications and Functional Space Requirements] for further requirements.

5.2.4 Exterior Connections

5.2.4.1 Provide connections on the exterior of the Facility which allow delivery and connection of service vehicles for the following services:

5.2.4.1(1) Supply of potable water services;

5.2.4.1(2) Sanitary sewage waste pump out;

5.2.4.1(3) Decontamination water storage tank pump out;

5.2.4.1(4) Medical oxygen services;

5.2.4.1(5) Supply to generator and boiler fuel tanks; and

5.2.4.1(6) Process water tank supply.

5.2.4.2 Each system noted above will be provided with a layby parking stall at the point of connection, each sized for HSU 11.5 m vehicles.

5.2.4.3 The design of the layby parking stalls will allow the oxygen, potable water, and sewage holding service connections to be accessed simultaneously while maintaining the Owner's 24/7 operations.

5.2.5 Catastrophic Event Management

5.2.5.1 Outbreak Control Zones

5.2.5.1(1) Provide Outbreak Control Zones as described in Section 5.11 Infection Control;

5.2.5.2 Ambulance Garage

5.2.5.2(1) Provide post-disaster requirements for the Ambulance Garage as described in Section 5.8 Ambulance Garage.

5.3 Mobile Medical Unit

5.3.1 Project Co will provide the infrastructure and support facilities set out below in order to accommodate the Owners' deployment of British Columbia's Mobile Medical Unit (MMU) on the Health Campus, as follows:

5.3.1.1 Provide a minimum of one designated location for the MMU deployment, meeting all of the following requirements:

5.3.1.1(1) Accommodating the physical clearances for setup of and access to the MMU at full deployment, consistent with site footprint described in the MMU Facility Requirements: A Quick Reference Guide and the MMU Dimension Diagram;

5.3.1.1(2) Complying with all fire safety regulations, including fire lane access, exit door clearances and muster station provision;

5.3.1.1(3) Supporting ease of manoeuvrability and positioning, unencumbered by curves in roadways and insufficient clearance caused by trees, overhangs or other obstacles;

5.3.1.1(4) Located such that the MMU does not adversely affect access for ambulances and other emergency and transport vehicles to and within the Health Campus;

5.3.1.1(5) Accessible to fuel and waste trucks that service the MMU up to four (4) times a day without disruption to traffic flow;

5.3.1.1(6) Located in close proximity to the ED entrance;

5.3.1.1(7) Located in close proximity to washrooms within the Facility for use by Staff and ambulatory Patients;

5.3.1.1(8) Providing a means for Staff to follow Facility code procedures, in order to:

5.3.1.1(8)(a) Notify the Facility switchboard through the Owner 7111 stat call in the event of the following:

5.3.1.1.8.(a).1 Code Red Procedure for a Code Red team response;

5.3.1.1.8.(a).2 Code White Procedure for a Code White team response;

5.3.1.1.8.(a).3 Code Blue Procedure for a Code Blue team response; and

5.3.1.1.8.(a).4 Notify the fire department in the event of a Code Red Procedure.

5.3.1.1(9) Provide MMU shore power connection points at the Facility exterior adjacent to the MMU deployment locations, consisting of one (1) 200A, 120/208V, 3-phase, 4-wire vital power circuit serving the MMU, and one (1) 60A, 120/208V, 3-phase, 4-wire vital power circuit serving the site trailer. Neutral and grounding conductor sizing will match current carrying conductor sizes.

5.3.1.1(10) Provide MMU underground communications pathway as set out in Section 7.9.2.2(9)(b). Connection points will be in a lockable, above ground weatherproof enclosure and use Crouse–Hinds Cam-Lok J Series connectors and local disconnect switches. Enclosure will be protected by bollards where exposed to vehicle impact or snow removal equipment.

5.4 Energy Centre

5.4.1 The Energy Centre means the collection of rooms and exterior spaces containing the major mechanical-HVAC, plumbing, electrical, and IM/IT equipment and central distribution hubs required for the Health Campus.

5.4.2 Project Co will provide an Energy Centre to meet the following requirements:

5.4.2.1 The Energy Centre will be where all energy required by the Health Campus is either generated or distributed from Utilities to the different buildings within the Health Campus, including the Facility.

5.4.2.2 The Energy Centre will provide energy capacity for the Health Campus, as well as provision to easily service Future Expansion without disruption to ongoing operations;

5.4.3 Basic Requirements

5.4.3.1 The Energy Centre will:

5.4.3.1(1) Be designed as either a stand-alone building or integrated into a single Facility on the Health Campus;

5.4.3.1(1)(a) If integrated into a single Facility, the Energy Centre will have

5.4.3.1.1.(a).1 Convenient Access to the loading dock for maintenance operations through Back-of-House circulation and a dedicated Freight Elevator that will serve all areas described in Section 5.4.7 Schedule of Accommodation; and

5.4.3.1.1.(a).2 Convenient Access between the FMO operations and logistics centre components and the Energy Centre for movement of Staff and materials through Back of House circulation.

5.4.3.1(2) Be designed such that major equipment is located at or above the Flood Construction Level as described in this Schedule;

5.4.3.1(3) If designed as a standalone building, will be designed to include an underground tunnel connecting the Energy Centre to the Facility for materials and supplies to be transported to and from the Facility;

5.4.3.1(4) Be consistent in form, character, materials, colours and details with those of the Facility and be contextually responsive to the adjacent neighbourhood(s);

5.4.3.1(5) Be provided with parking and loading as described in Section 4.26 Parking Requirements;

5.4.3.1(6) Be configured to enable removal and replacement of major equipment without the need to relocate adjacent equipment. Provide access within the Energy Centre to the Freight Elevator

for medium-sized component replacements, such that the need to use knock-out panels or other complex routes of travel are minimized;

5.4.3.1(7) Include access corridors, openings or removable knock-out panels to allow for the replacement of major equipment through walls;

5.4.3.1(8) Provide a Freight Elevator in accordance with Section 6.14.2.8 for Convenient Access to the service vehicle layby stalls described in Section 4.26.3.2 and/or the loading dock;

5.4.3.1(9) Be provided with a Q1.1 Control Room that has Convenient Access to the Steam Plant, Heating Plant and Main Chiller Plant. If the plants are located on separate floor levels, provide stairs adjacent to the Control Room for Staff to easily access them. If more than one (1) door is required in the Control Room to achieve the access requirements, the location of any additional doors will not negatively impact the functionality of the room or reduce the useable NSM prescribed in the Schedule of Accommodation; and

5.4.3.1(10) Be designed to include space for workbenches and storage for items used in the regular maintenance of the equipment such as belts and filters. Design the space for these items such that they are adjacent to their point of use for the convenience of Staff working on the equipment.

5.4.4 Mechanical System Requirements

5.4.4.1 Provide a third-party wind study to minimize the exhaust from the Energy Centre and locate and design the exhaust system (including with regard for prevailing winds) so that exhaust is not a nuisance to users of the Facility or to Patients of off-Site facilities.

5.4.4.2 Locate all intake louvers of the Energy Centre so that outdoor air is available 24/7 and is not required to pass through areas whose operations may impact the availability of outdoor air at any time, including emergency scenarios. Generator radiator cooling air will be discharged in a location where the elevated temperature will not have an adverse impact.

5.4.4.3 Fresh air intakes will be located to not entrain contaminants from outdoor sources. All intakes will be located in areas that are not accessible by the public and will not be located near exhaust air outlets. Exhaust air louvres and outlets will be located to avoid the re-entrainment of contaminants in accordance with CSA Z317.2.

5.4.4.4 Orient the fresh air intake louvers of the Energy Centre to face away from Clinical Spaces and other noise sensitive locations as outlined in Appendix 3C [Acoustic and Noise Control Measures] and so that outdoor air entering the ventilation system does not contain any contaminant in a concentration greater than normal outdoor ambient air in that locality.

5.4.4.5 Take into account the locations of boiler and emergency generator exhaust and ensure that contaminated exhaust and fumes are not introduced into the Facility fresh air intakes.

5.4.4.6 Perform CFD modeling analysis to support the placement of intakes. CFD modeling will take into account exhaust locations, local wind conditions and Facility exhausts. Refer to Section 7.5.9.2(10) for further information

5.4.4.7 Refer to Section 7.2 Energy Centre for requirements.

5.4.5 Electrical System Requirements

5.4.5.1 Project Co will provide electrical systems as follows:

5.4.5.1(1) Emergency generators, paralleling switchgear, associated fuel and ancillary systems;

5.4.5.1(2) BC Hydro Vista switchgear, if BC Hydro requirements allow;

5.4.5.1(3) Incoming service switchgear (service box), if BC Hydro requirements allow;

5.4.5.1(4) High Voltage Automatic Transfer Switches;

5.4.5.1(5) High voltage switchgear, except for transformer primary isolating means;

5.4.5.1(6) Unit substation serving the Energy Centre and adjacent Facility areas, including main transformers, 600V switchgear, 600V CDPs, distribution transformers, 208V CDPs and panelboards; and

5.4.5.1(7) Locate all major electrical components above the 5.0 m Flood Construction Level (FCL) in accordance with the CD-1 (-) Bylaw, including Vista switches, generators, switchgear, HVATS, CDPs, MCCs, transformers, UPS, and associated auxiliary systems. Main generator fuel tanks may be installed underground. Wiring for generator auxiliary systems will have power fed from vital panelboards above the FCL, with watertight connections used for any splices or terminations below the FCL.

5.4.5.2 Refer to Section 7.8 Electrical (Division 26) for further requirements.

5.4.6 IM/IT System Requirements

5.4.6.1 Project Co will provide IM/IT systems as follows:

5.4.6.1(1) Entrance Facility;

5.4.6.1(2) Telecommunications Rooms; and

5.4.6.1(3) MER.

5.4.6.2 Refer to Section 7.9 Communications (Division 27) and Section 7.10 Electronic Safety and Security (Division 28) for further requirements.

5.4.6.3 Provide visual monitoring of the Steam Plant, Heating Plant and Main Chiller Plant with cameras providing as many view angles as necessary for full visibility of the equipment. Cameras will be displayed and monitored by Staff in the Control Room. Cameras will reside on the IP Video Surveillance System and Project Co will provide a dedicated monitoring station with IP Video Surveillance System software in the Control Room and Q1.7 Office-FMO; refer to Part 7 for further requirements.

5.4.7 Schedule of Accommodation

5.4.7.1 The following table outlines the space requirements for the Energy Centre. Where the units and NSM/unit are not provided, Project Co will determine the specific space requirements based on the Design and in accordance with the requirements of Section 5.1.2.

Ref. No.	Room Type	Area Requirements			Room Remarks
		units	nsm/unit	nsm	
Q ENERGY CENTRE					
Q1 General Requirements					
Q1.1	Control Room	1	32.00	32.00	Requires Direct Access to Q2.1, Q2.2 and Q2.2.1. Incl. 6 workstations with double screens, two large wall-mounted displays, angled glazing for view of Steam, Heating and Chiller Plants.
Q1.2	Office-Private	2	9.50	19.00	Incl. 1 workstation.
Q1.3	Conference/Meeting Room-Small	1	16.00	16.00	Incl. table, 8 seats.
Q1.4	Lockers-Staff	8	0.50	4.00	Incl. 8 full-height lockers, benches.
Q1.5	Washroom-Staff	2	3.00	6.00	2-piece, incl. toilet, sink, gender neutral, not accessible. Locate one (1) Washroom adjacent to the Control Room.
Q1.6	Washroom/Shower-Staff	2	4.50	9.00	3-piece incl. toilet, sink, hand-held shower, gender neutral, accessible.
Q1.7	Office-FMO	1	7.0	7.0	Locate adjacent to the Main Chiller and Heating Plants. Will have glazing for visibility to the plants. Two (2) workstations with multiple views and monitoring of the plants.
	TOTAL NSM: General Requirements			**93.00**	
Q2 Mechanical Requirements					
Q2.1	Steam Plant	quantity per			To suit design and equipment requirements. Incl. emergency

Ref. No.	Room Type	Area Requirements			Room Remarks
		units	nsm/unit	nsm	
		design			shower for Steam, Heating and Chiller Plant.
Q2.2	Heating Plant	quantity per design			To suit design and equipment requirements.
Q2.2.1	Main Chiller Plant	quantity per design			To suit design and equipment requirements.
Q2.2.2	Chiller Heat Pump (Condenser Water Heat Recovery)	quantity per design			To suit design and equipment requirements.
Q2.3	Cooling Towers	quantity per design			To suit design and equipment requirements. Exterior rooftop space.
Q2.4	NEU Room	quantity per design			To suit design and equipment requirements. Requires Direct Access to Q2.2.2
Q2.5	Boiler Fuel Oil Day Tanks	quantity per design			To suit design and equipment requirements.
Q2.6	Water Entry Room	quantity per design			To suit design and equipment requirements. Room requires access at grade. Does not need to be located in Energy Centre.
Q2.7	Elevator Machine Room	1			To suit manufacturer's requirements.
	TOTAL NSM: Mechanical Requirements				
Q3 Electrical Requirements					
Q3.1	BC Hydro Vista Switch Room	quantity per design			To suit design and equipment requirements. Requires Convenient Access to Q3.2 and O4.20
Q3.2	High Voltage Electrical Room	quantity per design			To suit design and equipment requirements. Requires Convenient Access to Q3.4
Q3.2.2	Main Service Entry Room	quantity per design			To suit design and equipment requirements.
Q3.3	Main Electrical Rooms	quantity per design			To suit design and equipment requirements.
Q3.4	Generator Room	quantity per design			To suit design and equipment requirements.
Q3.5	Generator Fuel Day Tanks	quantity per design			To suit design and equipment requirements.
Q3.6	Main UPS Room	quantity per design			To suit design and equipment requirements.

Ref. No.	Room Type	Area Requirements			Room Remarks
		units	nsm/unit	nsm	
Q3.7	Comm Entrance Facility (EF) #1	quantity per design			To suit design and equipment requirements. Requirement to be located at or within 1 level of grade.
Q3.8	Comm Main Equipment Room (MER) #1	quantity per design			To suit design and equipment requirements.
Q3.9	Local Telecom Room (TR) - Energy Centre	quantity per design			To suit design and equipment requirements.
	TOTAL NSM: Electrical Requirements				
	TOTAL NSM: ENERGY CENTRE				

5.4.7.2 If the Main Chiller and Heating Plant are located on separate levels or organized such that visibility from Q1.7 Office-FMO to both plants cannot be achieved, Project Co will provide an additional FMO office space meeting the same requirements at each plant location.

5.5 Commissioning Plan (LEED + Z8001 Framework)

5.5.1 Project Co is responsible for delivering a fully commissioned Facility to the Owner.

5.5.2 Commissioning will be carried out in accordance with CAN/CSA Z8001 and CAN/CSA Z317 series standards. In addition, Integrated Systems Testing of Fire Protection and Life Safety Systems will be carried out and documented in accordance with CAN/ULC S1001. In the event that these standards do not meet the requirements for the relevant LEED prerequisite and credit, the most stringent applicable standard will be followed in order to satisfy all requirements.

5.5.3 Project Co will procure a Project Commissioning Authority (CxA).

5.5.4 The CxA will not be involved with the Design and Construction of the Facility. The CxA will report directly to both the Owner and Project Co, and a conflict of interest declaration will need to be prepared by the CxA for Owner and Project Co review and approval for LEED compliance.

5.5.5 The CxA is involved from the early pre-design stages of the Project through two years after Service Commencement.

5.5.6 The CxA leads all the Commissioning related activities of the Project, and is required to complete the following tasks for all the Building Systems outlined:

5.5.6.1 Review of the Owner's Project Requirements (OPR). From LEED, the OPR details the functional requirements as well as the expectations of the building's use and operation. The intention is to document the Owner's requirements and

objectives for the Project to verify that those goals are carried through the life of the Project;

5.5.6.2 Review of the Designers' Basis of Design (BOD). From LEED, the BOD is prepared by the design team before any contractor submittals for commissioned equipment or systems are approved. It explains how the construction and other details will execute the OPR. The intention is to document the thought processes and assumptions behind design decisions made to meet the OPR;

5.5.6.3 Develop and covers the implementation of a Commissioning Plan, which includes the following items;

5.5.6.3(1) General project information

5.5.6.3(2) Goals and objectives;

5.5.6.3(3) Building Systems overview

5.5.6.3(4) Team roles and responsibilities;

5.5.6.3(5) Methods of communications and coordination

5.5.6.3(6) Systems to be commissioned.

5.5.6.3(7) Commissioning processes and activities;

5.5.6.3(8) A list of the health-care-specific elements that will be included in the commissioning process schedule;

5.5.6.3(9) Commissioning schedule;

5.5.6.3(10) Frequency of commissioning meetings;

5.5.6.3(11) Documentation of static verification;

5.5.6.3(11)(a) Verify and/or perform static verification before start-up activities and functional performance testing;

5.5.6.3(11)(b) Verify and document that all system elements are in accordance with the design requirements and correctly installed as per the manufacturers installation and operations manual, connected, and labelled;

5.5.6.3(12) Start-up;

5.5.6.3(12)(a) Witness and document all start-up activities and assemble reports for inclusion in the commissioning report;

5.5.6.3(13) Functional performance test procedures and checklists (including integrated system testing, post-occupancy, seasonal, and deferred testing);

5.5.6.3(14) Monitoring based commissioning requirements

5.5.6.3(15) Owner training needs;

5.5.6.3(16) Documentation;

5.5.6.3(17) Report of defects and deficiencies

5.5.6.3(18) Commissioning issue resolution process

5.5.6.3(19) A reference to the relevant standards applying to health care facility infrastructure and systems (e.g., CSA Z8000, Z32, Z3217.1, Z317.2, Z7396.1, and the Z317 series of engineering and physical plant standards);

5.5.6.3(20) The timing for commissioning activities and approvals for the potable water system, based on the requirements of CAN/CSA-Z317.13 for flushing, testing, and (where necessary) treating of water systems during and after construction;

5.5.6.3(21) The timing for commissioning activities and approvals for the HVAC system, from the start of design, through the phases of construction and the sequential stages of occupancy by building Staff, outpatients, and inpatients, to final acceptance of the Facility;

5.5.6.3(22) An outline of post-occupancy commissioning activities for HVAC system performance evaluation and optimization under various load conditions; and

5.5.6.3(23) Commissioning process tracking tool.

5.5.6.4 Commissioning-focused design review at the 50% Design and Construction Documents stage;

5.5.6.5 Review of Commissioning specifications;

5.5.6.6 Design review back-check at 70-90% Design and Construction Documents stage to verify that previous comments were incorporated;

5.5.6.7 Commissioning-focused review of shop drawings;

5.5.6.8 Review of equipment static checks and pre-functional checks;

5.5.6.9 Review of equipment operational checks and start-up checks. This includes reviewing mock-ups of key spaces to identify areas of conflict;

5.5.6.10 Review of functional performance testing, and witnessing of integrated systems testing in accordance with CAN/ULC S1001 Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems for relevant systems and CSA-Z8001 as applicable

5.5.6.11 Review of O&M manuals and of Asset data for Owner's CMMS;

5.5.6.12 Coordinate all training and demonstrations to the Owner;

5.5.6.13 Complete Commissioning report and required LEED Commissioning documentation;

5.5.6.14 Complete systems manual and required LEED Commissioning documentation;

5.5.6.15 Seasonal or deferred functional performance testing; and

5.5.6.16 Pre-warranty expiration review. This will extend 2 years after Service Commencement.

5.5.7 Refer to Appendix 3I [Commissioning Roles and Responsibilities] for a minimum list of systems to be commissioned.

5.5.8 In addition to the above, the Owner requires that the following are included in the CxA scope:

5.5.8.1 Architectural Systems – wall assemblies, floor and ceiling assemblies, interior space assemblies, acoustic barriers, hardware;

5.5.8.2 Building Envelope

5.5.8.2(1) Airtightness Testing – The Facility in its entirety is to be tested in accordance with ASTM Designation E779-19 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization, and reported, and to be designed and constructed with the intention of meeting an air-leakage target of 2.0 L/s*m^2 @ 75 Pa (0.40 cfm/ft^2 @ 0.3" w.c.) or sealed according to Good Industry Practice per the VBBL.

5.5.8.2(2) The complete building envelope system is required to be included in the Building Commissioning Plan. Full compliance to LEED Energy and Atmosphere Credit Enhanced Commissioning Option 2 Envelope Commissioning is required.

5.5.8.3 Vertical transportation systems (including integration with emergency power and code blue);

5.5.8.4 High voltage electrical distribution (utility and emergency power);

5.5.8.5 Fire alarm and detection systems;

5.5.8.6 Plumbing systems – external water distribution, non-potable and process water, water purification systems, drainage systems, storm water connections;

5.5.8.7 Fire protection systems;

5.5.8.8 Other Health Care Facility mechanical systems – natural gas, propane, fuel transfer systems, kitchen NFPA 96 exhaust. Commissioning of laboratory spaces requiring containment level CL2+ will include all items set out in the Laboratory Biosafety Guidelines;

5.5.8.9 The Outbreak Control Zones will be commissioned, balanced and demonstrated to the Owner in real time as part of the verification process prior to Service Commencement Date.

5.5.8.10 Emergency generators, (including fuel systems) paralleling and control switchgear, and HVATS;

5.5.8.11 UPS systems;

5.5.8.12 AGVs;

5.5.8.13 Electronic Safety and Security – Access Control System, Wireless Staff Duress System, Fixed Duress System, Intrusion Detection System, Intercommunications System, IP Video Surveillance System, Clinical Observation Camera System, Patient Wandering System;

5.5.8.14 Communications – IM/IT Common Works, IM/IT Structured Cabling, IM/IT Wireless Network, IM/IT Data Network, Audio-Visual Systems, IM/IT VoIP System, Integration Engine, Patient Physiological and Vital Signs Monitoring System, Public Address System, Nurse Call System, Distributed Antenna System, Location Services (RTLS), IM/IT End User Equipment;

5.5.8.15 Automated integration systems, controls;

5.5.8.16 M &V energy metering systems; and

5.5.8.17 AFDDR will be provided by and configured by Project Co in consultation with the Owner.

5.5.8.18 Owner supplied equipment and clinical Commissioning - ensure clinical equipment start-up is included in Commissioning schedule and user training is provided. In addition, clinical equipment will be stress tested as part of the integrated test plan prepared by CxA. As per CSA-Z8001, integration testing will be done under actual conditions, and not simulated conditions. The intent is to go through various scenarios, under normal and emergency power, to ensure that the integrated systems work as required. This includes developing real-life scenarios, so the clinical team can run through various steps to validate clinical function of the room. Test plan to include input from the Owner.

5.5.8.19 CxA to review all shop drawings from the perspective of Building Systems - i.e. confirm that temperatures, pressures, voltages, and other requirements are able to be met by the Building Systems.

5.5.8.20 Pre-requisite for integrated systems testing of Equipment and Building Systems equipment includes acceptance test reports that have been accepted by Project Co and reviewed by the Owner.

5.5.8.20(1) Project Co will commission all Building Systems serving Equipment prior to overall acceptance testing of Equipment and Building Systems equipment supplied by Project Co (refer to Appendix 2E [Equipment and Furniture]).

5.5.8.20(2) Overall acceptance testing of Equipment and Building Systems equipment that is supplied by the Owner is by the Owner, but it is a pre-requisite that Commissioning of Building Systems serving Equipment and Building Systems equipment is complete prior to acceptance testing; refer to Appendix 2E [Equipment and Furniture].

5.5.8.20(3) Equipment and Building Systems equipment Commissioning will be included as a Commissioning schedule line item. At Project Co's Cx meetings, the Owner's representatives will provide input of what Building Systems are needed for Cx of Equipment and Building Systems equipment and this is to be included in overall Cx schedule.

5.5.8.20(4) End-to-end integrated testing will be performed as part of the commissioning of Equipment and Building Systems equipment.

5.5.8.21 In addition to the information in the preceding and following sections, refer to Appendix 3I [Commissioning Roles and Responsibilities]. The list of Building Systems included in these sections and Appendix 3I [Commissioning Roles and Responsibilities] are taken from CSA Z8001 and is not intended to be exhaustive. Project Co. will ensure that all CSA Z8001 systems applicable to the project are included in the commissioning process, even if not listed in these sections or in Appendix 3I [Commissioning Roles and Responsibilities].

5.5.8.22 Commissioning Management

5.5.8.22(1) The CxA will lead and organize the Commissioning team.

5.5.8.22(2) The trades will designate Commissioning representatives who will attend the Commissioning meetings and will follow up with Commissioning related items.

5.5.8.22(3) The CxA will chair and keep minutes of Commissioning meetings, and issues log tracking.

5.5.8.22(4) Minimum frequency of Commissioning meetings leading up to Service Commencement is:

5.5.8.22(4)(a) 12 months - bi-weekly (2 times per month)

5.5.8.22(4)(b) 6 months - weekly meetings.

5.5.8.22(5) Frequency of Cx meetings will be identified in initial Commissioning Plan for review by the Owner.

5.5.9 Commissioning Schedule

5.5.9.1 The CxA will develop a Cx schedule outline, which will be iterated through and developed with input from the Owner and Project Co at the Cx meetings.

5.5.9.2 Cx schedule will be drafted at the end of Design phase and updated throughout Construction.

5.5.9.3 Project Co will provide key milestone dates, including the following: connection to Utilities, permanent power availability, building enclosure complete (or by zone), building clean date (or by zone), IT infrastructure completion date, and other.

5.5.9.4 The IT infrastructure of the Facility, as related to mechanical and controls equipment, is to be online prior to the start-up of mechanical and controls equipment. Project Co and their trades are responsible for delivering the IT infrastructure earlier than traditional projects, as Commissioning of Building Systems is reliant on network connections.

5.5.9.5 Related to the above, Project Co will ensure that Communications Rooms are ready for IT installations. This includes: sealed floors, spaces dust free, provision of ventilation and/or temporary cooling, and other applicable requirements.

5.5.9.6 Project Co and their trades will provide equipment start-up and Commissioning durations to the CxA for inclusion in the Cx schedule.

5.5.9.7 After development of the initial Cx schedule, the CxA team will hold a meeting with all applicable Project Co team members and Owner representatives to review the key steps and milestones and identify opportunities to optimize the Commissioning schedule.

5.5.9.8 All Project Co Building Systems equipment and Equipment described in Appendix 2E [Equipment and Furniture] will be included in the Cx schedule. The party responsible for providing the item will provide input into the Cx schedule for timelines and durations. Additionally, the party responsible for providing the item will provide input as to which Building Systems are required for each key item, as this will inform the Cx schedule.

5.5.9.9 Acceptance testing dates and durations will be included in the overall Cx schedule. Dates/durations to be provided by Project Co and Owner, based on who is supplying the given item.

5.5.10 AFDDR and "Smart Commissioning" Approach

5.5.10.1 The Project will employ a "Smart Commissioning" approach, where the AFDDR software will be configured and deployed in consultation with the Owner and will be made available for use by the Commissioning team towards the end of Construction with reports to the satisfaction of the Owner through two-years post occupancy.

5.5.10.2 The CxA will participate in this "Smart Commissioning" approach as follows:

5.5.10.2(1) Conduct a detailed review of control sequences, metering systems, and their integration with AFDDR. This is to include at a minimum the CxA, Project Co's mechanical designer, electrical designer, controls contractor, mechanical contractor, electrical contractor, and AFDDR system integrator. One review session prior to shop drawing development, and one meeting after shop drawings have been reviewed;

5.5.10.2(2) Bench testing of controls: all BMS control sequences will be tested virtually, witnessed by the CxA prior to implementation on site. This will include simulating sensor performance to observe control system response to ensure logic is per the sequence of operations;

5.5.10.2(3) CxA will facilitate the development of AFDDR logic and rules. The CxA will facilitate a BAS/AFDDR integration meeting with the commissioning team during the development of the AFDDR requirements;

5.5.10.2(4) CxA will consult facilities management personnel on AFDDR logic and rules to prioritize which are important and which may not be needed;

5.5.10.2(5) Implementation of AFDDR logic and rules is to be completed by the AFDDR provider;

5.5.10.2(6) AFDDR provider is to have their system in place and ready to pull in data points as soon as BMS or other control system components come online;

5.5.10.2(7) AFDDR system will be commissioned by the AFDDR provider and overseen and reviewed by the CxA. This will include checking that points are mapped over to AFDDR system properly, and that AFDDR system reports are accurate. Samples/mock-ups of each system will be checked and verified prior to deployment and use of AFDDR system.

5.5.10.2(8) AFDDR system will become active as the Building Systems come online. AFDDR system will be used as a Commissioning tool by the CxA to supplement on-site physical checks;

5.5.10.2(9) Automated test scripts will be implemented, facilitated by the CxA for testing of distributed or repetitious systems. This is to be used to supplement but not replace hands-on testing. This may include, for example, running automated test scripts for VAV boxes, where the AFDDR system will cause VAV boxes to open and provide fault if there is no increase in airflow, or open heating coil valves and provide a fault if there is no increase in supply air temperature.

5.5.10.2(10) Automated test scripts are to be reviewed by the Cx team to ensure that there is no unintended damage to equipment, i.e. in the example above, only a subset of VAV's would be tested at the same time, as to not create a rapid change in system air flow rate that could cause damage to ductwork.

5.5.10.2(11) CxA will utilize the AFDDR system as a tool for its reviews and to inform the CxA reporting during the warranty period. Development of the scope and frequency of reporting will be determined in consultation with the Owner.

5.5.10.2(12) AFDDR system will be the platform to be used for monitoring based Commissioning as required for LEED purposes.

5.5.11 Acoustic Performance Testing

5.5.11.1 Post-construction performance verification tests will be carried out at the earliest opportunity on two separate examples of each unique wall assembly having a required STC rating (Refer to Appendix 3C [Acoustic and Noise Control Measures]) of 45 or more. These tests will be performed at the first opportunity that rooms are enclosed and before Construction is complete so that corrective measures can be applied to spaces that are not yet complete. If both tests do not achieve the required ASTC rating, then another two (2) walls will be tested to establish the extent of the problem. Corrective measures will be taken as required and all failing walls retested. It is the responsibility of Project Co to provide remedial Work and retesting. A test plan that includes the number and location of all tests must be provided to the Owner for approval before testing begins.

5.5.11.2 Compliance testing will be performed by Project Co.

5.5.11.3 Testing will be done at a minimum of two (2) of each of the room/partition types occurring within the Facility, all operable partitions and additional spaces, as required by the Owner.

5.5.11.4 Failure to meet the minimum performance requirements will require both re-testing and further testing to demonstrate compliance.

5.5.11.5 Compliance test reports must be provided to the Owner for review and approval.

5.5.11.6 ASTC tests will be done wherever the test standard can be applied.

5.5.11.7 NIC tests will be done only when ASTC standard test requirements cannot be met.

5.5.11.8 The measured ASTC or NIC performance must be within five (5) points of the STC ratings provided in Appendix 3C [Acoustic and Noise Control].

5.5.11.9 Where internal partitions include doors and/or windows, the STC_C of the partition must be calculated based on the assigned STC ratings for each component as specified in Appendix 3C [Acoustic and Noise Control] and the area of each component. Compliance test reports for composite partitions must include calculations of the STC_C for the partition along with the measured ASTC or NIC value. The measured ASTC or NIC value must be within 5 points of the calculated STC_C value to be deemed compliant.

5.5.11.10 Post-construction performance verification tests will be carried out of HVAC noise levels (Noise Criteria (NC) in 10% of all occupied spaces as listed in Appendix 3C [Acoustic and Noise Control]:

5.5.11.10(1) A test plan that includes the number and location of all tests must be provided to the Owner for approval before testing begins;

5.5.11.10(2) The testing will be focused, but not exclusively, on those spaces located closest to the mechanical spaces serving the various portions of the Facility;

5.5.11.10(3) Where the NC requirements of in Appendix 3C [Acoustic and Noise Control] are not met, measures will be taken to reduce the HVAC noise levels to below the levels shown in Appendix 3C [Acoustic and Noise Control]; and,

5.5.11.10(4) Rooms that did not meet the NC requirements will be re-tested after noise reduction has been applied, plus an additional 5% of rooms will be tested.

5.5.11.11 Post-construction performance verification tests will be taken of the reverberation times to demonstrate compliance with Appendix 3C [Acoustic and Noise Control]:

5.5.11.11(1) The testing will include the Chapel, Sacristy, Ceremony Room, Meditation Room, Audiology Rooms, all conference rooms and meeting rooms with a seating capacity requirement greater than 15 chairs, plus a minimum of 10% of spaces where maximum RT_{60} requirements have been specified in Appendix 3C [Acoustic and Noise Control] with an appropriate cross-section of space types;

5.5.11.11(2) A test plan that includes the number and location of all tests must be provided to the Owner for approval before testing begins;

5.5.11.11(3) Where the measured reverberation times do not meet the requirements in Appendix 3C [Acoustic and Noise Control], corrective measures will be taken to achieve the targets and similar corrective measures will then be applied to all other spaces of the same type; and,

5.5.11.11(4) Rooms that did not meet the RT_{60} requirements will be re-tested after corrective measures have been taken and an additional 5% of rooms of that type will be tested.

5.5.12 Mechanical

5.5.12.1 General

5.5.12.1(1) Fire Protection, Plumbing and HVAC Systems will be commissioned in accordance with CAN/CSA Z8001 and applicable CAN/CSA Z317 series.

5.5.12.1(2) Commissioning (Cx) is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the Project. Cx is performed after systems and integrated systems are completely installed and functional.

5.5.12.2 Objectives:

5.5.12.2(1) Verify installed equipment, systems and integrated systems operate in accordance with the Agreement and design criteria and intent;

5.5.12.2(2) Ensure appropriate documentation is compiled into the O&M Manual and Commissioning Report; and

5.5.12.2(3) Effectively train Facility Management Staff. Refer to Section 7.7.3.37.

5.5.12.3 Project Co trades will assist in Cx process, operating equipment and systems, troubleshooting and adjusting as required.

5.5.12.3(1) System to be operated at all modes to ascertain that they function correctly, consistently and efficiently at all expected operating modes. Systems to be operated interactively with each other as intended in accordance with the Project Agreement and design criteria.

5.5.12.3(2) During these checks, adjustments to be made to enhance performance to meet the Owner's operational and functional requirements in accordance with this Agreement.

5.5.12.4 Commissioning phases will include:

5.5.12.4(1) Pre-design;

5.5.12.4(2) Design;

5.5.12.4(3) Construction;

5.5.12.4(4) Facility Start-up;

5.5.12.4(5) Verification;

5.5.12.4(6) Performance testing;

5.5.12.4(7) Acceptance and interim acceptance; and

5.5.12.4(8) Post-occupancy acceptance.

5.5.12.5 Fire Protection Systems

5.5.12.5(1) Fire Protection systems, along with fire safety measures, provide protection to occupants in the Facility. Commissioning Plan will specify which tests are to be carried out and the timing, sequence, and approval process for the tests.

5.5.12.5(2) Commissioning process will address the verification and performance testing of the fire protections systems that detect, alarm against, and control the spread of fire and smoke.

5.5.12.5(3) The intent of Commissioning requirements in CAN/CAS Z8001 is to supplement, not replace, the requirements of the Governmental Authority and applicable codes

5.5.12.5(4) All fire protection system elements will be commissioned. These include the following:

5.5.12.5(4)(a) Fire suppression services, including automatic sprinkler systems; standpipes; portable extinguishers; and special extinguishing media systems;

5.5.12.5(4)(b) Smoke management systems;

5.5.12.5(4)(c) Fire and smoke detection systems, alarm systems, and other annunciators

5.5.12.5(4)(d) Voice communication and public address systems;

5.5.12.5(4)(e) Fire and smoke separators, including closures and other hardware;

5.5.12.5(4)(f) Egress and evacuation systems;

5.5.12.5(4)(g) Emergency power systems; and

5.5.12.5(4)(h) Fire safety and emergency plans.

5.5.12.6 Plumbing

5.5.12.6(1) Plumbing systems will be commissioned. These include the following:

5.5.12.6(1)(a) Domestic water systems – hot water, hot water recirculation and cold water;

5.5.12.6(1)(b) Non-potable water system(s);

5.5.12.6(1)(c) Drainage systems – sanitary, storm and drainage vents;

5.5.12.6(1)(d) Gas systems – natural gas, propane and secondary fuel (diesel) systems.

5.5.12.7 HVAC

5.5.12.7(1) HVAC systems include all air, water, gas systems and associated support systems designed to provide heating, cooling and ventilation with in the Facility.

5.5.12.7(2) Commissioning will include start-up, verifications, performance testing, post-occupancy evaluation, and documentation of the installation and performance of all HVAC systems. Commissioning should begin with individual pieces of equipment before moving to complete system and should progress from manual operation to fully automatic operation under building automation control.

5.5.12.7(3) During development of the Commissioning Plan and preparation of the check sheets, consideration will be given to the performance criteria specified in Table 1 of CAN/CSA Z317.2.

5.5.13 Electrical

5.5.13.1 Electrical Commissioning will be carried out on complete and fully integrated systems in compliance with CAN/CSA Z8001, CSA Z32, and other applicable codes and standards.

5.5.13.2 The extent of Commissioning will be as called for under this section of the specifications and under other specific section.

5.5.13.3 Commissioning will include system verification for: operation, workmanship, conformance of equipment and materials to specifications, record documentation,

maintenance manuals and operation instructions, and the documentation in the reporting of testing and adjustment, and Commissioning.

5.5.13.4 Electrical Systems to be commissioned and demonstrated will include the following:

5.5.13.4(1) HV, LV Switchgear;

5.5.13.4(2) Unit Substations;

5.5.13.4(3) CDPs;

5.5.13.4(4) Automatic transfer switches;

5.5.13.4(5) Emergency generators and paralleling system;

5.5.13.4(6) Generator load bank and load bank connections;

5.5.13.4(7) Main and distribution transformers;

5.5.13.4(8) Branch circuit panelboards;

5.5.13.4(9) Isolated power systems;

5.5.13.4(10) Feeder cables;

5.5.13.4(11) Building ground electrode;

5.5.13.4(12) Patient reference ground;

5.5.13.4(13) Receptacles;

5.5.13.4(14) MCCs;

5.5.13.4(15) Lighting control systems;

5.5.13.4(16) Emergency unit equipment;

5.5.13.4(17) Branch circuit wiring;

5.5.13.4(18) Electrical systems identification;

5.5.13.4(19) Lightning protection;

5.5.13.4(20) UPS systems;

5.5.13.4(21) Automatic power factor correction and harmonic correction systems;

5.5.13.4(22) Phase balance and polarity;

5.5.13.4(23) Power quality and monitoring including power factor correction and harmonic mitigation;

5.5.13.4(24) Operation of circuit breakers, interlocking schemes, ground fault monitoring, line isolation monitoring, etc.; and

5.5.13.4(25) CSA Z32 testing.

5.5.13.5 Emergency Generator and Automatic Transfer Switches

5.5.13.5(1) The CxA will prepare the emergency generator and automatic transfer switch checklists and submit to the Owner for review. Checklists are to be completed by the CxA during the Design phase, and during the installation and start-up phase.

5.5.14 Life Safety Systems

5.5.14.1 Fire Alarm System

5.5.14.1(1) Commissioning of fire alarm system will include verification, testing and demonstration of the system in accordance with applicable portions of CAN/ULC-S537, CAN/ULC-S1001, CAN/ULC-S524, CSA C282, VBBL and other recognized installation and test codes.

5.5.14.1(2) Provide schedule and sequence of tests and demonstration on the system. Provide Commissioning procedures prior to applying for Occupancy Permit.

5.5.14.1(3) Commissioning of the fire alarm system will include the integration of other systems such as elevator, code blue, access control, smoke control and smoke venting, fire suppression, emergency generators, emergency lighting, AGV system, central monitoring station, and provision of record documentation.

5.5.15 Food Services Equipment (Including Walk-in Cold Rooms, Freezers and Refrigerators)

5.5.15.1 Ensure that all equipment is operational and safe. Perform all tests, adjustments and balancing prior to equipment demonstrations and instructions.

5.5.15.2 Use qualified personnel acceptable and approved by the appropriate Project Co design consultant and named in Appendix 3I [Commissioning Roles and Responsibilities] to conduct tests.

5.5.15.3 Tests that fail to verify acceptable performance of equipment and systems will be repeated after corrective measures are carried out. Repeat the tests until acceptable performance levels are achieved.

5.5.15.4 Provide competent instruction in the use of the equipment, using equipment specialists. Instructions will consist of and include:

5.5.15.4(1) Classroom sessions in the use of operational and maintenance manuals.

5.5.15.4(2) "Hands on" equipment operation and maintenance for all modes of operation and adjustments.

5.5.15.4(3) Procedures for dealing with equipment failure, abnormal operation or emergency situations.

5.5.15.5 Commissioning will be consistent with the overall Project requirements as referenced in the conditions of this Agreement.

5.5.15.5(1) Fire Suppression System

5.5.15.5(1)(a) All as required to constitute a fully approved system installed in accordance with NFPA96, 17A, ULC/ORD 1254.6 and authorities having jurisdiction.

5.5.15.5(1)(b) Test: Complete system to be tested, commissioned and certified.

5.5.15.5(2) Exhaust Hood

5.5.15.5(2)(a) All as required to constitute a fully approved system installed in accordance with NFPA96, 17A, and authorities having jurisdiction.

5.5.15.5(2)(b) Test: Complete system to be tested, commissioned and certified.

5.5.16 Communications, IM/IT and Safety and Electronic Security

5.5.16.1 In consultation with the Owner, incorporate Division 27 (Communications and IM/IT) as well as Division 28 (Electronic Safety and Security) into the Commissioning Plan. Refer to Appendix 3I [Commissioning Roles and Responsibilities] for a summary of the systems included in the Commissioning process. Please note that the list of systems included in Appendix 3I [Commissioning Roles and Responsibilities] is derived from CSA Z8001 and is not intended to be exhaustive. Project Co will ensure that all CSA Z8001 systems applicable to the Project are included in the Commissioning process, even if not listed in Appendix 3I [Commissioning Roles and Responsibilities].

5.5.16.2 CxA is to review the communications, IM/IT, and electronic security equipment’s compatibility with the infrastructure in the building (power, data, thermal requirements, etc.).

5.5.16.3 CxA is to include communications, IM/IT and electronic security equipment Commissioning in the overall Commissioning schedule.

5.5.16.4 The Commissioning schedule will reflect the requirement to provide clean, secure, and environmentally controlled Communications Rooms ten (10) months prior to Service Commencement to facilitate the installation of IM/IT network equipment, as further detailed in Section 7.9.2.2(1)(u).

5.5.16.5 CxA is to include communications, IM/IT and electronic security equipment in the overall integrated systems test plan.

5.5.17 Elevators

5.5.17.1 Detailed check sheets will be prepared by the Elevator Sub-Contractor to verify all aspects of basic elevator operation meet specified requirements, including directional lanterns, position indicators, dispatching, hall buttons, disabled persons audible/visual indications, ride quality/performance, user training, elevator management system, Firefighters Emergency Operation and concurrent operations, such as Standby Power and Medical Emergency Operations.

5.5.17.2 All of the above functions will be tested and verified using the check sheets, prior to use by the public.

5.5.17.3 All check sheets will be submitted to the CxA for review and inclusion in the Commissioning report.

5.5.17.4 Testing and Inspection

5.5.17.4(1) An inspection for life safety and code compliance by the applicable safety authority will be provided under the base price.

5.5.17.4(2) In addition to the inspection by the applicable authority for life safety and code compliance, an inspection for material, workmanship and elevator performance will be carried out by Project Co’s Elevator Consultant.

5.5.17.4(3) Pre-Test Elevators (FEO/Standby Power/Medical Emergency Operation)

5.5.17.4(4) A minimum of one (1) site visit for pre-testing of the fire alarm, standby power generator, and medical emergency operation signals, as well as elevator operation under these conditions, with the Electrical Sub-Contractor.

5.5.17.4(5) This will include for activation of various fire alarm initiating devices (heat and smoke detectors) to trigger recall of the elevator(s).

5.5.17.4(6) This will include for activation of the transfer switch signal, as well as pre-transfer signal if applicable, to trigger standby power operation of the elevator(s).

5.5.17.4(7) This will occur after the elevator work on each elevator is completed and will be scheduled by the Elevator Sub-Contractor.

5.5.17.4(8) Project Co and the Owner will attend all testing, verification and Commissioning. Coordination and scheduling of this joint attendance will be provided by the CxA.

5.5.17.5 Final Test Elevators (FEO/Standby Power/Medical Emergency Operation)

5.5.17.5(1) A minimum of two (2) site visits for final testing of the fire alarm, standby power generator, and medical emergency operation signals, as well as elevator operation under these conditions: a minimum of one (1) visit with the Electrical Sub-Contractor and the relevant elevator safety authority, and a minimum of one (1) visit with the Electrical Sub-Contractor and the building code inspector from the local jurisdiction.

5.5.17.5(2) This will include for activation of various fire alarm initiating devices (heat and smoke detectors) to trigger recall of the elevator(s).

5.5.17.5(3) This will include for activation of the transfer switch signal, as well as pre-transfer signal if applicable, to trigger standby power operation of the elevator(s).

5.5.17.5(4) This will occur after the elevator work on each elevator is completed and will be scheduled by the Elevator Sub-Contractor.

5.5.17.5(5) The elevator contractor will also visit site for integrated systems testing with the Commissioning team, which will include operation of elevator under different clinical and failure testing scenarios.

5.5.17.6 The CxA will include the above elevator testing items in the Commissioning schedule, will witness testing, and will include testing documentation in the Commissioning report.

5.5.18 Automated Guided Vehicles (AGVs)

5.5.18.1 General Testing

5.5.18.1(1) Project Co will correct any workmanship or performance criteria not in conformance with this Schedule.

5.5.18.1(2) The testing of the system will be performed as follows:

5.5.18.1.2.(a).1 Acceptance Test – Static
5.5.18.1.2.(a).2 Acceptance Test – Operational loading/unloading
5.5.18.1.2.(a).3 Performance testing
5.5.18.1.2.(a).4 Reliability testing

5.5.18.2 Acceptance Test – Static

5.5.18.2(1) Project Co representatives will conduct a visual inspection noting any discrepancies between the system and the contract criteria or other defects in workmanship or material.

5.5.18.2(2) The results of the inspection will be accurately documented with the appropriate action to be taken and noted.

5.5.18.2(3) The results of the system visual inspection will be of the following:

5.5.18.2(3)(a) If the system is found to be without visible defects or variation to requests by both parties, there will be written statement of the Owner and Project Co indicating same and the acceptance procedure will proceed to the next element, dynamic testing. The CxA will be responsible for creating, managing and recordkeeping of this document.

5.5.18.2(3)(b) If visible defects or variations from criteria are found, the CxA will manage the process to appropriately track them on a “punch list” with recommended corrections and an agreed upon schedule for completion of corrections to both parties’ satisfaction before static acceptance is granted.

5.5.18.3 Acceptance Test – Operational Loading/Unloading

5.5.18.3(1) This acceptance test will consist of various operational testing and simulating actual operation. The total system will be audited by the CxA for conformance.

5.5.18.4 Vehicle Testing

5.5.18.4(1) Each vehicle will be fully tested for full functionally prior to the performance testing of the system.

5.5.18.4(2) Each vehicle will go through a complete charging cycle.

5.5.18.4(3) Each vehicle will demonstrate on a minimum of ten (10) carts the ability to pick up and drop off carts.

5.5.18.5 Cart Receiving Positions

5.5.18.5(1) The system will demonstrate the capability of carts being received at each of the receiving positions.

5.5.18.5(2) A minimum of five (5) transactions per position is required to demonstrate acceptance.

5.5.18.6 Cart Send Positions

5.5.18.6(1) The system will demonstrate the capability of carts being dispatched from each of the send positions.

5.5.18.6(2) A minimum of five (5) transactions per position is required.

5.5.18.7 Chargers

5.5.18.7(1) The system will demonstrate the capability for vehicles to properly connect to each of the charge stations.

5.5.18.7(2) A minimum of five (5) transactions per position is required to demonstrate acceptance.

5.5.18.8 The results of this operational test will be one of the following:

5.5.18.8(1) If the system is found to be without defects or variation to criteria by both Project Co and the Owner, there will be a joint written statement by the Owner and Project Co to that effect and the acceptance procedure will proceed to the subsequent step of reliability testing.

5.5.18.8(2) If defects or variations from criteria are found, they will be appropriately noted on a “punch list” with recommended corrections and an agreed upon schedule for completion of corrections will be drawn up to both parties’ satisfaction before operational acceptance is granted. Disputes will be handled as set out in Schedule 13 [Dispute Resolution Procedure].

5.5.18.9 Performance Test – after acceptance and during Reliability Testing

5.5.18.9(1) Vehicle performance will be correlated against the accepted traffic matrix by Project Co. Significant variance (>10%), will be cause to conduct further investigations and require corrective actions.

5.5.18.9(2) The AGV System during the performance test will demonstrate the capability of transporting the estimated number of trolleys during the 24 hour period as identified in Project Co’s Cart Matrix. If the system can be programmed to use “dummy loads” in lieu of loading actual carts, this is acceptable providing it has been approved in the system testing plan. Test results will be compared with the simulation.

5.5.18.10 Reliability Test

5.5.18.10(1) Upon successfully completing the Operational Loading/Unloading Acceptance Test, the system will be used in an actual operation for a period of six (6) calendar weeks. At the end of this period, the CxA will arrange another inspection of the system.

5.5.18.10(2) If the system is found to be without defects or variations in accordance with this Agreement, the Integrated AGV System acceptance testing will be complete, and the warranty period will begin.

5.5.18.10(3) If the system has defects or variations to the criteria, they will be noted on a new “punch list” with recommended corrections and an agreed upon schedule for completion of corrections. When corrections have been completed, reliability testing will continue until the system has been fully accepted.

5.5.18.10(4) The AGV System is to provide an overall reliability of at least 95%. Specific component reliability will be higher. The reliability factors to be computed are as follows:

5.5.18.10(4)(a) Computer and Controls: Available to direct and control the AGV’s fleet for 99.5% of the operational time of the production operation. This number is independent of the vehicle reliability, but when down, takes the entire AGV system down. Examples of downtime would include computer lock-ups, any computer failures or any required re-boots of the computer system within the Facility hours of operation. A communication failure from the control system to the AGV is to be included where the communication failure prevents communicating with all the vehicles.

5.5.18.10(4)(b) Individual AGV Reliability: Each AGV will demonstrate a reliability of 98% uptime. This reliability is to be calculated by tracking the vehicle time in automatic mode during production hours minus the downtime of the vehicle (include vehicle faults, load handling faults, and vehicle failures) divided by the vehicle time in automatic mode during production hours. If the vehicle is removed from automatic mode due to a fault or failure, time is counted until functionality is restore and the vehicle resumes operation in automatic mode (time counts only during production hours).

5.6 Architecture

5.6.1 Form and Character

5.6.1.1 The architectural Design of the Facility will incorporate the following requirements:

5.6.1.1(1) The Design will reflect the Owner’s values and role as:

5.6.1.1(1)(a) A regional and provincial tertiary and quaternary health care centre; and

5.6.1.1(1)(b) The main urban health centre for the City's most vulnerable and marginalized.

5.6.1.1(2) The Main Entrance will convey the Owner's Identity and express its role in the community. It will include elements that reflect the history of the Site.

5.6.1.1(3) Reflect the Owner's Identity; refer to Section 3.1. The architectural character will represent and reflect the Owner's Catholic faith-based health care mission identity and commitment to compassion, social justice and indigenous reconciliation;

5.6.1.1(4) The Design will create a positive Patient environment that enables Staff to deliver complex clinical processes in a non-institutional environment;

5.6.1.1(5) The Design will promote simplicity to create a Facility that can be easily understood by all its users both in its form and layout;

5.6.1.1(6) Maximize glazing in exit stairs for views to the exterior, safety and orientation to the Health Campus;

5.6.1.1(7) The Facility will be highly articulated to break down its scale, utilizing such components as glazing, canopy and shading systems, varying cladding patterns/design, as well as exposed structural elements;

5.6.1.1(8) The Design will reinforce the recognition of primary entries, feature material changes at major height transitions in the massing and express the functional distinction between components such as inpatient floors and surgical floors;

5.6.1.1(9) The Design of the Facility exterior will be articulated to create an architecturally interesting and refined structure. Emphasize the modular, recurrent elements of Appendix 3A [Clinical Specifications and Functional Space Requirements] in the massing and materials to achieve articulation, visual interest, and human scale;

5.6.1.1(10) Locate highly acute Clinical Spaces to be hidden from the public areas including all public entrances, lobbies, waiting areas and outpatient areas;

5.6.1.1(11) The scale of the Facility will be progressive, as the Patient or visitor transitions from the larger public spaces to the smaller private treatment zones;

5.6.1.1(12) The Facility will be designed and orientated to maximize daylighting and views. Daylighting and views will assist with Wayfinding and promote a therapeutic environment of well-being;

5.6.1.1(13) The Facility will respond appropriately to the environmental forces of sun, wind, and precipitation; and

5.6.1.1(14) The Facility will be integrated with the exterior environment to create cohesive indoor/outdoor connectivity at the public entrance areas;

5.6.1.2 Design will prevent views from the exterior into privacy sensitive spaces, including Patient rooms, spaces where care or treatment is being administered to Patients, Staff offices or similar spaces. Provision of translucent film or similar are not an acceptable means of preventing views in.

5.6.1.3 Enclosed Atrium

5.6.1.3(1) Project Co will provide an Enclosed Atrium to meet the following requirements:

5.6.1.3(1)(a) Provide a minimum 1000 NSM multi-storey Enclosed Atrium at Level 1. The Enclosed Atrium will provide Direct Access to the following components as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]:

5.6.1.3.1.(a).1 M1.1 – Main Entrance Lobby;
5.6.1.3.1.(a).2 M2.1 – Food Court;
5.6.1.3.1.(a).3 M2.2 – Retail;
5.6.1.3.1.(a).4 M3 – Public Services;
5.6.1.3.1.(a).5 M6 – Roman Catholic Chapel;
5.6.1.3.1.(a).6 M7 – All Nations Sacred Space; and
5.6.1.3.1.(a).7 M8 – Meditation Room.

5.6.1.3(1)(b) The Enclosed Atrium will provide Convenient Access to the following components as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]:

5.6.1.3.1.(b).1 K1.1 – C4HA Outpatient Clinics Entrance;
5.6.1.3.1.(b).2 A1 – Emergency Department ;
5.6.1.3.1.(b).3 N1 – Learning Commons; and
5.6.1.3.1.(b).4 N2 – Conference Centre.

5.6.1.3(1)(c) The Enclosed Atrium will:

5.6.1.3.1.(c).1 Establish the Owner’s Identity through Design elements such as Wayfinding and artwork, refer to Sections 5.12.6 Artwork and 5.13 Wayfinding and Signage;

5.6.1.3.1.(c).2	Facilitate Wayfinding as a key transitional point and be clearly marked with signage. The location will provide Wayfinding for Patients, visitors and Staff on multiple floors of the Facility through signage and interior glazing surrounding the Enclosed Atrium for orientation;
5.6.1.3.1.(c).3	Provide a calming environment, with areas to relax and serve as a Wayfinding element enabling the users to orientate themselves;
5.6.1.3.1.(c).4	Provide a large and flexible gathering space for use in a wide variety of activities that is conducive to allowing both small and large events to take place, including emergency disaster response scenarios;
5.6.1.3.1.(c).5	Be multi-functional for the Owner's use in public education or information displays;
5.6.1.3.1.(c).6	Provide Quality Daylight and interior windows along all adjacent circulation corridors to the maximum extent possible;
5.6.1.3.1.(c).7	Be fitted out with motorized blinds controlled by BMS to control glare and provide thermal comfort;
5.6.1.3.1.(c).8	Be provided with four (4) floor-mounted electrical outlets for the Display/Retail Area, to be distributed across the space based on the Design;
5.6.1.3.1.(c).9	Be provided with two (2) ATM machines. These may be located in the Main Entrance Lobby;
5.6.1.3.1.(c).10	Be provided with two (2) pay phones and two (2) taxi phones. These may be located in the Main Entrance Lobby;
5.6.1.3.1.(c).11	Be provided with Wayfinding and Patient registration kiosks;
5.6.1.3.1.(c).12	Have colours and finishes consistent with the interior design theme and include pathways in the floor pattern to create links with the surrounding components;
5.6.1.3.1.(c).13	Delineate seating areas from circulation pathways through the use of flooring patterns or feature walls;
5.6.1.3.1.(c).14	Use wood as a featured material in the ceiling and walls;
5.6.1.3.1.(c).15	Be designed for full access to interior and exterior glazing for ease of cleaning by the Owner by use of temporary means; and

5.6.1.3.1.(c).16 Be designed to include convenience stairs located adjacent to the Public Passenger Elevators which will connect the main floor level to the second floor.

5.6.1.4 Rooftop Penthouse and Architectural Screens

5.6.1.4(1) Rooftop mechanical equipment will be housed in an enclosed penthouse.

5.6.1.4(2) Rooftop mechanical/electrical equipment will be positioned minimum 2 m away from unguarded roof edges so that it can be inspected and maintained without requiring fall protection, in conformance to WSBC regulations.

5.6.1.4(3) Miscellaneous roof top mounted mechanical, electrical and communications equipment will be concealed from view through architectural screens. Screens will hide mechanical, electrical and communications equipment from view by neighboring properties and/or Facility occupants. Screens will be clad with architectural materials consistent with those used in the Facility.

5.6.1.5 Exterior Building Materials and Colour

5.6.1.5(1) The Design will:

5.6.1.5(1)(a) Incorporate materials to create a distinct character reflective of the Owner's Identity, and consistent with the Design Objectives described in Section 3.2.1.1(1);

5.6.1.5(1)(b) Feature a material palette that avoids an institutional aesthetic;

5.6.1.5(1)(c) Include variation and articulation of the exterior facade through varied use of materials;

5.6.1.5(1)(d) Minimize extensive unbroken exterior wall areas or surfaces;

5.6.1.5(1)(e) Have an animated exterior that includes materials and colours to add visual interest for the Patients, visitors and Staff;

5.6.1.5(1)(f) Include variations of glazing sizes and create patterns to reduce scale and massing of the Facility; and

5.6.1.5(1)(g) Emphasize the glazed and visually transparent major entrances with surrounding solid elements.

5.6.1.5(2) Materials will be durable and high quality. Refer to Section 3.7 Sustainability.

5.6.1.5(3) Exterior materials will include the following:

- 5.6.1.5(3)(a) wood;
- 5.6.1.5(3)(b) stone;
- 5.6.1.5(3)(c) brick masonry;
- 5.6.1.5(3)(d) composite metal panels;
- 5.6.1.5(3)(e) Architectural Concrete;
- 5.6.1.5(3)(f) concrete (cementitious) veneer solid Rain Screen panels;
- 5.6.1.5(3)(g) aluminium windows and spandrel panels; and
- 5.6.1.5(3)(h) aluminium curtain wall.

5.6.1.5(4) Brick masonry will be carefully considered.

5.6.1.5(5) Unacceptable materials include stucco, vinyl siding, large expanses of non-Architectural Concrete, mirrored glass, and neon lighting.

5.6.1.5(6) Limited amounts of smooth or corrugated metal panels, or proven high quality cementitious cladding panels, may be considered by the Owner.

5.6.1.5(7) Exterior wall cladding materials to be applied through the use of thermally-broken, galvanized concealed fasteners.

5.6.1.5(8) Wall panels will be of sufficient thickness, complete with control and expansion joints, to mitigate material deformities due to structural and thermal movement within the wall assembly. Warping, oil-canning and/or mechanical modifications, which may alter its physical appearance and diminish its intended performance, are not permitted.

5.6.1.5(9) At all conditions where dissimilar metals are in contact, provide separators to prevent galvanic corrosion including aluminum window and curtain walls.

5.6.1.5(10) Facade transparency and views into non-clinical, public activities will be provided, especially at grade levels and large waiting areas; accordingly, use of mirrored or highly reflective glass is not permitted.

5.6.1.6 Access to Daylight and Views

5.6.1.6(1) Direct Natural Light

5.6.1.6(1)(a) A space has Direct Natural Light where the following conditions are satisfied:

5.6.1.6.1.(a).1 The space will have an exterior window;

5.6.1.6.1.(a).2 A light radius will be measured horizontally from the centreline of the exterior window;

5.6.1.6.1.(a).3 For spaces having rectangular geometry, the centre of the space will fall within an 8-metre light radius, or a 10-metre light radius if the area is over 70 square metres; and

5.6.1.6.1.(a).4 For spaces having non-rectangular geometry, half or more of the total area of the space will fall within an 8-metre light radius, or a 10-metre light radius if the area is over 70 square metres.

5.6.1.6(2) Borrowed Light from Exterior Windows

5.6.1.6(2)(a) A space has Borrowed Light from exterior windows where the following conditions are satisfied:

5.6.1.6.2.(a).1 The space will have at least one window facing in the direction of an exterior window;

5.6.1.6.2.(a).2 A light radius in a straight line will be measured horizontally from the centreline of an exterior window, extending through an interior window within the same room which has the exterior window, and connecting to an interior window within the space receiving the Borrowed Light;

5.6.1.6.2.(a).3 For spaces having rectangular geometry, the centre of the space will fall within an 8-metre light radius within a 10-metre light radius if the area is over 70 square metres;

5.6.1.6.2.(a).4 For spaces having non-rectangular geometry, half or more of the total area of the space will fall within an 8-metre light radius, or a 10-metre light radius if the area is over 70 square metres;

5.6.1.6.2.(a).5 Window(s) in doors, or fully glazed doors, where allowable, may be considered a window for the purposes of Borrowed Light; and

5.6.1.6.2.(a).6 For the purposes of determining Direct Natural Light or Borrowed Light, exterior windows facing into courtyards are acceptable, provided no courtyard dimension is less than 7.5 m.

5.6.1.6(3) Borrowed Light from Skylights and Clerestory Windows

5.6.1.6(3)(a) A space has Borrowed Light from skylights and clerestory windows where the following conditions are satisfied;

5.6.1.6.3.(a).1 There will be a skylight in the space no smaller than 1.5 m², or a clerestory window having its sill higher than 1.5 m AFF, or a window(s) in the space facing in the direction of a clerestory window or skylight;

5.6.1.6.3.(a).2 A light limit will be measured horizontally from the perimeter of the skylight or clerestory window;

5.6.1.6.3.(a).3 For spaces having rectangular geometry, the centre of the space will fall within a 6-metre light limit;

5.6.1.6.3.(a).4 For spaces having non-rectangular geometry, half or more of the total area of the space will fall within a 6-metre light limit; and

5.6.1.6.3.(a).5 Window(s) in doors, or fully glazed doors, where allowable, may be considered a window for the purposes of Borrowed Light.

5.6.1.6(4) Project Co will apply the following principles in the Design of the Facility to address access to daylight and views:

5.6.1.6(4)(a) Arrange circulation routes and occupied spaces to maximize opportunities for windows;

5.6.1.6(4)(b) Select window size and placement consistent with the space use or function;

5.6.1.6(4)(c) Include windows of the largest possible size consistent with Project sustainability and space use objectives; and

5.6.1.6(4)(d) Provide skylights, with glare protection, where windows are not possible or suitable and privacy is not a concern.

5.6.1.6(5) Provide the following minimum requirements for access to daylight and views:

5.6.1.6(5)(a) All principal horizontal circulation routes, including corridors accessing Clinical Spaces and Care Team Stations, will include natural lighting strategies and access to views in the form of windows or skylights; provide windows at the ends of long corridors;

5.6.1.6(5)(b) Glazed doors at entrances to exterior public or Secure Outdoors Spaces;

5.6.1.6(5)(c) Exterior windows in Inpatient Care, Critical Care Complex, and Maternity Centre as follows:

5.6.1.6.5.(c).1 the maximum sill height to be 900 mm; and

5.6.1.6.5.(c).2 window head to extend to the underside of the ceiling.

5.6.1.6(5)(d) For Inpatient Care and Critical Care Complex, the minimum width of the exterior window glazing will be:

5.6.1.6.5.(d).1 2.4 m for bariatric Patient rooms, including bariatric Airborne Isolation Rooms, and

5.6.1.6.5.(d).2 1.6 m for all other Patient rooms, including Airborne Isolation Rooms.

5.6.1.6(5)(e) For Maternity Centre, the minimum width of the exterior window glazing will be:

5.6.1.6.5.(e).1 2.4 m for bariatric Patient rooms, and

5.6.1.6.5.(e).2 1.6 m for all other Patient rooms.

5.6.1.6(5)(f) For Mental Health Areas, the minimum width of the exterior window glazing will be:

5.6.1.6.5.(f).1 2.4 m for bariatric Patient rooms, including bariatric Airborne Isolation Rooms, and

5.6.1.6.5.(f).2 1.6 m for all other Patient rooms, including Airborne Isolation Rooms.

5.6.1.6(6) Direct Natural Light and Borrowed Light will be required in compliance with CSA Z8000 and in accordance with the room types listed below:

5.6.1.6(6)(a) The following rooms in the Emergency Services Component require Direct Natural Light:

5.6.1.6.6.(a).1 Waiting.

5.6.1.6(6)(b) The following rooms in the Critical Care Complex require Direct Natural Light:

5.6.1.6.6.(b).1 Future Expansion (Patient Room).

5.6.1.6(6)(c) The following rooms in the Inpatient Care Component require Direct Natural Light:

5.6.1.6.6.(c).1 Lounge-Family/Visitor; and

5.6.1.6.6.(c).2 Lounge/Living Room-Patient.

5.6.1.6(6)(d) The following rooms in the Renal Outpatient Component require Direct Natural Light:

5.6.1.6.6.(d).1 Waiting.

5.6.1.6(6)(e) The following rooms in the Maternity Centre Component require Direct Natural Light:

- 5.6.1.6.6.(e).1 Future Expansion (Patient Room-SRMC); and
- 5.6.1.6.6.(e).2 Lounge-Family/Visitor.

5.6.1.6(6)(f) The following rooms in Urban Health and Integrated Mental Health and Substance Use Component require Direct Natural Light:

- 5.6.1.6.6.(f).1 Lounge/Living Room, Patients;
- 5.6.1.6.6.(f).2 Lounge-Family/Visitor; and
- 5.6.1.6.6.(f).3 Waiting.

5.6.1.6(6)(g) The following rooms in the Surgical and Interventional Services Component require Direct Natural Light:

- 5.6.1.6.6.(g).1 Minimum of fifteen (15) ACU Patient Spaces in Component G1.5.

5.6.1.6(6)(h) The following rooms in the Outpatient Care Centre Component require Direct Natural Light:

- 5.6.1.6.6.(h).1 Waiting;
- 5.6.1.6.6.(h).2 Minimum of twelve (12) Infusion Treatment Bay-Stretcher.

5.6.1.6(6)(i) The following rooms in the Medical Imaging Component require Direct Natural Light:

- 5.6.1.6.6.(i).1 Waiting.

5.6.1.6(6)(j) The following rooms in the Centre for Healthy Aging Component require Direct Natural Light:

- 5.6.1.6.6.(j).1 Waiting;
- 5.6.1.6.6.(j).2 Inter-Professional Team Room;
- 5.6.1.6.6.(j).3 K2.2.18 Multipurpose Room-Large (or the Multipurpose Room-Large that is adjacent to the K2.3.1 Servery, per Appendix 3A clause 12.4.3.20); and
- 5.6.1.6.6.(j).4 K1.2.5 Multipurpose Room-Large (1 of the 2 Units).

5.6.1.6(6)(k) The following rooms in the Rehabilitation Centre Component require Direct Natural Light:

- 5.6.1.6.6.(k).1 Waiting.

5.6.1.6(6)(l) The following rooms in the Main Entrance and Public Services Component require Direct Natural Light:

- 5.6.1.6.6.(l).1 Chapel; and
- 5.6.1.6.6.(l).2 All Nation Sacred Space/Ceremony Room.

5.6.1.7 Outdoor Spaces

5.6.1.7(1) The landscape will complement and enhance the existing surrounding landscape form, tree species, open space, and adjacent street character.

5.6.1.7(2) Formal planting will define movement corridors such as streets, driveways and pedestrian walkways.

5.6.1.7(3) Low under-planting will be used to create accents in the landscape and a hierarchy of space by drawing attention to focal points and important Facility entrances.

5.6.1.7(4) Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for clinical and additional requirements for outdoor spaces.

5.6.2 Building Envelope

5.6.2.1 Basic Requirements:

5.6.2.1(1) Provide a building envelope which meets the climate resiliency requirements for future climate projections, refer to Section 3.8.1.2.

5.6.2.1(2) Provide a building envelope which prevents the accumulation and stagnation of rain, snow, ice and dirt on the horizontal and vertical surfaces.

5.6.2.1(3) Provide a building envelope which sheds water, snow and ice safely from exterior surfaces so they are not trapped in the assembly where they may cause deterioration or staining or present a danger to the safety of any person.

5.6.2.1(4) Provide a building envelope in accordance with Rain Screen wall requirements with an exterior insulated wall assembly.

5.6.2.1(5) Provide a building envelope with a predicted service life that exceeds 50 years as defined in CSA S478.

5.6.2.1(5)(a) For components and assemblies whose categories of failure are 6, 7, or 8 in Table 3 in CSA S478, use a Design Life equal to the Design Life for the Facility.

5.6.2.1(5)(b) For components and assemblies whose categories of failure are 4 or 5 in Table 3 in CSA S478, use a Design Life equal to at least half of the Design Life of the Facility.

5.6.2.1(6) Where component and assembly Design Life are shorter than the Design Life of the Facility, Design and construct so they can be readily replaced.

5.6.2.1(7) Provide a building envelope to ensure indoor noise criteria are met as specified in Appendix 3C [Acoustic and Noise Control Measures].

5.6.2.1(8) Design of the Facility, including the structure and structural components, will minimize effects of corrosion and deterioration due to environmental impacts and use, including malicious damage by use of measures such as:

- 5.6.2.1(8)(a) Concrete crack control joints and expansion/contraction joints;
- 5.6.2.1(8)(b) High strength concrete mixes, proportioned to durability requirements for exposure and use;
- 5.6.2.1(8)(c) Reinforcing of concrete for crack control;
- 5.6.2.1(8)(d) Hot-dip galvanize and paint with a two part epoxy paint system all exposed steel in accordance with Sections 6.5.4.1(3) and 6.5.6.2(2); and
- 5.6.2.1(8)(e) Embedded steel protection angles and skid plates for service areas.

5.6.2.1(9) Ensure the building envelope will accommodate the high humidity service conditions inside the Facility.

5.6.2.1(10) Condensation within building envelope assemblies or on interior surfaces will not be permitted under any operational condition.

5.6.2.1(11) 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.

5.6.2.1(12) Ensure the building envelope avoids thermal bridging.

5.6.2.1(13) Ensure continuation of the air barrier, vapour barrier, thermal barrier and moisture barrier across the entire envelope including foundations, walls and roofs. Continuity of these components will be maintained at all intersections, attachments and appendices.

5.6.2.1(14) Ensure the building envelope is insulated primarily exterior to the interior wall or back-up wall.

5.6.2.1(15) Accommodate differential movement due to temperature variations, and structural movement.

5.6.2.1(16) Back-up walls for outer cladding will consist of concrete masonry units, poured in place reinforced concrete or structural metal framing backup system. Design for deflection of interior finishes will conform to code in all conditions.

5.6.2.2 Rain Screen Requirements

5.6.2.2(1) All exterior walls will meet the following Rain Screen wall requirements:

5.6.2.2(1)(a) Drain all accumulated water to the exterior of the Facility and to provide a means for drying of any accumulated moisture within the cladding assembly;

5.6.2.2(1)(b) Materials will be installed to all shed precipitation;

5.6.2.2(1)(c) Prevent moisture penetration through the exterior of the wall assembly;

5.6.2.2(1)(d) Provide a continuous air space of minimum 25 mm clear width; and

5.6.2.2(1)(e) Flashings, drips or overhangs, will be sufficient to deflect accumulated water away from the Facility face, at all:

5.6.2.2.1.(e).1 Changes in plane;
5.6.2.2.1.(e).2 Intersections of walls and roofs;
5.6.2.2.1.(e).3 Changes in cladding material; and
5.6.2.2.1.(e).4 Window and door heads or sills.

5.6.2.2(1)(f) Provide vents at top and bottom of the walls that allow any moisture to drain out and allow fresh air to pass through. Provide screens to keep insects out.

5.6.2.3 Testing Requirements

5.6.2.3(1) Project Co will retain a Building Envelope Consultant as part of the Project team throughout the Design and Construction process. The Building Envelope Consultant will provide assistance in building envelope thermal review, testing and thermal bridging calculations.

5.6.2.3(2) Provide a building envelope report, signed by the Building Envelope Consultant, prior to Service Commencement confirming the as-built Construction conforms to the recommendations in the building envelope report.

5.6.2.3(3) Submit building envelope test results, witnessed by the Building Envelope Consultant, to the Owner verifying that the building envelope meets all requirements.

5.6.2.3(4) The Facility will be tested and the air leakage rate of the building envelope will not exceed 0.40 cfm/ft2 at a pressure differential of 0.3 inches water gauge (2.0 L/s.m2 at 75 Pa) at the upper 96 percent confidence interval in accordance with ASTM E 779 or an equivalent method approved by the City.

5.6.2.3(5) A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates will be submitted to the Owner and City. The following modifications will be made to ASTM E 779:

5.6.2.3(5)(a) Tests will be accomplished using either (1) both pressurization and depressurization or (2) pressurization alone, but not depressurization alone. If both pressurization and depressurization are not tested, the air leakage will be plotted against the corrected P for pressurization in accordance with Section 9.4 of ASTME E 779;

5.6.2.3(5)(b) The test pressure range will be from 25 Pa to 80 Pa per Section 8.10 of ASTM E 779, but the upper limit will not be less than 50 Pa and the difference between the upper and lower limit will not be less than 25Pa; and

5.6.2.3(5)(c) If the pressure exponent n is less than 0.45 or greater than 0.85 per Section 9.6.4 of ASTM E779, the test will be rerun with additional readings over a longer time interval.

5.6.2.3(6) If the tested rate exceeds the rate assumed as part of the energy modeling and associated Energy Target, a visual inspection of the air barrier will be conducted and any leaks noted will be sealed. An additional report identifying the corrective actions taken to seal air leaks will be submitted to the Governmental Authority and any further requirement to meet the leakage air rate will be waived, aside from the impact on the energy target.

5.6.2.4 Roofs

5.6.2.4(1) Provide a complete horizontal barrier to the exterior using SBS modified bitumen roofing system (multi-ply) for all roofs in accordance with the following standards:

5.6.2.4(1)(a) All roofing systems will conform to Roofing Practices Manual by the Roofing Contractors Association of British Columbia (RCABC);

5.6.2.4(1)(b) Provide RCABC written warranty issued in the name of the Owner, signed jointly by the applicator and manufacturer, stating that the modified bituminous sheet roofing will provide a leak-free waterproofing surface for a minimum of ten (10) years. Warranty will cover both material and workmanship (including labour to remove / replace overburden) where repairs will be made and roofing recovered at no cost to the Owner. Membrane manufacturer to provide ten (10) year manufacturers "leak-free" performance warranty, non-pro-rated.

5.6.2.4(2) Roof areas will be designed to be attractive and will avoid use of large areas of undifferentiated gravel.

5.6.2.4(3) All roofs are to have Direct Access for maintenance Staff. Ensure Design incorporates all safety requirements required by the VBBL, the Owner's Fall Protection Program and Fall Protection Design Requirements, and WorkSafe BC.

5.6.2.4(4) Provide stair access to all major roof areas larger than 100 NSM. Ladder access will only be allowed to small roof areas. Rappelling down from upper roofs to access lower roofs is not acceptable. Use of roof hatch accesses will be minimized.

5.6.2.4(5) Any means of access to the roofs such as doors and hatches will have hardware that is lockable and will integrate with access control system.

5.6.2.4(6) Provide high parapets or guardrails to minimize the need for fall arrest anchors for operational Staff. Locate at main roofs and other roof areas needing regular access for maintenance. Minimum parapet height to comply with applicable codes.

5.6.2.4(7) Provide fall arrest systems as required to allow safe and Convenient Access to service components such as exterior glazing, cladding, exterior louvres, vents, and intakes.

5.6.3 Facility Configuration and Internal Circulation

5.6.3.1 Facility Entrances

5.6.3.1(1) All access and egress points from the Facility exterior, except those requiring further protection under Section 4.26.5.1(2), will be protected from snow and rain by canopies or overhangs that

extend a minimum 1.2 m beyond the face of the Facility and on both sides of the opening a minimum of 600 mm. Canopies and overhangs will be designed to accept the weight of persons walking on them for repeated cleaning and maintenance. Materials will be durable and robust. Plastics, canvas or other fabrics are not permitted.

5.6.3.1(2) Public entrances will be named and have illuminated signs designating the name of the entrance on the canopy.

5.6.3.1(3) Provide visible places to sit, protected from the prevailing winds near both the interior and exterior of entrances.

5.6.3.1(4) Entrance designs will create positive and calming first impressions for Patients and families.

5.6.3.1(5) Entrance vestibules will provide complete transparency from the exterior, from the interior immediately in front of the vestibule, and from occupied spaces such as waiting areas adjacent to the vestibule.

5.6.3.1(6) In addition to entrance vestibules listed in Appendix 3A [Clinical Specifications and Functional Space Requirements], Project Co will provide all entrances vestibules to meet the functional needs of the Facility and this Schedule.

5.6.3.1(7) Entrance vestibules will be configured in L or T shapes and sized such that only one set of doors will open at one time in order to preserve the airlock effect for climate control and protection from the prevailing winds. Ensure adequate distance between the sets of doors to allow stretchers and wheelchairs and attendants to fit lengthwise into the vestibule. No rotating doors are permitted. The Owner may consider entrance vestibules configured for a straight line of travel provided that the vestibule doors are adequately spaced to preserve the airlock effect and other measures are taken, such as the offset of doors, to offer protection from prevailing winds. Coordinate with the requirements of Section 7.5.8.1(7).

5.6.3.1(8) Entrances serving accessible parking spaces will be accessible to bariatric Patients and visitors, and persons using wheeled mobility devices. Automatic doors should be provided at these entrances.

5.6.3.1(9) Provide a bariatric path of travel for the public from the Facility entry(s) to all rooms and spaces used by bariatric Patients. Within that path of travel, doors (including elevators) will have a minimum width of 1.22 m unless otherwise required by this Schedule.

5.6.3.1(10) Pedestrian interest and comfort at entries will be provided through specifically designed seating, signage, lighting and features that signal the Facility's use.

5.6.3.1(11) Project Co will provide bird control measures, such as bird netting or other deterrents as reviewed with the Owner, at all Facility entrances and at-grade service areas to deter birds from perching on exterior building components such as canopies and other associated infrastructure.

5.6.3.1(12) Dedicated entrance areas, such as the Centre for Healthy Aging and UH and IMHSU Entrance Vestibule-Walk-in and Dedicated Outpatient Entrance, will be designed for the specific needs of the intended Patients and their families.

5.6.3.1(13) Adjacent to the Main Entrance Lobby of the Facility, at the entrance to the Centre for Healthy Aging and at the UH and IMHSU Entrance Vestibule Walk-In, provide weather protection for small group seating outside the entry.

5.6.3.1(14) Weather protection will also be implemented where Facility entrances front a sidewalk or open space such as drop-off or lay-by areas.

5.6.3.1(15) Ensure that areas protected from weather still receive daylight using appropriate measures such as increased height-to-depth proportions and the use of glass roof panels.

5.6.3.1(16) Orient the Facility entrances to minimize wind exposure.

5.6.3.1(17) Pedestrian interest and comfort at entries will be provided through specifically designed seating, signage, lighting and features that enhance a feeling of invitation, acceptance, normality and de-stigmatization.

5.6.3.1(18) Provide wheelchair alcoves visible and accessible to the public at all public entrance vestibules such as M1.1.3 Discharge Lounge.

5.6.3.1(19) Design the Main Entrance Lobby to have an intimate, warm and welcoming character. The space will be acoustically treated to control excessive noise and sound reverberation that would prevent effective communications in the space, allow the spread of noise to adjacent noise sensitive interior spaces or make spending time in the space uncomfortable.

5.6.3.1(20) Entryways and doors will be illuminated using light levels that are comfortable when entering and exiting.

5.6.3.1(21) Provide two (2) public telephones and two (2) direct line telephones to taxi services adjacent to each regularly used exterior entrance to the Facility. Ensure at least one telephone is accessible to Persons with Disabilities.

5.6.3.1(22) Wayfinding kiosks and 2x digital signs will be located near entrances; one for listings of events, the other for general purpose messaging.

5.6.3.1(23) At each information counter and reception area, provide hearing amplifiers.

5.6.3.1(24) All regularly used exterior entrances to the Facility will have a vestibule as specified. These vestibules will:

5.6.3.1.24.(a).1 Provide complete transparency from the exterior, from the interior immediately in front of the vestibule, and from inhabited spaces adjacent to at least one long side of the vestibule;

5.6.3.1.24.(a).2 be configured and sized in order to preserve the airlock effect for climate control. Ensure distance between the sets of doors allow wheelchairs ample room for manoeuvring into the vestibule. Provide a heated air curtain system over the exterior doors to control the temperature loss during winter months;

5.6.3.1.24.(a).3 have sliding doors to the exterior and the interior, except that where sliding doors are not feasible, use swinging doors. Use doors that will be motion-sensor activated. Provide motion-sensor activation by Persons with Disabilities push-button controls located on the inside and outside of the doors; and

5.6.3.1.24.(a).4 have permanent recessed entrance mats in compliance with LEED requirements.

5.6.3.1(25) Provide permanent recessed entrance mats as follows:

5.6.3.1(25)(a) Measuring minimum 3.0 m in length in the primary direction of travel at regularly used exterior entrances of the Facility and 1.22 m permanent recessed entrance mats at other specified entrances.

5.6.3.1(25)(b) Acceptable entryway systems include permanently installed grates, grills and slotted systems that allow cleaning underneath the system, complete with

drains connected to the Facility storm water removal system.

5.6.3.1(26) Provide exterior entrance vestibules for the following areas, which will be considered regularly used exterior entrances to the Facility. At these locations at a minimum, provide 3.0 m minimum length (in the direction of travel) permanent recessed entrance mats:

- 5.6.3.1.26.(a).1 Main Entrance Lobby;
- 5.6.3.1.26.(a).2 UH and IMHSU Entrance Vestibule Walk-In;
- 5.6.3.1.26.(a).3 Emergency Department Vestibule Walk-in;
- 5.6.3.1.26.(a).4 Emergency Department Vestibule – Ambulance;
- 5.6.3.1.26.(a).5 Entrance Vestibule-VPD/BCEHS;
- 5.6.3.1.26.(a).6 UH and IMHSU Dedicated Outpatient Entrance
- 5.6.3.1.26.(a).7 C4HA Outpatient Clinics Entrance;
- 5.6.3.1.26.(a).8 Food Court Entrances;
- 5.6.3.1.26.(a).9 Operational Support – Loading Bay Vestibule - Walk-In;
- 5.6.3.1.26.(a).10 Operational Support – Elevator Lobby Vestibule;
- 5.6.3.1.26.(a).11 Morgue Entrance;
- 5.6.3.1.26.(a).12 Ambulance Garage Lobby Vestibule – walk-in; and
- 5.6.3.1.26.(a).13 Parking Passenger Elevator Lobby Vestibules.

5.6.3.1(26)(b) Provide a 1.22 m in length (in the direction of travel) recessed permanent entrance mat from the following spaces, at a minimum:

- 5.6.3.1.26.(b).1 Mental Health Inpatient Unit Exterior Courtyard;
- 5.6.3.1.26.(b).2 Therapy Roof Garden;
- 5.6.3.1.26.(b).3 Critical Care Roof Garden;
- 5.6.3.1.26.(b).4 Spiritual Garden; and
- 5.6.3.1.26.(b).5 Traditional Medicine Garden

5.6.3.2 Stairs

5.6.3.2(1) Exit Stairs

5.6.3.2(1)(a) Locate exit stairs strategically for the convenience of Staff to promote the use of stairs over elevators.

5.6.3.2(1)(b) Locate exit stairs with Convenient Access from circulation routes and in accordance with Section 5.7.2.

5.6.3.2(1)(c) Avoid stair locations that negatively impact planning flexibility or constrain desirable views from Clinical Spaces and Staff work areas.

5.6.3.2(1)(d) Provide windows for daylight and views from exterior walls of stairwells for orientation, amenity and safety by deterring undesirable and criminal activity or behaviour. Provide adequate lighting into stairwells for security at night.

5.6.3.2(1)(e) Provide stairwell Design that facilitates the use of evacuation sleds, excluding exit stairwells from the underground parking.

5.6.3.2(2) Convenience Stairs

5.6.3.2(2)(a) Provide convenience stairs that can be accessed by Patients, visitors and Staff throughout regular hours of operation and located strategically to reduce elevator use by Staff, visitors and Patients.

5.6.3.2(2)(b) The maximum allowable distance between the convenience stair(s) and the closest elevator is 10 metres.

5.6.3.2(2)(c) Provide convenience stairs with a minimum width for each flight of 1.6 m, complete with glazing for views to adjoining areas, located adjacent to the Parking Passenger Elevators which will connect the underground parking levels with Main Entrance Lobby for public and Staff use.

5.6.3.2(2)(d) Provide convenience stairs for Staff use which connect the Maternity Centre with the Surgical and Intervention Services as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.6.3.2(2)(e) Convenience stairs will have finishes similar to the floor levels they serve and, in all cases, will have a finished floor.

5.6.3.2(3) Safety of Stairs and Areas Open to Below

5.6.3.2(3)(a) Where horizontal gaps at the switchback between flights of stairs in a stairwell exceed 400 mm, provide steel (painted or stainless steel), or glass guardrails extending full height from the landing or stairs to the underside of the one above to prevent

public, Patients or Staff from using them for self-harm.

5.6.3.2(3)(b) Stairwells will not allow for individuals to hide in the landing areas, and solid walls will not be used to divide flights of stairs.

5.6.3.2(3)(c) Where floor areas are open to the floor area below, provide full height floor to ceiling glazing to prevent public, Patients or Staff from self-harm.

5.6.3.2(3)(d) Provide guards in stairwells as required by VBBL at window openings.

5.6.3.2(3)(e) Where convenience stairs are located in prominent public areas such as the Main Entrance Lobby or Enclosed Atrium, provide architectural guardrails consisting of glass and stainless steel which are designed to prevent public, Patients or Staff from self-harm by extending a minimum height of 1.8m above the stair tread.

5.6.3.3 Corridors

5.6.3.3(1) Provide clear width for movement of Staff, visitors, Patients including clear space at all Public elevator lobbies so as not to reduce the required clear corridor width.

5.6.3.3(2) Provide clear width for movement of equipment, AGV, stretchers, beds, pallets and carts servicing the Facility.

5.6.3.3(3) Where possible, design corridors to have chamfered, 45 degree corners with the angled portion of the wall a minimum 1.5 m long measured from corner to corner, to allow ease of movement for stretchers, beds and accompanying medical Staff and equipment.

5.6.3.3(4) In Clinical Spaces, provide alcoves in corridors for storage of equipment. The alcoves will be dispersed in the Clinical Spaces allowing corridors to be kept clear of all equipment and supplies. Where possible, corridors will have rest areas for Patients to promote mobility and activity. Alcoves will not reduce required corridor width.

5.6.3.3(5) Doors will not swing into corridors and reduce the required minimum width, except for where alcoves in corridors are required to have doors.

5.6.3.3(6) Corridors in the Facility will meet the following minimum requirements:

5.6.3.3(6)(a) 1.8 m wide where serving only administrative functions or similar areas where AGV, beds, stretchers and carts are not being transported;

5.6.3.3(6)(b) 3.1 m deep by 3.4 m long in front of each Patient Transfer/Staff Service Elevator and FM Service Elevator. Refer to Section 6.16 Automated Guided Vehicle System for additional requirements;

5.6.3.3(6)(c) 4.0 m wide for Back of House corridors on the loading dock floor level where corridors provide access to the following areas:

- 5.6.3.3.6.(c).1 Operational Support Component where Equipment, carts, beds, stretchers, AGVs and trolleys are transported to and from other Components;
- 5.6.3.3.6.(c).2 Loading dock;
- 5.6.3.3.6.(c).3 FMO Component; and
- 5.6.3.3.6.(c).4 Patient Transfer/Staff Service Elevators and/or FM Service Elevators.

5.6.3.3(6)(d) 3.0 m wide for the Back of House clean core to be provided connecting all Interventional Suites. Corridor width will be clear and uninterrupted by any structure, walls or door swings, for Staff and service access;

5.6.3.3(6)(e) 2.4 m wide where corridors on floor levels lead to knock-out panels and the point of connection to Future Expansion and including Health Campus to CSRC links; and

5.6.3.3(6)(f) 4.0 m wide where connecting the Energy Centre below grade to the Facility, if a standalone Energy Centre is provided.

5.6.3.4 EMI Requirements

5.6.3.4(1) Project Co will locate spaces with sensitive equipment, such as EEG and EMG Rooms, at sufficient distance from EMI and radio frequency interference-producing equipment and vibrating equipment such as elevators.

5.6.3.4(2) Project Co is responsible for mitigation of all EMI interference from external sources (e.g. moving ferrous objects) and external AC magnetic field sources such as power feeders and transformers for the MRIs. Include these requirements in the planning for Future Expansion to ensure proper allowances are included in the wall thicknesses for shielding and RF cages such that the

NSM requirements described in Appendix 3A [Clinical Specifications and Functional Program] for Future Expansion will be achieved.

5.6.3.5 Equipment Manoeuvrability

5.6.3.5(1) Project Co will Design and construct the Facility so that all equipment such as AGV vehicles, stretchers, wheelchairs, food carts, linen carts, waste carts, tow motors, etc. will satisfactorily manoeuvre in the areas, particularly vestibules and corridors, where such equipment is expected to be circulating through, arriving at, or parked in.

5.6.4 Loading Docks

5.6.4.1 Project Co will:

5.6.4.1(1) Provide a loading dock that is capable of being secured and locked when not in use. Provide an overhead rolling security gate(s) complete with an adjacent man-door(s) with electronic access control for after-hours access to and from the loading dock by authorized persons.

5.6.4.1(2) Provide a clean, elevated loading dock at an approximate height of 1.32 m to accommodate the following:

5.6.4.1(2)(a) five (5) loading bays to accommodate WB-20 trucks, each with dock bumpers, dock leveler and all required safety equipment including fall protection;

5.6.4.1(2)(b) three (3) Light Single Unit (LSU) parking stalls located directly adjacent to the dock ramp for Convenient Access to the loading dock; and

5.6.4.1(2)(c) one (1) full clean corridor connecting the clean loading dock to the Facility.

5.6.4.1(3) Provide a soiled, elevated loading dock at an approximate height of 1.32 m to accommodate the following:

5.6.4.1(3)(a) one (1) loading bay to accommodate a WB-20 truck with dock bumper, dock leveler and all required safety equipment including fall protection;

5.6.4.1(3)(b) one (1) Medium Single Unit (MSU) bay for a recycling compactor with a dock level tilt cart dumper, power pack, and 30.6 cubic metre (40 cubic yard) container. Provide clear height of 7.31

m to accommodate the container removal requirements;

5.6.4.1(3)(c) two (2) Medium Single Unit (MSU) bay for waste compactors, each with a dock level tilt cart dumper, power pack, fixed baler, and 23 cubic metre (30 cubic yard) container. Provide clear Ceiling Height of 7.31 m to accommodate the container removal requirements;

5.6.4.1(3)(d) one (1) Medium Single Unit (MSU) bay for a cardboard compactor with a dock level tilt cart dumper, power pack, fixed baler and 30.6 cubic metre (40 cubic yard) container, with dock bumpers and all required safety equipment including fall protection, except that fall protection is not required for the dock level tilt car dumper. Provide clear Ceiling Height of 7.31 m to accommodate the container removal requirements;

5.6.4.1(3)(e) two (2) cart/can washers that are located between the clean and soiled dock, eliminating cross contamination; and

5.6.4.1(3)(f) one (1) soiled corridor connecting the soiled loading dock to the Facility.

5.6.4.1(4) The loading dock will be designed as two (2) separate, but proximally located docks; a clean loading dock and a soiled loading dock. The separation between the clean and soiled docks will consist of a minimum horizontal distance of approximately 9 m (one structural bay), which may include physical walls with high-speed service doors in a pass-through arrangement to enable flexibility in the use of the two (2) docks during downtime operations, and will suit the functional requirements of the Owner to ensure separation of flows as described in Section 5.6.4.1(4).

5.6.4.1(5) The logistics floor, which contains the loading dock, will be designed to provide separation of flows such that clean incoming materials and soiled outgoing materials do not cross paths. Project Co will design for the separation of clean and soiled flows such that

5.6.4.1(5)(a) Soiled materials leaving the Patient Transfer/Staff Service and FM Service elevators and being transported to the soiled loading dock will not cross paths with clean materials such as food being

delivered to the Central Food Production or linens being delivered to the Store-Clean Linen Hold.

5.6.4.1(6) Loading dock will be located below grade, completely protected from the elements of sun, wind and rain, screened from public view and accessed from either National Avenue or the New Local Street. The maximum gradient in the loading zone where trucks maneuver into and out of the loading bays will be maximum 2% slope.

5.6.4.1(7) Slope loading dock floor away from the Facility to allow for drainage during wash down. Provide a minimum two (2) hose bibs at the loading dock.

5.6.4.1(8) Loading docks will accommodate the movement of pallet jacks and tow motors for loading and unloading of deliveries from the loading dock to the receiving and breakdown areas within the Logistics Centre.

5.6.4.1(9) Loading dock will be minimum 8.0 m wide, with a minimum 3.5 m clear height, to accommodate pallet jacks and supply truck trains consisting of five (5) carts plus tow motor and hitch. Minimum equipment dimensions are as follows:

5.6.4.1(9)(a) Tow motor 1.88 m (L) including hitch = 2.02 m (L) x 965 mm (W);

5.6.4.1(9)(b) Waste cart 1.83 m (L) including hitch = 2.33 m (L) x 920 mm (W); and

5.6.4.1(9)(c) Outside Turning Radius 1.77 m.

5.6.4.1(10) Demonstrate to the Owner that the loading dock layout will allow for efficient, secure and sufficient width for the movement of equipment and supplies as accompanied by maintenance and support Staff. Also demonstrate that a minimum 0.5 m horizontal clearance is provided between a vehicle turning path and any other structural components and/or vehicles inside the loading area.

5.6.4.1(11) Consult with Owner for the types of equipment/containers used for loading/unloading and confirm that the loading dock will be functional with the necessary turning radius when the dock equipment (levelers or lifts) are in operation.

5.6.4.1(12) Provide a secure and lockable, fenced exterior medical gas bottle storage and exchange area for deliveries and empty bottle pick-up at the below grade loading dock with Direct Access to the Medical Gas Manifold Spaces to allow for a single delivery point and

simple manifold cylinder exchange. If Project Co locates the storage and exchange area at grade, rather than at the below grade loading dock, Project Co will:

5.6.4.1(12)(a) Provide a separate loading area at grade, secured by overhead rolling service door, having Direct Access to the medical gas bottle storage and exchange area and designed to accommodate one (1) Medium Single Unit medical gas bottle delivery truck with a minimum 8.0 m width and a minimum 3.5 m clear height;

5.6.4.1(12)(b) Comply with any City requirements pertaining to the fenced storage and exchange area at grade;

5.6.4.1(12)(c) Provide a fenced exterior medical gas bottle exchange area that is completely protected from the elements of sun, wind and rain, and screened from public view;

5.6.4.1(12)(d) Provide a maximum slope gradient in the medical gas bottle delivery truck loading zone of 2% slope; and

5.6.4.1(12)(e) Provide a dock leveler; refer to Section 6.14.5.2(2)(c).

5.6.4.1(13) The minimum vertical clearance for non-MSU vehicle types in any loading area will be 5.5 m. Reduction in clear height may be acceptable if it can be demonstrated to the satisfaction of the Owner and Governmental Authority that a lesser height will not negatively impact Facility operations.

5.6.4.1(14) Provide high-speed service doors with access control at each corridor connecting the Facility to the loading dock where materials and services are being transported, with a minimum of

5.6.4.1(14)(a) one (1) at the clean dock;

5.6.4.1(14)(b) one (1) at the soiled dock; and

5.6.4.1(14)(c) where required by Section 5.6.4.1(4).

5.6.4.1(15) High-speed service doors will span the full width of the corridor to maximize material transports through the opening. Each location will include a set of exterior double doors that can be held open during normal hours of operation and closed/locked via access control after hours to provide a secure perimeter along the entire loading dock platform.

5.6.4.1(16) Project Co will provide bird control measures, such as bird netting, as part of the loading dock to deter birds from perching on walls, roofs, docks, screens, drainage system components and other associated infrastructure.

5.6.5 Interior Walls and Partitions

5.6.5.1 General Requirements

5.6.5.1(1) Use interior walls and partition systems that provide acoustic separations as required for the specific functions to be carried out in the spaces affected, and in accordance with the requirements of Appendix 3C [Acoustic and Noise Control Measures].

5.6.5.1(2) Seismic resistance capabilities will conform to the requirements of CSA S832-06 Guidelines for Seismic Risk Reduction of Operational and Functional Components of Buildings.

5.6.5.1(3) All interior walls and partitions will extend full height from floor to underside of the structure above.

5.6.5.1(4) Ensure proper sealing of all walls above and below the ceiling to maintain relative pressurization requirements of the HVAC system requirements in accordance with CAN/CSA-Z317.2.

5.6.5.1(5) Design and select interior walls and partitions, partition systems and interior finishes to comply with the following criteria:

5.6.5.1(5)(a) withstand repeated cleaning and maintenance and support infection prevention and control as relevant for the particular or specific function;

5.6.5.1(5)(b) wall finishes will be smooth, water-resistant and washable using hospital grade disinfectant that includes a high concentration of bleach. In the vicinity of plumbing fixtures, provide a wet wall panel system;

5.6.5.1(5)(c) provide washable painted surfaces consisting of a water-borne epoxy paint where the function of the area dictates, where required by Section 6.9.5.15, or unless noted otherwise;

5.6.5.1(5)(d) some micro-perforated materials may be acceptable for use in infection control sensitive areas and may also provide useful sound absorption to control noise, consult with the Infection Control Practitioner;

5.6.5.1(5)(e) limit the passage of particles from both above the ceiling plane and adjacent non-Clinical Spaces into the clinical environment;

5.6.5.1(5)(f) ensure proper sealing of all walls, partitions and partition systems above and below the ceiling plane;

5.6.5.1(5)(g) resist damage due to normal wear and resist damage due to collision in high traffic areas; permanence and durability, including impact resistance;

5.6.5.1(5)(h) be non-toxic/ non-allergenic;

5.6.5.1(5)(i) have low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality;

5.6.5.1(5)(j) have flexibility to permit adaptability of interior spaces, if required, to suit future process revisions;

5.6.5.1(5)(k) have a matte, non-glare finish;

5.6.5.1(5)(l) be of a colour that contrasts with handrails and floors;

5.6.5.1(5)(m) have a smooth and non-abrasive finish behind handrails attached to walls;

5.6.5.1(5)(n) Recesses and gaps created by tiles, metal framing, wall, partition and furring will allow for ease and proper repeated cleaning, those that do not will not exist; and

5.6.5.1(5)(o) the completion of Unusable Area will not be deemed a cost to the Owner.

5.6.5.2 Special Requirements

5.6.5.2(1) In all Operating Rooms, all Interventional Suites, Airborne Isolation Rooms, Airborne Isolation-Hybrids and MDRD with the exception of Administration Areas, and all VHF rooms such as Exam/Treatment Room and Patient Room, wall finishes will be free of fissures, open joints, or crevices that can retain or permit passage of dirt particles.

5.6.5.2(2) With the exception of walls provided with full-height wall protection as required under Section 6.10.7.1(15), provide two-component seamless epoxy wall coatings on walls and ceilings in all areas

where high physical abuse, chemical abuse, extreme moisture, and/or soiling are reasonably expected to occur, such as:

5.6.5.2(2)(a) MDRD, with the exception of administration areas;

5.6.5.2(2)(b) Scope reprocessing areas;

5.6.5.2(2)(c) Critical Care Patient Rooms, Airborne Isolation Rooms, Hybrids and VHF rooms such as Exam/Treatment Room and Patient Room;

5.6.5.2(2)(d) Kitchen and food service areas other than those specified in Section 6.9.6.4, such as Nourishment Rooms and kitchenettes;

5.6.5.2(2)(e) Laboratory and pharmacy areas;

5.6.5.2(2)(f) Morgue and autopsy areas;

5.6.5.2(2)(g) Where special procedures and/or resuscitation will be preformed such as Operating Rooms, Interventional Suites and Procedure Rooms;

5.6.5.2(2)(h) Washrooms and ensuite washrooms, except for shower areas;

5.6.5.2(2)(i) Hand hygiene sinks alcoves;

5.6.5.2(2)(j) Sterile holding and storage areas;

5.6.5.2(2)(k) Rooms where soiled items and Equipment will be bought or held such as Soiled Utility rooms and holding areas, except that in Soiled Utility rooms the epoxy wall coating will be provided from the height AFF of the wet wall panel systems required by Section 6.9.9.2; and

5.6.5.2(2)(l) Workrooms such as biomedical engineering.

5.6.5.2(3) In the MDRD, with the exception of Administration Areas, ceiling, walls, and work surfaces will be impervious to moisture.

5.6.5.2(4) For all ceilings in shower areas, Project Co will provide MMRGWB with two-component epoxy wall coating.

5.6.5.2(5) Design and construct interior walls with recessed wall-mounted bedpan disinfectors within each space shown in Appendix 2E [Equipment and Furniture].

5.6.5.2(6) Every Store-Narcotics Vault or similar space where narcotics are stored, will be designed and constructed with walls extending to the underside of the structure above and having continuous metal mesh mechanically installed between the exterior-facing IRGWB sheathing and the steel stud framing from 100 mm to 2.4 m (4" to 96") AFF.

5.6.5.2(7) Partition design will allow for built-in pass through where required by Appendix 3A [Clinical Specifications and Functional Program].

5.6.5.2(8) Provide protection against water damage in spaces that contain equipment or services by providing required partition base Design, such as concrete curbs.

5.6.5.3 Interior Wall Framing

5.6.5.3(1) 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 and seismic loads.

5.6.5.3(2) Construct steel stud framing to accommodate electrical, plumbing and other services in the partition cavity, and to support fixtures, wall cabinets, medical equipment and other such wall-mounted items. Provide reinforcement and backing.

5.6.5.3(3) Design will account 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.

5.6.5.3(4) Design assembly to accommodate construction tolerances, deflection of Facility structural members, and clearances of intended opening.

5.6.6 Wall Backing

5.6.6.1 At a minimum, Project Co will provide wall backing as follows:

5.6.6.1(1) Full width of the wall from 1.0 m to 1.8 m AFF in alcoves around hand hygiene sinks;

5.6.6.1(2) As required to support Millwork, washroom accessories, and any wall-mounted items listed in Appendix 3F [Food Services Equipment List] and Appendix 3L [Millwork and Modular Casework Matrix];

5.6.6.1(3) As required to support all wall-mounted Equipment listed in Appendix 2E [Equipment and Furniture].

5.6.6.1(4) Full width of the wall around chemical dispensing systems, plumbed emergency washing facilities, eyewashes and showers;

5.6.6.1(5) On the wall behind the head of the Patient's bed, stretcher or recliner from 200 mm AFF, for vertical headwalls, or 800 mm AFF, for horizontal headwalls and in spaces without headwalls, to a minimum height of 2.1 m AFF to align with the top of the door frame, with width requirements as follows:

- 5.6.6.1(5)(a) For all Patient Rooms with headwalls, to the full width of the wall behind the head of the Patient's bed, stretcher or recliner;
- 5.6.6.1(5)(b) For all other rooms/spaces with headwalls, extending a minimum of 600 mm beyond each side of the headwall; and
- 5.6.6.1(5)(c) For rooms without headwalls, extending a minimum of 600 mm beyond each side of the Patient bed, stretcher or recliner, or as reviewed with the Owner;

5.6.6.1(6) As required to support hangers to for Patient walkers or mobility aids in Patient rooms;

5.6.6.1(7) At all coat hook locations; and

5.6.6.1(8) Full wall width and from 300 mm to 2.1 m AFF on all walls with wall-mounted equipment in the following rooms or areas:

- 5.6.6.1(8)(a) Housekeeping Closets;
- 5.6.6.1(8)(b) Medication Rooms, except that no wall backing is required on the area of wall behind a floor-mounted medication dispensing system;
- 5.6.6.1(8)(c) Clean Supply Rooms;
- 5.6.6.1(8)(d) Soiled Utility Rooms;
- 5.6.6.1(8)(e) Soiled Holding Rooms;
- 5.6.6.1(8)(f) Rehab Gym spaces;
- 5.6.6.1(8)(g) Storage rooms;
- 5.6.6.1(8)(h) Alcove-Scrub Stations;
- 5.6.6.1(8)(i) All spaces within the Central Food Production area;

5.6.6.1(8)(j) All spaces within MDRD, with the exception of administration areas; and

5.6.6.1(8)(k) All spaces within the FMO shop areas.

5.6.6.2 Provide wall backing to support wall-mounted multimedia devices.

5.6.7 Ceilings

5.6.7.1 Design ceilings to accommodate ceiling-mounted equipment as set out in Appendix 2E [Equipment and Furniture] and as set out in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.6.7.2 Design ceilings to accommodate the ceiling mounted ceiling lift and track system. Tracks, rails and pipes located in the traffic path for Patients in beds and/or on stretchers will not be less than 2.6 m above the finished floor; refer to Section 6.11.3 Ceiling Lifts.

5.6.7.3 Provide ceilings in spaces described in Appendix 3A [Clinical Specifications and Functional Space Requirements] in accordance with the Risk Category described in Appendix 3N [Safety and Risk Reduction Matrix].

5.6.7.4 Provide ceiling lighting grid and ceiling mounts for roll photo backdrops and other specialty ceiling systems and feature as required by the Owner in the Media Services Component.

5.6.7.5 Ceilings will be constructed without fissures, open joints, or crevices that can retain or permit passage of dirt particles or steam and condensation. Ceiling penetrations will be properly sealed to prevent the entrance of air, insects and rodents.

5.6.7.6 Ceilings will limit the passage of particles from both above the ceiling plane and adjacent non-Clinical Spaces into the clinical environment.

5.6.7.7 Ceilings in mechanical and electrical service rooms and Communications Rooms will be open, unless required otherwise by VBBL.

5.6.7.8 Design and select ceiling systems and ceiling finishes to comply with the following criteria:

5.6.7.8(1) repeated cleaning, maintenance and infection prevention and control;

5.6.7.8(2) Repeated removal and re-installation to gain access above without chipping, cracking or delaminating

5.6.7.8(3) flexibility and access to the spaces above;

5.6.7.8(4) compatibility with mechanical, plumbing, electrical, communications services and fixtures;

5.6.7.8(5) low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality; and

5.6.7.8(6) aesthetic and design qualities to provide a healing environment for the Patients, Staff and public.

5.6.7.9 Ceilings in spaces referred to as restricted space or semi-restricted space in the Appendix 3A [Clinical Specifications and Functional Space Requirements] will be monolithic and constructed with solid surfacing materials or GWB as a seamless and unbroken surface. Service access panels will be limited to the number of booms for servicing. Service access panels will be clipped and sealed to maintain the seal after replacement to prevent the transmission of contaminants into or out of the occupied space.

5.6.7.10 Suspended acoustic ceiling tile systems utilized in areas where humidity, steam and moisture will be encountered such as the following, will have a proven use for food preparation/kitchen and clean room areas. Provide ceilings constructed of durable, water-resistant, washable, scratch-resistant and soil resistant, non-porous, non-shedding materials, on non-corrosive aluminum exposed grid system with stainless steel clips with recessed, enclosed pipes and fixtures so as to create a flush surface, facilitating frequent cleaning. Ceiling access will be provided for maintenance of pipes and fixtures. These ceilings will have a 30-year system warranty against visible sag, mould and mildew:

5.6.7.10(1) MDRD with the exception of the Administration Area;

5.6.7.10(2) Central Food Production area; and

5.6.7.10(3) Distributed Food Services spaces including Nutrition Centres, Serveries and Complete Nourishment.

5.6.7.11 All piping, duct work, and structure will be covered by a finished ceiling in location where dust fallout would present a potential problem. All overhead piping and ductwork in dining or food handling areas will be concealed behind a solid finished ceiling. Exposed services are not permitted in public lobbies, waiting areas and Patient accessible areas.

5.6.7.12 Provide fittings, attachments and internal bracing/backing as required to accommodate and support ceiling-mounted clinical and non-clinical fixtures and equipment, including equipment in multimedia rooms and other applicable rooms.

5.6.7.13 Refer to Section 6.11.3.3 for recessed ceiling lift requirements to be coordinated with the ceiling design.

5.6.7.14 All Patient rooms will have ceilings, and the space between the ceiling and the structure above will be designed and constructed so that location of fixtures and services (such as luminaires, sprinklers, ducts, pipes, etc.) will not require removal or relocation for future installation of ceiling mounted ceiling lifts and their required support layouts.

5.6.7.15 Ceilings will allow access to equipment where necessary, except at those spaces as indicated elsewhere in this Schedule.

5.6.7.16 Ceilings in public areas and Patient common areas will be designed to avoid plain and featureless ceilings. Ceilings in these spaces will provide visual interest.

5.6.7.17 Ceiling Height Requirements

5.6.7.17(1) Ceilings height will be no less than 2.75 m above the finished floor in all areas except for the following:

5.6.7.17.1.(a).1 Ceiling Height in normally unoccupied areas such as alcoves, storage rooms for supplies and Soiled Utility rooms will not be less than 2.4 m above the finished floor;

5.6.7.17.1.(a).2 Ceiling Height in rooms or spaces 40.0 NSM or greater such as meeting rooms, service areas (Nutrition Centres), Study Room-Workstation areas, and conference rooms will be not less than 3.0 m unless otherwise required to comply with UBC FoM Design Guidelines and Functional Requirements for Learning Spaces;

5.6.7.17.1.(a).3 Except for ensuite washrooms with ceiling lifts as described in Section 5.6.7.17.1.(a).11, the Ceiling Height in Clinical Spaces within Mental Health Areas including Secure Rooms will be not less than 3.0 m;

5.6.7.17.1.(a).4 Ceiling Height in all areas accessible to the public, excluding washrooms, in the M1-Main Entrance component will be not less than 3.5 meters including; waiting areas, lounges, information or Patient registration kiosks, coffee shop and food court seating areas, retail gift shop and display areas;

5.6.7.17.1.(a).5 Ceiling Height in M7 - All Nations Sacred Space Ceremony Room will be not less than 3.5 m;

5.6.7.17.1.(a).6 Ceiling Height in M8 - Meditation Space Meditation Room will be not less than 3.0 m;

5.6.7.17.1.(a).7 Ceiling Height in M 6.2 Chapel will not be less than 9.0 m;

5.6.7.17.1.(a).8 Ceiling Height in Command Centre/EOC will be not less than 3.6 m;

(a).8.1 Ceiling Height in gymnasium spaces including the Rehab Gym-Group Exercise and Rehab Gym-Strength Training will be not less than 3.3 m;

5.6.7.17.1.(a).9	Ceiling Height in the Sally-Port will be as required to accommodate the highest design vehicle described in Section 4.26.5.2.
5.6.7.17.1.(a).10	Ceiling Heights in all Operating Rooms, Procedure rooms, resuscitation rooms Interventional Suites to be of a height to accommodate the requirements of Appendix 2E [Equipment and Furniture] and will not be less than 3.0 m unless otherwise required to be higher based on the hybrid imaging equipment or other ceiling mounted equipment. Ceiling Heights to be coordinated to suit specific floor or ceiling hybrid equipment in combination with other ceiling-mounted equipment;
5.6.7.17.1.(a).11	Ensuite washrooms with ceiling lifts will have a Ceiling Height at a uniform distance AFF that is below the Ceiling Height in the adjoining Patent Room. A bulkhead matching the ensuite washroom Ceiling Height will extend into the Patient room along the length of the single track extension from the x-y gantry to provide an entirely recessed, fixed single track with smooth transition of the ceiling lift from the x-y gantry in the Patient Room into the ensuite washroom. Ceiling Height in ensuite washrooms will be reduced below that of the adjoining Patient Room only as required to accommodate the recessed fixed rail system.
5.6.7.17.1.(a).12	Ceilings Height in rooms containing ceiling mounted equipment or ceiling-mounted surgical light fixtures, will be of sufficient height to accommodate the equipment or fixtures and their normal movement; and
5.6.7.17.1.(a).13	Ceiling Height in N4.4 Studio-Video will be not less than 4.27 m.
5.6.7.17.1.(a).14	Refer to Section 6.17.7.1 for the Ceiling Height requirements in Central Food Production.

5.6.8 Flooring and Floor Finishes

5.6.8.1 The floor and floor systems will 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.

5.6.8.2 Flooring will not be installed over materials that contain moisture content which exceeds that recommended by the flooring manufacturer.

5.6.8.3 Use static-resistant flooring material for imaging rooms, imaging control rooms and Communications Rooms, refer to Section 6.9.7.9.

5.6.8.4 Provide flash-cove floor base at all locations with vinyl or rubber flooring. Flash cove base will be straight cut, with cove former, finished with metal J-cap and apply silicone caulking to any gaps.

5.6.8.5 At solid surface wet wall panel locations, the panels will overlap the flash cove detail and be sealed at junction.

5.6.8.6 Project Co will provide flooring:

5.6.8.6(1) To suit types and concentration of pedestrian and/or vehicular/wheel traffic to be anticipated; use heavy-duty materials for flooring on which wheeled or service vehicle traffic is anticipated and to which wear and damage may result;

5.6.8.6(2) With low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality;

5.6.8.6(3) That is impact-absorbing in areas requiring footfall impact noise control such as in Clinical Spaces;

5.6.8.6(4) To meet the acoustic performance criteria set out in Appendix 3C [Acoustic and Noise Control Measures];

5.6.8.6(5) To withstand repeated cleaning, maintenance and infection prevention and control including the frequency and quality of joints;

5.6.8.6(6) Designed for ease of replacement when required by the Owner;

5.6.8.6(7) That is imperviousness to concentrations of moisture anticipated to be on the floors and duration of that moisture; and

5.6.8.6(8) That has durability and resistance to concentrated service traffic, both pedestrian and vehicular;

5.6.8.7 Aesthetic and design qualities requirements include:

5.6.8.7(1) Provide flooring which promotes the requirement to create a healing environment within the Facility for the benefit of Patients, Staff and public; and

5.6.8.7(2) Which complies with the following elder-friendly Evidence Based Design principles for the purposes of safety and Wayfinding in Clinical Spaces including:

5.6.8.7(2)(a) Provide one (1) totally continuous flooring surface;

5.6.8.7(2)(b) Provide a 30-degree difference of LRV between surfaces of floors-to-walls and doors-to-walls;

5.6.8.7(2)(c) Adjoining flooring materials will not contrast more than 10 degrees of LRV;

5.6.8.7(2)(d) Avoid placing blue and green together as older adults may have difficulty distinguishing these colours;

5.6.8.7(2)(e) Do not use flecked, striped and patterned floors; and

5.6.8.7(2)(f) Do not use highly reflective flooring or reflective trims or transitions.

5.6.9 Surfaces

5.6.9.1 Provide surfaces with the following characteristics, consistent with their functional purpose:

5.6.9.1(1) Resistant to graffiti in public areas such as washrooms;

5.6.9.1(2) resistant to microbial spread and growth;

5.6.9.1(3) non porous and smooth;

5.6.9.1(4) durable;

5.6.9.1(5) seamless;

5.6.9.1(6) resilient and impact resistant;

5.6.9.1(7) non-toxic/ non allergenic;

5.6.9.1(8) matte finish presenting minimal glare;

5.6.9.1(9) without bold patterns or flecked colours;

5.6.9.1(10) constructed in a way that will not soak up or harbour moisture;

5.6.9.1(11) water impermeable in areas where water or dampness can occur; and

5.6.9.1(12) cleanable with the disinfectants and cleaning products to be used in the Facility.

5.6.9.2 Use interior walls and partition systems that provide acoustic separations as required for the specific functions to be carried out in the spaces affected, and in accordance with the requirements of Appendix 3C [Acoustic and Noise Control Measures].

5.6.9.3 Pharmacy ISO Requirements

5.6.9.3(1) Project Co will provide surfaces including floors, walls, ceilings, sealants, Millwork and Modular Casework which meet UPS 797 and 800 standards including:

5.6.9.3(1)(a) Surfaces of ceilings, walls and floors will be smooth, impervious, free from cracks and crevices and non-shedding;

5.6.9.3(1)(b) Surfaces will be resistant to damage by disinfectant agents;

5.6.9.3(1)(c) Junctures of ceilings to walls will be coved or caulked to avoid cracks or crevices where dirt can accumulate;

5.6.9.3(1)(d) Floors will be sheet vinyl with heat-welded seams and minimum 150 mm flash coving to the sidewall; and

5.6.9.3(1)(e) Finishes which comply with the ISO Cleanroom classification for which they will be installed.

5.6.9.4 Laboratory Containment Requirements

5.6.9.4(1) Project Co will provide surfaces including floors, walls, ceilings, sealants, Millwork and Modular Casework which meet Laboratory Biosafety Guidelines for CL2+ facilities including, at a minimum:

5.6.9.4(1)(a) Doors, frames, Millwork, Modular Casework and workbench tops will be non-absorptive;

5.6.9.4(1)(b) Surfaces will provide impact resistance in accordance with laboratory function;

5.6.9.4(1)(c) Surfaces will be continuous and compatible with adjacent and overlapping materials;

5.6.9.4(1)(d) Walls and floor finishes will have fully welded seams;

5.6.9.4(1)(e) Continuous seal between floors and walls;

5.6.9.4(1)(f) 150 mm flash cove floor finish;

5.6.9.4(1)(g) Interior surfaces will minimize movement of gases and liquid through perimeter membrane;

5.6.9.4(1)(h) Interior coatings will be gas and chemical resistant in accordance with laboratory function;

5.6.9.4(1)(i) Workbenches and bench tops will have no open seams;

5.6.9.4(1)(j) All penetrations to be sealed with non-shrinking sealant at containment barrier;

5.6.9.4(1)(k) Windows positioned on containment barrier will be sealed in place; and

5.6.9.4(1)(l) Window glazing material will provide required level of security.

5.6.10 Line of Sight

5.6.10.1 Line of Sight means the ability to see what is important from where a person is located; the implications to the Design include the general layout, use of low walls and Furniture, low equipment, glazed walls, signage, screens, lighting fixtures, cameras and other wall or ceiling mounted equipment, straight corridors and doorways that line up.

5.6.10.2 Location and Design of interior walls and columns will minimize disruption of Line of Sight.

5.6.10.3 Line of Sight will be determined in consultation with the Owner and includes the ability for a person to see:

5.6.10.3(1) For the general public, from main entry points and important circulation paths to elevator doors;

5.6.10.3(2) For Staff, from the location where Staff normally perform their work, centreline of inner entrance doors at the Entry Vestibule, or centre of the Lobby/Waiting Area; and

5.6.10.3(3) For Clinical Spaces, to all four corners of the space where possible, centre point of entrance doors, and head of the Patient bed.

5.6.11 Maintenance Walkway

5.6.11.1 Project Co will provide, directly above the ceiling over the Surgical and Interventional Services area, an interstitial space with maintenance walkways, or other such space that provides access and maintainability, such that any work or modifications to any of the systems can be completed above the spaces without impacting the operation of the rooms and without personnel having to enter Restricted Circulation corridors, OR(s), Interventional Suites or the Sterile Core, etc. Refer to Section 7.5.9.1(15) for a description of equipment and components to be serviced from the interstitial space. Where the remote LED driver access

required by Section 7.8.13.1(4) is provided from interstitial spaces, lockable recessed cabinets are not required. Where access is not possible from the interstitial space for the required periodic maintenance of certain elements, select services may be located in CSA Type III spaces within the Surgical and Interventional Services Component, provided Project Co can demonstrate that the requirements of Section 3.16.2 and Section 5.1.2 have been achieved.

5.6.11.2 It is desirable to the Owner to have the maintenance walkway serve as an access space for FMO to service the infrastructure below the MDRD, should the MDRD be located on the floor above the Surgical and Interventional Services Component.

5.6.11.3 The maintenance walkway will have a minimum clear height of 2.4 m above the finished floor surface.

5.6.11.4 Refer to requirements set out in Section 5.9 Structural Design.

5.6.11.5 If the G3.1 Workstation-General are located on the same floor as the Surgical and Interventional Services Component, the interstitial space with maintenance walkways will also encompass this area for the future Restricted Circulation, six (6) Operating Rooms and Sterile Core.

5.6.11.6 If the G3.1 Workstation-General are located adjacent to the Scopes and major Procedures Zone on a separate floor from the Surgical and Interventional Services Component; the area will be configured and located in such a way that maintenance and repair can be performed without entering Clinical Spaces; refer to Section 7.1.1.10.

5.6.12 Acoustics and Noise Control

5.6.12.1 Project Co will design and construct the Facility in consultation with an Acoustic and Vibration Consultant.

5.6.12.2 Design and Construct the Facility to comply, at a minimum, with the requirements described in Appendix 3C [Acoustic and Noise Control Measures].

5.6.12.3 Provide acoustic and noise control measures necessary to create a healing environment for Patients, a safe and comfortable environment for Staff and confidentiality where it is required.

5.6.12.4 Acoustic and noise control measures will include the following as a minimum:

5.6.12.4(1) attenuation of sound within public, Patient and Staff environments;

5.6.12.4(2) sound isolation between the exterior and interior spaces;

5.6.12.4(3) sound isolation between interior spaces within the Facility at both horizontal and vertical separations;

5.6.12.4(4) sound and vibration control of Facility service noises and sound isolation of Facility service rooms;

5.6.12.4(5) sound isolation and acoustic controls as required for specialty rooms such as conference rooms and multimedia rooms;

5.6.12.4(6) sound attenuation (noise control) for equipment within rooms; and

5.6.12.4(7) sound masking system referred to in Appendix 3C [Acoustic and Noise Control Measures].

5.6.12.5 Where penetrations are necessary to meet the requirements of this Schedule:

5.6.12.5(1) Back-to-back penetrations (e.g., electrical boxes, Telecommunications Outlets, medical gas outlets, shower/bath valve assembly, etc.) in acoustic rated walls (STC 45 or higher) will be in separate stud cavities or spaced a minimum of 400 mm apart within a common stud cavity filled with batt insulation; if these conditions are not met, then all of the boxes on at least one side of the wall within the common stud cavity will be wrapped with acoustic rated putty patches or boxed and sealed with the equivalent GWB layers as the partition they penetrate.

5.6.12.5(2) Piping passing through any acoustic rated partition, including for shower heads, toilets, faucets etc., will not contact the wall and the gap will be sealed with an acoustic rated caulk.

5.6.12.5(3) Recessed cabinets and bathtubs will be boxed and sealed with the equivalent GWB layers as the partition they penetrate and the remaining gap in the stud wall will be filled with batt insulation

5.6.12.6 Minimize constructions such as ducts, rigid conduits, or corridors that act as 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 the acoustical requirements described in Appendix 3C [Acoustic and Noise Control Measures]. Seal around conduits where they penetrate walls.

5.6.12.7 Isolate structure-borne vibrations and sound with resilient mountings (appropriate vibration isolators) 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 connect to vibrating equipment and isolate them from the structure with resilient gaskets and sealant where they pass through walls, floors, or other Facility surfaces.

5.6.12.8 Use acoustic barriers, vibration isolators, and carefully selected exterior equipment to prevent exterior noise from exceeding noise bylaws and to limit re-entrant noise to the Facility and future buildings on the Site.

5.6.12.9 Provide acoustic barriers and careful Design around Facility exterior activities that include loading bay vehicle activity and idling, to prevent noise that neighbours may find offensive.

5.6.12.10 Refer to Appendix 3C [Acoustic and Noise Control Measures], Table 1 for minimum wall STC ratings. Project Co will design to meet all STC requirements of Table 1 – Minimum STC Ratings of Demising Walls and Floor/Ceiling Assemblies as well as the ASTC or NIC compliance tests required in Appendix 3C [Acoustic and Noise Control Measures]. As not all possible adjacency combinations are listed in Table 1, Project Co will propose STC ratings for any such new adjacency combinations for review by the Owner, based on similar adjacency combinations, room type, functionality, intent, and purpose of the room.

5.6.12.11 Acoustic Treatment

5.6.12.11(1) Sounds absorptive materials (acoustic surfaces) will be employed to control the reverberation and transmission of sound within and beyond the room or space in which it is created:

5.6.12.11(1)(a) All normally occupied spaces will incorporate acoustic surfaces to achieve a design Reverberation Time equal to or less than those indicated in Appendix 3C [Acoustic and Noise Control Measures].

5.6.12.12 Partitions

5.6.12.12(1) Design and construct the Facility to comply with the minimum sound transmission ratings between spaces described in Appendix 3C [Acoustic and Noise Control Measures].

5.6.12.12(2) All penetrations through partitions will be sealed with non-setting acoustical sealant. This includes all mechanical, electrical, and plumbing.

5.6.12.12(3) All walls will be insulated.

5.6.12.13 Ceilings

5.6.12.13(1) Provide suspended acoustic ceiling tile with a minimum NRC rating of 0.70 and minimum CAC rating of 35 will be used throughout the Facility , except where equivalent alternate treatment is provided, in NICU areas (see Appendix 3C, Section 7), or where prohibited by cleanroom requirements.

5.6.12.14 Doors

5.6.12.14(1) Provide doors which meet the requirements listed in Appendix 3C [Acoustic and Noise Control Measures] including the minimum STC ratings in Table 3 and door assignments in Table 5.

5.6.12.15 Glazing

5.6.12.15(1) For acoustic requirements for interior glazing refer to Appendix 3C [Acoustic and Noise Control Measures].

5.6.12.16 Mechanical systems and equipment:

5.6.12.16(1) Mechanical systems will be designed such that background sound levels within the Facility do not exceed levels specified in Table 6 of Appendix 3C [Acoustic and Noise Control Measures]

5.6.12.16(2) Additionally, Project Co will meet the following requirements:

5.6.12.16(2)(a) Ducts, rigid conduits, or other paths that may acoustically connect two spaces will be avoided. Where required, they will be sealed appropriately so as to maintain the sound isolation requirements between spaces.

5.6.12.16(2)(b) Where supply and/or return ducts are common to (i.e. serve) adjacent rooms, provide appropriate sound attenuation duct lining at the diffuser and/or grill to maintain the STC of the wall assemblies involved. Seal around any duct or conduit penetrations.

5.6.12.16(3) To avoid the flanking transmission of sound, return air openings/grills serving adjacent rooms will be spaced as far apart as possible, and specifically will not be located close on either side of a demising wall.

5.6.12.16(4) Insulation jackets (acoustic duct lining) will be utilized as appropriate at supply air diffusers to reduce sound entering space from the plenum.

5.6.12.16(5) Supply air diffusers will be selected so that turbulent airflow noise levels generated by the diffusers will be less than 10 points below the NC range specified for that room type in Appendix 3C [Acoustic and Noise Control Measures], Table 6.

5.6.12.16(6) Provide vibrating equipment with appropriate resilient mountings to sufficiently suppress structure-borne sound and vibration transfer to adjacent or nearby noise and/or vibration sensitive spaces.

5.6.12.16(7) Provide ducts, pipes, and conduits with resilient, non-rigid boots or flexible couplings where they leave vibrating equipment; and isolate them from supporting structures with resilient hangers/gaskets and apply acoustical sealant where they pass through walls, floors, or other surfaces of the Facility.

5.6.12.16(8) Noise producing equipment will not be located within corridors or in rooms or alcoves that open onto the corridor.

5.6.12.16(9) When testing sound levels from HVAC equipment the units will be fully operational. Refer to Appendix 3C [Acoustic and Noise Control Measures] for room Noise Criteria (NC) ratings.

5.6.12.16(10) Exterior noise from mechanical and electrical equipment, whether operating continuously, quasi continuously or intermittently but regularly, will not, individually or collectively, cause noise levels to exceed the requirements of Appendix 3C [Acoustic and Noise Control Measures] or City Noise Bylaw 6520.

5.6.12.17 Sound Masking

5.6.12.17(1) Where sound isolation will be compromised due to construction limitations caused by conflicts in partition requirements and/or particularly low background sound levels and/or in open work areas, the option for a sound masking system to enhance privacy will be presented to the Owner for consideration. Project Co will have its Acoustic and Vibration Consultant provide documentation highlighting the need and intended areas for use.

5.6.13 Green Roofs

5.6.13.1 Project Co will provide intensive or extensive green roof as required to meet LEED Gold certification and/or the City's Rainwater Management Plan.

5.6.13.2 The location of intensive or extensive green roofs will be as determined in consultation with the Owner to meet requirements for maintenance access and water ingress concerns.

5.6.13.3 For additional green roof requirements refer to Section 8.2.6 of this Schedule.

5.7 Areas of Refuge

5.7.1 Project Co will provide Areas of Refuge to meet the requirements as set out in the VBBL and this Schedule. These will include compartments containing rooms such as operating rooms, recovery rooms, delivery rooms and intensive care units, from which it is impracticable to move Patients in an emergency, which for this Project will include:

5.7.1.1 01 Emergency Services

5.7.1.1(1) Decontamination Room

5.7.1.1(2) Exam/Treatment Room-Resuscitation

5.7.1.2 02 Critical Care Complex

5.7.1.2(1) Patient Room-Critical Care-Bariatric-Airborne Isolation

5.7.1.2(2) Patient Room-Critical Care-Airborne Isolation

5.7.1.2(3) Patient Room-Critical Care

5.7.1.2(4) Patient Room-Critical Care-Training Room

5.7.1.3 04 Renal Outpatient

5.7.1.3(1) Hemodialysis Treatment Station-Bed-Airborne Isolation

5.7.1.3(2) Hemodialysis Treatment Station-Bed-Airborne Isolation-Hybrid

5.7.1.3(3) Hemodialysis Treatment Station-Bed

5.7.1.3(4) Hemodialysis Treatment Station-Chair

5.7.1.4 05 Maternity Centre

5.7.1.4(1) Fetal Monitoring Area

5.7.1.4(2) Patient Room-SRMC-Bariatric-Airborne Isolation-Hybrid

5.7.1.4(3) Patient Room-SRMC

5.7.1.4(4) Patient Room-Post-Section-Airborne Isolation-Hybrid

5.7.1.4(5) Patient Room-Post-Section

5.7.1.4(6) Operating Room-C-Section

5.7.1.4(7) Recovery Bay-C-Section

5.7.1.4(8) Procedure Room-Airborne Isolation-Hybrid

5.7.1.4(9) Procedure Room

5.7.1.4(10) Patient Room-NICU-Airborne Isolation-Hybrid

5.7.1.4(11) Patient Room-NICU

5.7.1.5 07 Surgical and Interventional Services

5.7.1.5(1) Operating Room

5.7.1.5(2) Operating Room-Hybrid

5.7.1.5(3) ACU Patient Room-Airborne Isolation-Hybrid

5.7.1.5(4) ACU-Patient Space-Small

5.7.1.5(5) Procedure Room-General

5.7.1.5(6) Procedure Room-Bronchoscopy

5.7.1.5(7) Procedure Room-ERCP/GI Endoscopy

5.7.1.5(8) Procedure Room-GI Endoscopy

5.7.2 Emergency Access to Floor Areas

5.7.2.1 Doors providing access to floor areas from exit stairs through a travel distance up or down of not more than 2 storeys to an unlocked door as set out in VBBL, will not be permitted on floors containing the following programs listed in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.7.2.1(1) B Critical Care Complex

5.7.2.1(2) C4.2 - IPU 08 MedPsych / Eating Disorders

5.7.2.1(3) E Maternity Centre

5.7.2.1(4) F1 - Stabilization Unit

5.7.2.1(5) F2 - Outpatient Services

5.7.2.1(6) F3 - Mental Health Inpatients

5.7.2.1(7) G Surgical and Interventional Services

5.8 Ambulance Garage

5.8.1 General Requirements

5.8.1.1 Provide an enclosed, conditioned, at-grade Ambulance Garage for ambulance vehicles with a back-in arrangement and overhead fabric rolling doors. Refer to Section 4.26.

5.8.1.2 Provide automated overhead fabric rolling doors that are access controlled for use only by authorized vehicles entering the Ambulance Garage.

5.8.1.3 Provide an access door equipped with card reader for Staff and service access to the Ambulance Garage.

5.8.1.4 Comply with BCAS Ambulance Station Design Standards, BCAS, BC Emergency and Health Services, including minimum vertical clearance.

5.8.1.5 Provide Direct Access to A1.1.20 Store-Ambulance Garage for storage of BCAS cleaning and restocking supplies.

5.8.1.6 Provide clearance on each side of the vehicle so that a stretcher, in its fully extended position with Staff around it, can be manoeuvred between the structure and the doors of the vehicle in their fully open position.

5.8.1.7 Provide a minimum of two (2) hose bibs, hoses and hose reels, complete with adequate floor drains, distributed to allow for spraying down of the garage and ambulances at all bays. Floor slab will be sloped to drain minimum 2% away from the Facility.

5.8.1.8 Provide a utility sink on an interior wall of the Ambulance Garage for BCAS to clean equipment and supplies.

5.8.2 Emergency Disaster Response Area

5.8.2.1 Provide an emergency disaster response area located inside the Ambulance Garage meeting the following requirements:

5.8.2.1(1) Configure the area so that it can be closed off to serve as an extended triage and primary response area;

5.8.2.1(2) Provide space to accommodate 16 beds;

5.8.2.1(3) Provide medical gas outlets, electrical receptacles and nurse call equipment for each bed location, each fitted out with a protective cover preventing Patient access:

5.8.2.1(4) Two (2) duplex hospital-grade vital outlets will be provided in weatherproof concealed enclosures around the inside perimeter of the Ambulance Garage adjacent to each of the 16 medical gas enclosures.

5.8.2.1(5) Four (4) additional duplex outlets, each on a dedicated circuit, will be provided throughout the Ambulance Garage for connecting portable radiant electric heating to maintain thermal comfort during an emergency disaster response event.

5.8.2.1(6) Two (2) Data Drops will be provided in weatherproof concealed enclosures around the perimeter of the Ambulance Garage adjacent to each of the 16 medical gas enclosures.

5.8.2.1(7) A code blue button will be provided in the Ambulance Garage for use during an emergency disaster response event.

5.8.2.1(8) Provide three (3) wall-mounted shower heads along one (1) wall to serve as decontamination showers; water from these showers will drain through the Ambulance Garage oil interceptor. Provide drop-down curtains for each shower;

5.8.2.1(9) Ensure that the janitorial sink and the hand hygiene sink that are used for normal Ambulance Garage operations are located away from the decontamination showers;

5.8.2.1(10) Provide a hose reel with tempered water;

5.8.2.1(11) Ensure that the Ambulance Garage floor surface is appropriate for use as an emergency disaster response area including decontamination showers and required cleaning procedures; and

5.8.2.1(12) Provided with an overhead gas fired radiant heating system and negatively pressurized relative to the rest of the Facility.

5.8.2.2 Provide an emergency exterior decontamination area meeting the following:

5.8.2.2(1) CSA Z8000 requirements as set out in Section 2.4.5;

5.8.2.2(2) Located adjacent to the emergency department and the exterior water and power hookups;

5.8.2.2(3) Provided with exterior power as described below to support tents for disaster management (Outbreaks, Contained Treatment, Minor Diagnostics and Advanced First Aid);

5.8.2.2(4) Power hookups to consist of two (2) 100A, 208V, 3-phase vital power connection points provided at the Facility exterior adjacent to the exterior water hookups for the Emergency Disaster Response Area. Connection points will be in a weatherproof enclosure and use cam-lock type connectors;

5.8.2.2(5) Connection points may be fed from either a panelboard or CDP. All upstream equipment to reserve sufficient spare capacity to enable full loading of these power connections, in addition to the spare capacity requirements of other sections;

5.8.2.2(6) Wireless network coverage will extend throughout the large emergency exterior decontamination area;

5.8.2.2(7) Sized to accommodate temporary tents in case of a disaster event requiring the decontamination and treatment of 500 Patients;

5.8.2.2(8) Designed and constructed to convey surface water away from tent area. Surface grading will cause no ponding, and adequate drainage will be provided to avoid wet and/or muddy ground conditions during and after storm events; and

5.8.2.2(9) Provided with sufficient services to plug in trailers for on-site Stabilization, Advanced First Aid, Minor Diagnosis (e.g. Ultrasound), refer to Section 5.3 Mobile Medical Unit.

5.9 Structural Design

5.9.1 Structural Design Principles

5.9.1.1 Project Co will retain a Structural Engineer of Record who has demonstrated experience in the structural design of buildings similar in size and complexity to this Facility.

5.9.1.2 The structural design for a post-disaster importance category, including minimum design loads and general provisions and material specifications, will satisfy the more stringent requirements of the VBBL, local by-laws, other applicable or referenced design standards, loading criteria required by equipment suppliers or construction technique and the performance requirements detailed in this Section.

5.9.1.3 Carry out the Construction so that Construction-caused settlement of existing buildings and structures does not exceed 6 mm at any location.

5.9.1.4 Design and construct the Facility so that the long-term total foundation settlement will not exceed 25 mm, that the differential long-term total foundation settlement will not exceed 20 mm in 10 m and that the settlement or differential settlement will not impair the operation of the Facility.

5.9.1.5 Project Co will retain a geotechnical engineer, who is a Professional Engineer registered in British Columbia, as part of the Project team. A supplementary geotechnical investigation may be required to specify foundation design parameters.

5.9.1.6 During site preparation and Construction, a qualified geotechnical engineer, registered in the Province of British Columbia, will provide site reviews and ongoing testing to confirm the general intent of the foundation and site preparation specification and design recommendations, including densification, are carried out.

5.9.1.7 Field reviews by the Owner are required for the following aspects of the work:

5.9.1.7(1) Review of shoring installation;

5.9.1.7(2) Review of site stripping;

5.9.1.7(3) Review of foundation subgrade prior to footing construction;

5.9.1.7(4) Review of pavement subgrade; and

5.9.1.7(5) Review of pavement base and sub-base compaction.

5.9.2 Design loads

5.9.2.1 Performance Criteria

5.9.2.1(1) Use the following minimum specified floor design live loads except where the specific use and occupancy of a space requires a higher live load including future use:

5.9.2.1(1)(a) Basement parking areas 2.4kPa;

5.9.2.1(1)(b) Basement levels other than parking areas: 4.8kPa;

5.9.2.1(1)(c) Truck loading area: 12kPa but not less than that required for the designated City fire truck;

5.9.2.1(1)(d) Level 1 floor: 4.8kPa

5.9.2.1(1)(e) Upper floors (patient rooms, examination rooms, offices, workstation areas, laboratories, operating rooms or similar spaces): 3.6kPa

5.9.2.1(1)(f) Upper floors (storage rooms, assembly spaces and corridors): 4.8kPa

5.9.2.1(1)(g) Mechanical, electrical, telecommunication, and service rooms: 3.6kPa but not less than actual machinery weight; and

5.9.2.1(1)(h) Maintenance walkways: 2kPa.

5.9.2.1(2) Design all suspended floors to accommodate concentrated loads from specified and planned future equipment, fixtures, and machinery, whether floor, wall, or ceiling-mounted, including medical equipment and ceiling lifting devices.

5.9.2.1(3) Design floors for a minimum superimposed specified dead load allowance of 1.0kPa to allow for partitions, and 0.5kPa on upper floors and roof levels to allow for ceilings and mechanical equipment (other than medical equipment). Provide for a minimum superimposed dead load of 0.25kPa on the parking floors.

5.9.2.1(4) Design roofs for minimum net uplift wind loads and for the minimum snow and rain loads, including snow drift loads, required by post-disaster importance levels in accordance with VBBL and referenced standards. Notwithstanding other requirements design the roofs to accommodate concentrated loads from specified and planned future equipment, machinery and features, whether roof or ceiling-mounted, including medical equipment and ceiling lifting devices.

5.9.2.1(5) Design roofs for the superimposed specified dead load of roofing materials, green roofs (where applicable), ceilings, mechanical equipment, but not less than 1.5kPa to allow for future re-roofing alternatives.

5.9.2.1(6) Design floors and roofs above mechanical and electrical service rooms for not less than a superimposed suspended equipment

specified dead load of 2kPa in addition to the minimum dead load allowances specified above.

5.9.2.1(7) Unless an alternative shoring plan meeting all strength, short-term and long-term deflection, levelness and flatness requirements is prepared by a shoring engineer and as reviewed by the Owner:

5.9.2.1(7)(a) Removal of formwork for suspended reinforced concrete floors and immediate re-shoring will commence only once 100% of the 28-day design concrete strength has been achieved, but no earlier than seven days after pouring.

5.9.2.1(7)(b) Re-shoring will be completed during the same day as the formwork was removed.

5.9.3 Flexibility for Future Change

5.9.3.1 Design the floor structure to be able to accommodate, without additional reinforcing, six (6) 130 mm diameter cored holes per structural bay at almost any location in the floor plate. The design for the concrete floors will assume at least one (1) reinforcing bar is cut in every layer of reinforcement at each core location.

5.9.3.2 Design the floor structure with a minimum of one 150 mm diameter knock-out opening on two sides of each column for future use, except at parking levels (that only have parking areas in them and no other Facility or Energy Centre program spaces) where one 150 mm diameter knock-out opening on one side of each column located within exterior walls is required. The knock-out openings will be in addition to any openings required for current services.

5.9.3.3 Design the floor structure so that it will not interfere with the support layout of future ceiling mounted ceiling lifts installations.

5.9.3.4 In general, the minimum primary structural support grid will be 9 m x 9 m to accommodate flexibility in the layout of the Facility, with allowance for variation for near perimeter walls and areas requiring larger clear spans.

5.9.3.5 The exterior wall of the parking levels that face the Clinical Support and Research Centre will have one (1) knock-out opening per level for future connection to the Clinical Support and Research Centre parking levels. The width of the knock-out openings will accommodate two-way traffic flow between the buildings.

5.9.3.6 Design the structure to be able to accommodate future link bridges connecting the Facility with the Clinical Support and Research Centre. Refer to requirements in Section 5.6 Architectural for locations to be connected by link bridges.

5.9.3.7 The structural system will make provisions to allow for the installation, servicing and future replacement of any specialized equipment and its components including future MRI and CT scanners. All floors and elevators along the routes of

the delivery, servicing and replacement of the equipment will be designed with capacities adequate for the loading of the equipment. Provide floor plans for the specialized equipment installation and replacement component delivery routes with corridors, doors, and elevations that meets the specification of minimum delivery routes sizes and capacity as required by the Owner and equipment supplier.

5.9.4 Coordination

5.9.4.1 Coordinate the structural members with the architectural finishes to have adequate thickness, cover and reinforcing to satisfy the fire protection and durability requirements.

5.9.4.2 Coordinate all structural members with other disciplines to avoid utility interferences and to ensure adequate architectural headroom and clearances.

5.9.4.3 Coordinate structure with equipment requirements for slab depressions and cast-in hardware, including for refrigerators, freezers, audiometric rooms, floor troughs and cart wash troughs. Provide adequate depth of slab depressions to avoid the need for ramps. Refer to Appendix 2E [Equipment and Furniture] and Appendix 3F [Food Services Equipment List] for equipment requirements.

5.9.5 Deflection limits

5.9.5.1 Design the structure to meet the deflection limits of VBBL and the applicable materials design standards listed in this Schedule and as appropriate for the non-structural components of the Facility. Notwithstanding the above, the deflection limit will not exceed the levels specified in this Section:

5.9.5.1(1) for typical concrete floor or roof construction, the maximum deflection occurring after the installation of non-structural elements due to all sustained loads, including long-term creep deflection and live load deflection, will not exceed span/480 and will not exceed span/360 for the parking levels;

5.9.5.1(2) for steel floor construction, the maximum live load deflection will not exceed span/480 with the total load deflection not exceeding span/360. The total load deflection is to include effects of shrinkage of concrete topping slabs;

5.9.5.1(3) for steel roof construction, the maximum live load deflection will not exceed span/360 and the total load deflection will not exceed span/240;

5.9.5.1(4) wind storey drift: Height/500; and

5.9.5.1(5) seismic storey drift: Height/100.

5.9.5.2 Design the structure to conform with specific deflection requirements for equipment as recommended by the supplier or manufacturer of that equipment.

5.9.5.3 Design the structure such that the deformations of the structure under service loads are compatible with the architectural finishes and cladding system.

5.9.6 Vibration Limits

5.9.6.1 Design the structure to minimize the effects of floor vibration due to use, occupancy, equipment and external vibration sources. The design method will include dynamic analysis of the floor system to determine floor accelerations and velocities using published dynamic loading and a demonstration that those accelerations and velocities meet the vibration limits below.

5.9.6.2 An Acoustic and Vibration Consultant will be retained by Project Co. The consultant will be a Professional Engineer registered in the Province of British Columbia and reviewed by the Owner, with demonstrated experience in providing recommendations and analysis for acoustic and vibration performance of buildings.

5.9.6.3 Equipment or Machinery that could be a source of vibration is to be mounted using vibration isolation techniques.

5.9.6.4 Where practical, vibration isolation tables may be used to support vibration sensitive equipment. The Acoustic and Vibration Consultant must provide documentation of the isolation table performance, equipment requirements, and floor vibration modelling results for review and approval by the Owner.

5.9.6.5 Design the structure such that vibration does not exceed any of the following:

5.9.6.5(1) Maximum acceptable vibration levels appropriate to the planned use and occupancy of the floors;

5.9.6.5(2) Limits provided in ISO 10137 or any other published and widely accepted specification reviewed by the Owner;

5.9.6.5(3) In areas supporting sensitive equipment, the limits specified by the manufacturer of the specified equipment; and

5.9.6.5(4) The following limits for typical medical and non-medical Facility spaces:

Common Classification	Occupancy or Equipment Requirement Examples	Maximum Vibration Velocity[(1)] (µm/s, 1-s, r.m.s.)
Residential Day (ISO)	Circulation Corridors Lounge Areas Shared Offices and workspaces Public Areas Reception Waiting rooms Washrooms Clinical Spaces (daytime) Meeting rooms (unless using wall or ceiling mounted video cameras or projectors) Private Offices	200
Residential Night (ISO)	Patient rooms and any area where occupants may sleep	140
Operating Theatre (ISO)	Medical/Procedure rooms, Specialty Medical (except imaging – depends on equipment) Operating Rooms and critical work areas MDRD Multimedia room floors, ceilings or walls that support video cameras or projectors Bench microscopes up to 100 x magnification	100 (Note: threshold of human perception)
VC-A	Bench microscopes up to 400 x magnification Optical and other precision balances Optical comparators	50
VC-B	Microsurgery Eye surgery Bench microscopes at magnification greater than 400x Optical equipment on isolation tables	25
VC-C	Magnetic Resonance Imagers	12
VC-D	Mass spectrometers	6

(1) Value of constant velocity regions measured in one-third octave bands of frequency range 8 to 100 Hz, based on ASHRAE, AISC and ISO criteria. Vibration velocity at 4 Hz is to be limited to two (2) times the allowable vibration at 8 Hz and interpolated for intermediate bands. For VC-C, VC-D, or in any space where vibration sensitive equipment will be supported by isolation tables, the maximum vibration velocity applies to one-third octave bands from 1 to 80 Hz. Vibration level depends on walker weight and gait; appropriate footfall conditions must be applied for the space type under consideration.

5.9.6.6 In-situ measurement verification of floor vibration characteristics will be carried out where specified by the equipment manufacturer.

5.9.6.7 An independent testing firm may be retained by the Owner to verify compliance with the vibration requirements. The testing firm will measure the vibration using instrumentation that may include transducers, accelerometers, signal-conditioning equipment, data recorders, and analysis systems. Measured vibration performance characteristics for the structure will meet the requirements set out in this Schedule.

5.9.7 Durability

5.9.7.1 Design the structure and structural components of the Facility, including the secondary structure supporting cladding systems, to meet or exceed the requirements of CSA S478, Guideline on Durability in Buildings for a Long Life Category Design Service Life (50-99 years).

5.9.7.2 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:

5.9.7.2(1) Provide adequate concrete crack control joints and expansion / contraction joints. Caulk exposed joints;

5.9.7.2(2) Provide high strength concrete mixes proportioned to CSA A23.1 and CSA A23.2 durability requirements for exposure class;

5.9.7.2(3) Reinforce concrete for crack control and repair exposed cracks for the maximum allowable crack width in CSA A23.3;

5.9.7.2(4) Chamfer all corners of exposed concrete;

5.9.7.2(5) Hot-dip galvanize all exterior exposed steel and where visible to the public, Patients and Staff, paint to MPDA requirements. Design parking levels to comply with CSA S413;

5.9.7.2(6) Embed steel protection angles and skid plates for loading docks and garbage compactors; and

5.9.7.2(7) Add corrosion inhibitors to exterior reinforced concrete pavements subject to vehicle traffic.

5.9.8 Equipment Supports

5.9.8.1 Design and provide for support/anchorage of all equipment. Equipment will be supported, anchored, and braced to resist gravity, operational, wind and seismic loads in a manner appropriate for the functional and service requirements for the specific equipment.

5.9.8.2 For everything installed by Project Co, it is the responsibility of Project Co to ensure that the proposed solution will be endorsed by infection control. The solution will be discreet and aesthetically pleasing, as determined in consultation with the Owner.

5.9.8.3 Performance Criteria

5.9.8.3(1) Design floor and roof assemblies to support the gravity and seismic loads for floor, wall, or ceiling-mounted medical equipment. Ensure that steel content of structural members is

compatible with equipment that is sensitive to steel content of the surrounding structure.

5.9.8.3(2) Design the structure for the vibration limitations specified by the manufacturer of the specified equipment or required by the planned use and occupancy of the floor space. Carry out in-situ vibration testing when specified by the equipment manufacturer.

5.9.8.3(3) Unless proven not to be possible, design the supports for ceiling-mounted equipment, such as radiology gantries, to be universal so that the supports may be used for various types of equipment.

5.9.8.3(4) Drilled insert-type anchors for medical equipment supports and anchorage are to be rated by the insert manufacturer for seismic and cyclic loading applications.

5.9.9 Structural Systems

5.9.9.1 The preferred structural system for the suspended floors and roof is cast-in-place concrete flat slab construction. Any other proposed system will provide equivalent or better performance in terms of flexibility or change, vibration resistance, fire rating, acoustic separation, ceiling space available for services and overall height of the Facility.

5.9.9.2 Post-tensioned or precast concrete structural systems will not be accepted.

5.9.9.3 Roofs may be structural steel or concrete flat slab construction. Structural steel open web joists may be used at roof areas directly above mechanical rooms. They are not permitted in spaces containing clinical, functional or storage of materials related to hospital functions as required by CSA Z8000.

5.9.9.4 The foundation system will include a concrete raft slab capable of resisting the hydrostatic water pressure associated with a Tanked Foundation.

5.9.10 Seismic Separation

5.9.10.1 Design the structure to be completely independent from any existing or planned future adjacent structures by seismic isolation joint that takes into account the lateral drifts of both structures in accordance with the provisions of VBBL.

5.9.11 Seismic Isolation

5.9.11.1 Definitions

5.9.11.1(1) “Seismic Isolation” means an alternative seismic design concept that consists of installing an isolation system with low horizontal stiffness, thereby substantially increasing the fundamental period of the structure.

5.9.11.1(2) “Isolation System” means a collection of structural elements at the level of the isolation interface that includes all individual isolator units, all structural elements that transfer force between elements of the isolation system, all connections to other structural elements, and may also include a wind-resisting system, energy-dissipation devices, and a displacement restraint system.

5.9.11.1(3) “Seismically Isolated Structure” means the upper portion of the structure above the isolation system, the isolation system, and the portion of the structure below the isolation system.

5.9.11.1(4) “Isolator Unit” means a structural element of the isolation system that permits large lateral deformations under lateral earthquake design forces and is characterized by vertical-load-carrying capability, and lateral restraint (sufficient elastic stiffness) under non-seismic service lateral loads.

5.9.11.1(5) “Isolation Interface” means the boundary between the isolated upper portion of the structure above the isolation system and the lower portion of the structure below the isolation system.

5.9.11.2 General

5.9.11.2(1) Seismic Isolation design will comply with all requirements in VBBL and selected clauses in ASCE 7-16 as specified in this Section.

5.9.11.2(2) Seismically Isolated Structure will be designed so that the Facility remains operational and usable by the Owner for its intended functions both during and immediately after a seismic event with no impact to Patients or ongoing critical and non-critical procedures, and to meet structural performance required in this Section under the 2% in 50 year earthquake.

5.9.11.3 Seismic Isolation System

5.9.11.3(1) All spaces within the Facility, with the exception of non-essential services as reviewed by the Owner (including underground parking, loading/waste management, morgue and Central Food Production), will be located above Isolation Interface. If designed as a standalone building, the Energy Centre will be Seismically Isolated.

5.9.11.3(2) Seismic Isolator type: Friction pendulum bearing or lead-rubber bearing type systems will be used. Combinations of different Isolator types are not permitted.

5.9.11.3(3) Seismic Isolator System will be sized to not interfere with required functionality of the Facility as specified in this Schedule.

5.9.11.3(4) Fire rating requirements: all components of an Isolation system that are located below a floor assembly that is required to have a fire-resistance rating will have a fire-resistance rating of no less than that required for the supported floor assembly. The fire-resistance rating of the components will also meet that required for load bearing walls, columns and other gravity-bearing elements adjacent to the Isolation System.

5.9.11.3(5) A seismic gap will be provided around the structure to accommodate the total design displacement in both orthogonal horizontal directions simultaneously.

5.9.11.4 Design and Analysis

5.9.11.4(1) Analysis, modeling, and design of the Seismically Isolated Structure will be in accordance with VBBL. Supplemental energy dissipation requirements in VBBL will also be met if such devices are used.

5.9.11.4(2) At least one (1) set of upper-bound and one (1) set of lower-bound analyses will be performed to account for the variation in the non-linear force-deformation characteristics of Isolator Units as a result of the following: fabrication tolerances, the effects of axial, shear or combined axial and shear loads, load-rate effects, age effects, effects of temperature variations, first-cycle effects, and other effects that may be reported by manufacturer of the Isolator Units. Bounding properties of Isolation System components will be developed as per Clause 17.2.8 of ASCE 7-16.

5.9.11.4(3) The analysis of the Isolation System and structure will be performed separately for upper-bound and lower-bound properties, and the governing case for each response parameter of interest will be used for design. The lateral displacements and forces will be computed separately for upper-bound and lower-bound Isolation System properties.

5.9.11.4(4) Ground motions for analysis will meet the requirements of VBBL. Ground motions will be appropriately selected and scaled following guidelines in Commentary J in Structural Commentaries (User's Guide - NBC 2015: Part 4 of Division B). Three different suites of ground motion records will be used, one for each seismic source or scenario.

5.9.11.4(5) Elements of structures, non-structural components and equipment within Seismically Isolated Structures will be designed in accordance with Commentary J Paragraph 270 in Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B).

5.9.11.5 Performance Criteria

5.9.11.5(1) Notwithstanding Section 5.9.5, the maximum inter-storey drift at any level including displacement caused by vertical deformation of the Isolation System will be limited to 0.7% under 2% in 50 year earthquakes and 0.2% under design wind load.

5.9.11.5(2) The maximum horizontal floor acceleration at any level will be limited to 0.4g under 2% in 50 year earthquakes.

5.9.11.6 Design Review

5.9.11.6(1) A peer review of the structural design will be carried out by an independent peer review panel, engaged by the Owner. The scope of work will include review of the following as a minimum:

5.9.11.6(1)(a) A 'Basis of Design' document, including the seismic performance objectives, the overall seismic design methodology and the acceptance criteria.

5.9.11.6(1)(b) The proposed structural system and materials of construction.

5.9.11.6(1)(c) The earthquake hazard determination, and selection and modification of earthquake ground motions for application to the building model.

5.9.11.6(1)(d) The modelling approaches for structural materials and components.

5.9.11.6(1)(e) The structural analysis model, including soil–foundation–structure interaction as applicable and including verification that the structural analysis model adequately represents the properties of the structural system within accepted norms.

5.9.11.6(1)(f) A review of the structural analysis results and a determination of whether the calculated response meets approved acceptance criteria.

5.9.11.6(1)(g) The design and detailing of structural components.

5.9.11.6(1)(h) Drawings, specifications and quality control/quality assurance and inspection provisions in the design documents.

5.9.11.6(1)(i) Any other considerations that are identified as being important to meeting the established performance objectives.

5.9.11.7 Seismic Isolator Quality Control and Testing

5.9.11.7(1) Isolator testing: the force-deformation and damping characteristics of the Isolation System used in the analysis and design of the Seismically Isolated Structures will be validated by tests specified herein.

5.9.11.7(2) Qualification tests will be in accordance with Clause 17.8.1.1 of ASCE 7-16 and will be submitted to Project Co's Structural Engineer of Record (Registered Professional of Record) and the Owner for approval.

5.9.11.7(3) Prototype tests will be performed on two full-size specimens of each predominant type and size of Isolator Unit in accordance with Clause 17.8 of ASCE 7-16. In Clause 17.8.2.2 of ASCE 7-16, SM1 will be taken as S(1.0) and SMS will be taken as S(0.2). A detailed prototype testing scheme and the associated acceptance criteria will be prepared and submitted to Project Co's Structural Engineer of Record (Registered Processional of Record) and the Owner for approval prior to commencement of the tests. The prototype tests will satisfy the requirements in Clause 17.8.4 of ASCE 7-16. Prototype test results will be submitted to and approved by the Engineer of Record before the commencement of production.

5.9.11.7(4) Production tests will be performed on 100% of isolators in accordance with Clause 17.8 of ASCE 7-16. A detailed production testing scheme and the associated acceptance criteria will be prepared and submitted to Project Co's Structural Engineer of Record (Registered Professional of Record) and the Owner for approval prior to commencement of the tests. The production test result for each bearing produced will be submitted to and approved by Project Co's Structural Engineer of Record (Registered Professional of Record) and the Owner before the commencement of installation on site.

5.9.11.7(5) Manufacturer qualification requirements: Project Co will select a manufacturer who meets all the minimum criteria as follows:

5.9.11.7(5)(a) Have a minimum of ten (10) years of experience with successful installed performance of Seismic Isolation device for hospitals or other critical infrastructure facilities;

5.9.11.7(5)(b) Have previously completed design, production, tests, and delivery of the Seismic Isolation devices having similar load and displacement capacities and properties;

5.9.11.7(5)(c) Have an ISO9001 or equivalent certified Quality Control System for the seismic isolation devices, materials, manufacturing procedure, and testing procedures;

5.9.11.7(5)(d) Demonstrate adequate reliability, longevity, and design life of their Seismic Isolation device and materials;

5.9.11.7(5)(e) Demonstrate adequate engineering capability and experience to support the project team during the design and construction phase of the project;

5.9.11.7(5)(f) Have engineers that are experienced in the installation of Seismic Isolation devices for the supervision during the on-site installation of these devices;

5.9.11.7(5)(g) Have an engineer that is expert in the testing of the Seismic Isolation device, sign and seal to certify that the prototype and production tests satisfy the specification for the Seismic Isolation device sold.

5.9.11.7(5)(h) Demonstrate the manufacturing and testing resources to complete the deliveries within the specified construction schedule; and

5.9.11.7(5)(i) Have no failures of installed and in-service Seismic Isolation bearings during a seismic event.

5.9.11.7(6) Quality Assurance, Quality Control Certificates and Product Warranty:

5.9.11.7(6)(a) Project Co is responsible for ensuring that the seismic isolation devices, the materials used, assembly, manufacture, testing, delivery to site, and performance complies with this Specification. Project Co will nominate a representative from the manufacturer, who will be responsible for ensuring the Seismic Isolation devices comply with this Specification.

5.9.11.7(6)(b) Project Co will provide evidence with their proposal that formal quality assurance procedures are in place regarding the manufacture and testing of the Seismic Isolation device.

5.9.11.7(6)(c) The nominated representative is required to check the work at each relevant stage of the

manufacturing, and verify the necessary checklists, to ensure that the work complies with the Agreement.

5.9.11.7(6)(d) Project Co's Structural Engineer of Record (Registered Professional of Record) and the Owner may elect to audit the quality records, at which time the quality records, including checklists will be made available to them.

5.9.11.7(6)(e) Project Co will obtain from the manufacturer all certificates pertaining to the Seismic Isolation device and its components, detailed information about quality control program, and at least ten (10) years system and product warranty documents starting from the delivery of the last seismic isolator unit to the Site and will submit them all to Project Co's Structural Engineer of Record (Registered Professional of Record) and the Owner in the form of a report.

5.9.11.7(7) Isolation System inspection and replacement: the following items will be addressed as part of the long-term inspection and replacement program:

5.9.11.7(7)(a) Access for inspection and replacement of all components of the Isolation System will be provided.

5.9.11.7(7)(b) Project Co's Structural Engineer of Record (Registered Professional of Record) will complete a final series of observations of structure separation areas and components that cross the isolation interface before the issuance of the occupancy permit for the Seismically Isolated Structure. Such observations will verify that conditions allow free and unhindered displacement of the structure up to the total maximum displacement and that components that cross the isolation interface have been constructed to accommodate the total maximum displacement.

5.9.11.7(7)(c) Seismically Isolated Structures will have a monitoring, inspection, and maintenance plan for the Isolation System established by Project Co's Structural Engineer of Record (Registered Professional of Record).

5.9.11.7(7)(d) Remodeling, repair, or retrofitting at the Isolation System interface, including that of components that cross the isolation interface, will be performed under the direction of a registered professional.

5.10 Commercial Opportunity and Retail

5.10.1 Design and construct the following Shelled Space for commercial and retail spaces within the Facility:

5.10.1.1 Provide infrastructure and space to be fitted out for two (2) coffee shops as follows:

5.10.1.1(1) One coffee shop (1) located within the M1.1 Main Entrance Lobby and having Convenient Access to the Patient Transfer/Staff Service Elevators and the ED;

5.10.1.1(2) The second coffee shop will be located on either the same floor as the first and distributed or may be located on a different floor adjacent to the Conference Centre and having Convenient Access;

5.10.1.1(3) Meeting the following area requirements;

5.10.1.1(3)(a) M2.1.1 Coffee Shop/Café/Seating, having space allocations of 60 NSM to coffee shop, 20 NSM to storage, 7 NSM to disposal area, and 20 NSM to space for customer seating; and

5.10.1.1(3)(b) M2.1.2 Coffee Shop/Café, having space allocations of 30 NSM to coffee shop, 12 NSM to storage, and 5 NSM to disposal area.

5.10.1.2 Within M1.1 Main Entrance Lobby, provide infrastructure and alcove space for five (5) vending machines having Convenient Access to the Patient Transfer/Staff Service Elevators, located within the space as follows:

5.10.1.2(1) 1.524 m width x 914 mm depth x 2.134 m height.

5.10.1.3 Within M2.1 Food Court, provide infrastructure and space to be fitted out for four (4) kiosks, to be operated by one (1) licensed provider, having Convenient Access via Back of House circulation to the Patient Transfer/Staff Service Elevators, grouped within the food court space, each comprising the following spaces:

5.10.1.3(1) M2.1.3 Food Court;

5.10.1.3(2) M2.1.4 Store-Food Court; and

5.10.1.3(3) M2.1.5 Disposal Hold-Food Court.

5.10.1.4 Within M2.1 Food Court, provide infrastructure and space for customer seating configured in relation to the kiosks in the Food Court.

5.10.1.5 Design and Construction of the Shelled Space for commercial and retail spaces will be complete for the Service Commencement Date.

5.11 Infection Control

5.11.1 General

5.11.1.1 Project Co is encouraged to implement innovative infection prevention and control solutions to reduce health care acquired infections in the Facility such as copper-based composite coating on high-touch surfaces and ultra-violet (UV) light disinfection.

5.11.1.2 Project Co will comply with CSA Z317.13 Infection Control during Construction, Renovation or Maintenance of Healthcare Facilities.

5.11.1.3 Design and construct Airborne Isolation Room, AIR Anteroom, Airborne Isolation-Hybrid and Viral Hemorrhagic Fever or VHF Rooms to minimize air leakage into the space. Walls, windows, ceilings, and penetrations into the space will be fully sealed. Walls will extend to the underside of the slab and be fully sealed.

5.11.1.4 Design the Facility to mitigate and prevent, where possible, the spread of infection including via contaminated surfaces and airborne pathogens, consistent with all infection control standards.

5.11.1.5 Select materials that meet CSA Z8000 requirements, using simple detailing with quality workmanship and finishes and providing ease of accessibility to withstand routine repeated hospital-grade cleaning, allow for maintenance and minimize the physical spread of bacteria. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs.

5.11.1.6 Storage and handling of construction materials will meet the requirements of CSA Z317.13.

5.11.1.7 Project Co is responsible for ensuring that the materials used in the Facility will be endorsed by the Infection Control Practitioner.

5.11.1.8 Design the Facility to segregate sterile, clean, and soiled items, including traffic patterns of clean and soiled transport within the Facility.

5.11.1.9 Design the Facility to mitigate the spread of airborne infections during an outbreak by creating Outbreak Control Zones, as follows:

5.11.1.9(1) A1.8 – Clinical Decision Unit

5.11.1.9(1)(a) Provide one (1) Outbreak Control Zone consisting of a 10 Exam/Treatment Room pod and all associated

support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(2) B1 – Critical Care Complex Unit 01

5.11.1.9(2)(a) Provide one (1) Outbreak Control Zone consisting of a 15-bed pod and all associated 15-bed pod support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(3) B2 – Critical Care Complex Unit 02

5.11.1.9(3)(a) Provide one (1) Outbreak Control Zone consisting of a 15-bed pod with Patient Room-Critical Care-Airborne Isolation-VHF, Patient Room-Critical Care-VHF and all associated 15-bed pod support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(4) C1 – IPU 64-Bed Group 01

5.11.1.9(4)(a) Provide two (2) Outbreak Control Zones each consisting of a 16-bed pod and all associated 16-bed pod support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(5) C2 – IPU 64-Bed Group 02

5.11.1.9(5)(a) Provide two (2) Outbreak Control Zones each consisting of a 16-bed pod and all associated 16-bed pod support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(6) C2 – IPU 64-Bed Group 03

5.11.1.9(6)(a) Provide two (2) Outbreak Control Zones each consisting of a 16-bed pod and all associated 16-bed pod support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(7) C2 – IPU 64-Bed Group 04

5.11.1.9(7)(a) Provide two (2) Outbreak Control Zones each consisting of a 16-bed pod and all associated 16-bed pod support spaces as described in

Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(8) C2 – IPU 64-Bed Group 05

5.11.1.9(8)(a) Provide two (2) Outbreak Control Zones each consisting of a 16-bed pod and all associated 16-bed pod support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(9) C2 – IPU 64-Bed Group 06

5.11.1.9(9)(a) Provide two (2) Outbreak Control Zones each consisting of a 16-bed pod and all associated 16-bed pod support spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.1.9(10) Outbreak Control Zones will:

5.11.1.9(10)(a) be bounded by construction that secures the zone and allows the mechanical ventilation systems to create negative air pressure within the zone relative to adjacent floor areas;

5.11.1.9(10)(b) contain space that can be converted into an Anteroom adjacent to the entrance to each pod with a hand hygiene sink;

5.11.1.9(10)(c) wherever possible, align with VBBL-required fire separations; and

5.11.1.9(10)(d) be designed in coordination with all parts of this Schedule.

5.11.1.9(11) Outbreak Control Zones listed in Section 7.5.9.1(5)(e) will be designed to operate both independently and simultaneously.

5.11.2 Bed Bug Sauna and Disinfector/Washer-Wheelchairs/Gurneys

5.11.2.1 Project Co will provide a Bed Bug Sauna room as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

5.11.2.2 Performance Requirements:

5.11.2.2(1) Refer to Section 7.5.8.1(25) for temperature requirements.

5.11.2.3 The O8.7 Disinfector/Washer-Wheelchairs/Gurneys will be equipped with a wheelchair washer/disinfector, as described in Section 6.11.12 Wheelchair Washer/Disinfector.

5.11.3 Hand Hygiene Sinks

5.11.3.1 Prepare a workflow pattern and risk assessment in collaboration with the Owner to confirm the final quantity and placement of hand hygiene sinks in the Facility.

5.11.3.2 Provide hand hygiene sinks at the following locations, at a minimum:

5.11.3.2(1) As described in Appendix 3J [Sinks Matrix];

5.11.3.2(2) As described in Appendix 3A [Clinical Specifications and Functional Space Requirements]; and

5.11.3.2(3) at all points of entry to the Surgical and Interventional Services Component Restricted Circulation corridors, including stairwells.

5.11.3.3 All hand hygiene sinks located at unit entrances and OCZ vestibules will be accessible. Hand hygiene sinks in Mental Health Areas will be accessible and Ligature Resistant.

5.11.4 Scrub Sinks

5.11.4.1 At minimum, provide specialized, stainless steel scrub sinks in the following locations:

5.11.4.1(1) As indicated in CSA Z8000-18 7.5.12; and

5.11.4.1(2) As indicated in Appendix 3J [Sinks Matrix].

5.11.4.2 All scrub sinks will have hands-free operation.

5.11.4.3 Design will include appropriate placement of scrub solutions, eyewash, linens, mirror and surgical supplies such as masks, gloves, fingernail cleaners, brushes and other items required by the Owner.

5.11.5 Alcohol-Based Hand Rub Dispensers and Respiratory Etiquette Stations

5.11.5.1 Project Co will provide all alcohol-based hand rub dispensers for the Facility.

5.11.5.2 Project Co will prepare a workflow pattern and risk assessment in collaboration with the Owner to address the quantity and placement of alcohol-based hand rub dispensers, in accordance with BC Ministry of Health Best Practices for Hand Hygiene in All Healthcare Settings and Programs.

5.11.5.3 Provide alcohol-based hand rub dispenser stations at all entrances to the Facility so that visitors stop, take notice, and access them. Dispenser stations will have at

least four antiseptic hand rub dispensers mounted for Convenient Access for visitors.

5.11.5.4 Provide Respiratory Etiquette stations at all Facility entrances and other key locations, including selected unit entrances, as reviewed with the Owner. These stations will include signage, ABHR dispenser procedure, masks and tissues.

5.11.6 Personal Protective Equipment

5.11.6.1 Prepare a workflow pattern and risk assessment in collaboration with the Owner to confirm the final quantity and placement of PPE dispensers in the Facility.

5.11.6.2 The location and quantity of PPE dispensers throughout the Facility will be as reviewed by the Owner to meet functional and operational requirements.

5.11.6.3 At a minimum, Project Co will provide large, small and wall-mounted PPE dispensers to meet the following requirements:

5.11.6.3(1) Dispensing capacity and placement will be reviewed with the Owner to ensure that the capacity and placement meet the day-to-day requirements of the Component or space.

5.11.6.3(2) Large PPE dispensers will be Modular Casework and generally consist of the following:

5.11.6.3(2)(a) recessed storage cabinets for the types of PPE required to protect Staff from infections when in contact with blood or other bodily fluids, including gloves, disposable and reusable gowns, aprons, masks and hair/head covers, respirators, goggles, and face shields.

5.11.6.3(2)(b) factory produced components that are lockable, replaceable, reconfigurable and interchangeable in the future by the Owner with the ability to be easily rearranged to change configuration or to include additional modules; and

5.11.6.3(2)(c) having a minimum width of 1.2 m with a base at 150 mm AFF and an overall height of 2.1 m AFF.

5.11.6.3(3) Small PPE dispensers will be Modular Casework and generally consist of the following:

5.11.6.3(3)(a) recessed storage cabinets for the types of PPE required to protect Staff from infections when in contact with blood or other bodily fluids including gloves, gowns, aprons, masks, respirators, goggles, and face shields.

5.11.6.3(3)(b) factory produced components that are lockable, replaceable, reconfigurable and interchangeable in the future by the Owner with the ability to be easily rearranged to change configuration or to include additional modules; and

5.11.6.3(3)(c) having a minimum width of 300 mm with a base at 150 mm AFF an overall height of 2.1 m AFF.

5.11.6.3(4) Wall-mounted PPE dispensers will be prefabricated and generally consist of the following:

5.11.6.3(4)(a) coated wire holders that are easily cleanable, demountable for mechanical disinfection and adaptable to the sizes and the types of PPE required to protect Staff from infections when in contact with blood or other bodily fluids including gloves, gowns, aprons, masks, respirators, goggles, and face shields.

5.11.6.3(4)(b) factory produced components that are lockable, replaceable, reconfigurable and interchangeable in the future by the Owner with the ability to be easily rearranged to change configuration or to include additional modules; and

5.11.6.3(4)(c) having a minimum width of 300 mm with a base at 150 mm AFF an overall height of 2.1 m AFF.

5.11.6.4 Project Co will provide large PPE dispensers in the following locations, at minimum;

5.11.6.4(1) Entrance Vestibule-Walk-in;

5.11.6.4(2) Entrance Vestibule-Ambulance;

5.11.6.4(3) Entrance Vestibule-Decontamination;

5.11.6.4(4) Entrance Vestibule-VPD/BCEHS;

5.11.6.4(5) Vestibule-MRI;

5.11.6.4(6) Secure Vestibule-Waiting;

5.11.6.4(7) Dispensing/Secure Vestibule;

5.11.6.4(8) Anteroom-Non-Hazardous Drugs;

5.11.6.4(9) Anteroom-Hazardous;

5.11.6.4(10) Courier Pick-up and Drop-off Vestibule; and

5.11.6.4(11) All Vestibules including Vestibule-Gown/De-Gown and Vestibule-Gown/De-Gown.

5.11.6.5 Project Co will provide small PPE dispensers in the following locations at minimum:

5.11.6.5(1) Spaces where hand hygiene sinks are located, with the exception of hand hygiene sinks inside Patient Rooms, where only glove dispensers are needed;

5.11.6.5(2) Outreach Drug Distribution Areas;

5.11.6.5(3) Waiting areas; and

5.11.6.5(4) FM Service Elevator lobbies.

5.11.6.6 Project Co will provide wall-mounted PPE dispensers in the following locations at minimum:

5.11.6.6(1) All anterooms throughout the Facility, unless otherwise noted.

5.11.6.7 Provide small or large PPE dispensers in corridors connecting Clinical Spaces throughout the Facility, such that PPE is immediately accessible in all Patient Care Areas, including the following at minimum:

5.11.6.7(1) In Component A Emergency Services, provide one (1) small PPE dispenser in the corridor located between every two (2) rooms where care or treatment is being administered such as Exam/Treatment Rooms.

5.11.6.7(2) In Component B Critical Care Complex, provide one (1) small PPE dispenser in the corridor located between every two (2) Patient rooms;

5.11.6.7(3) In Component C Inpatient Care, provide one (1) small PPE dispenser in the corridor located between every two (2) Patient Rooms;

5.11.6.7(4) In Component D3 Renal Hemodialysis, provide one (1) small PPE dispenser directly adjacent to each Care Team Station;

5.11.6.7(5) In Component E Maternity Centre, provide one (1) small PPE dispenser in the corridor located between every two (2) Patient Rooms;

5.11.6.7(6) In Component F2 Clinics Outpatient Services, provide three (3) small PPE dispensers in the corridors to be distributed throughout the Component; and

5.11.6.7(7) In Component K Centre for Healthy Aging, provide three (3) small PPE dispensers in the corridor distributed through assessment area.

5.11.7 Surfaces

5.11.7.1 Materials and finishes will be moisture impervious and compatible with disinfectants and cleaning products to be used in the Facility, consistent with the requirements of Section 5.11.1.5.

5.11.7.2 Surfaces in operating rooms, interventional suites, inpatient areas, serveries, medication rooms, clean utility rooms, soiled utility rooms and MDRD, will be smooth and durable enough to withstand the additional repeated cleaning and disinfection that is required in these areas.

5.11.8 Equipment and Storage

5.11.8.1 Provide storage shelves that are:

5.11.8.1(1) cleanable with the Owner-approved detergents and disinfectants;

5.11.8.1(2) not located under sinks; and

5.11.8.1(3) minimum 200 mm AFF to permit routine cleaning.

5.11.8.2 Dedicated storage space with power outlet for charging required for large wheeled equipment such as mobile Patient lifts.

5.11.8.3 If open shelving is provided for storage, the bottom shelf of such shelving will be a solid surface to prevent contamination from the floor.

5.11.8.4 Storage space for sharps disposal and Patient waste disposal will be secure to avoid tampering or inappropriate access. Exact locations for sharps disposal and Patient waste disposal systems will be as required such that these items are available in all areas where Staff are treating Patients and additional areas as determined in consultation with the Owner.

5.12 Interior Environment

5.12.1 Interior Design

5.12.1.1 General Requirements

5.12.1.1(1) Employ, as part of the Project team, a professional interior designer.

5.12.1.1(2) Project Co will provide interior Design that

5.12.1.1(2)(a) Reflects the Owner's Identity and Design Objectives for the Facility;

5.12.1.1(2)(b) Integrates the overall interior Design throughout the Facility;

5.12.1.1(2)(c) Provides a distinct character for the Facility that relates to its purpose and the Patients using the Facility;

5.12.1.1(2)(d) Includes individual Design concepts for each Component area;

5.12.1.1(2)(e) Is sensitive to the user groups in different areas;

5.12.1.1(2)(f) Creates a physically, emotionally and culturally safe, welcoming and inclusive environment that accommodates the vulnerable and marginalized populations that the Owner serves, as well as provincial specialized tertiary and quaternary populations;

5.12.1.1(2)(g) Uses complementary environmental wall graphics and other thematic décor with a range of themes and colours;

5.12.1.1(2)(h) Is coordinated with all Facility Furniture, through Project Co's professional interior designer, with regard to Furniture selection, colours and fabrics; and

5.12.1.1(2)(i) Coordinates with progressive disclosure Wayfinding concepts, as described in Appendix 3G [Wayfinding and Signage].

5.12.1.2 Mental Health Interior Design Requirements

5.12.1.2(1) In addition to the requirements as described in Section 5.14.3, provide the following for Mental Health interior environments:

5.12.1.2(1)(a) A warm, welcoming and physically, emotionally, spiritually and culturally safe environment that will reduce anxiety and promote a sense of calm, trust and hope;

5.12.1.2(1)(b) Non-institutional elements that assist in normalizing the Patient environment, removing feelings of institutionalization and facilitate participation in treatment;

5.12.1.2(1)(c) Accent colours, lighting, wood-look floors and furnishings will contribute to de-escalation and effective Patient care;

5.12.1.2(1)(d) Natural colour palettes and use of colours that invoke natural scenery;

5.12.1.2(1)(e) Secure Rooms will have a calm colour. White or grey are not acceptable colours;

5.12.1.2(1)(f) Darker colours such as black and dark grey, along with vivid or rich/deep colours will not be used;

5.12.1.2(1)(g) All artwork will be realistic and depict the natural world; abstract art will not be used;

5.12.1.2(1)(h) Distribution of ambient full-spectrum colour within Patient environments; and

5.12.1.2(1)(i) Finishes that minimize glare.

5.12.1.3 Studio-Video Interior Design Requirements

5.12.1.3(1) Project Co will provide a cyclorama wall with smooth curves instead of right angles for professional lighting and no horizon line. Walls in room will be curved where they meet the floor and where they join together vertically. Room design will prevent shadows while filming.

5.12.1.3(2) Room will be painted blue.

5.12.2 Ergonomic Design

5.12.2.1 Project Co will provide:

5.12.2.1(1) Detailed Design features that expressly facilitate the physical activities of Staff and Patients to increase their safety, efficiency and general well-being, and eliminate ergonomic risk factors through the Design of Millwork, ceiling, lighting, lift devices, and Patient assist or equipment manoeuvring space;

5.12.2.1(2) All work spaces including Millwork, Furniture, lighting and finishes will eliminate strain and injury to Staff, including through consideration of:

5.12.2.1(2)(a) Separation and efficiency of clinical, Patient and support service workflow corridors;

5.12.2.1(2)(b) Convenience of equipment and supply storage for both clinical and non-clinical Staff; specific attention

will be paid to storage access from each Operating Room and Interventional Suite; and

5.12.2.1(2)(c) Ergonomic measures to address awkward posture and repetitive motion (lighting, work heights, adjustability) at all task-intensive work stations; specific attention will be paid to work surface heights for office/computer inputting versus task-intensive bench work. Incorporate three different standing heights in collaboration with the Owner.

5.12.3 Elder-Friendly Design

5.12.3.1 Project Co will comply with Code Plus, Physical Design Components for an Elder-Friendly Hospital, latest edition, or the edition in effect on the Effective Date, that sets forth elder-friendly and dementia-friendly design recommendations that go beyond industrial building codes and standards, to preserve the safety and promote the functional ability of older adults in health care facilities.

5.12.3.2 Project Co will provide Convenient Access to wheelchairs/stretchers and nestable transport chairs (Staxi) adjacent to the entrance, inside of the Facility.

5.12.3.3 Provide Universal Design and convenient access for persons who require the use of wheelchairs in Patient and public circulation routes, including flush and level entrances.

5.12.4 Pediatric Design

5.12.4.1 Design the Facility with pediatric-friendly spaces, using the following criteria:

5.12.4.1(1) Design the Facility to appeal to children of the various ages that will use each part of the Facility , including waiting areas, lounges and clinical areas as determined in consultation with the Owner;

5.12.4.1(2) Design the Facility to be scaled for children where applicable;

5.12.4.1(3) Provide ergonomically correct features to suit children where applicable;

5.12.4.1(4) Use space design, daylight, colour, pattern and texture to achieve pediatric-friendly spaces; and

5.12.4.1(5) Encourage playfulness and interaction with the environment where applicable.

5.12.5 Colour

5.12.5.1 Project Co will:

5.12.5.1(1) Provide departmental colour palettes appropriate for the emotional and psychological needs of Patients and Staff;

5.12.5.1(2) Provide natural colour palettes that contribute to the creation of a healing environment;

5.12.5.1(3) Avoid yellow and green colour combinations in Clinical Spaces, including in Patient recovery and treatment areas;

5.12.5.1(4) Provide colours appropriate to the uses of the Facility, including mental health;

5.12.5.1(5) Apply colours and textures to enhance pedestrian and elder safety and assist in Wayfinding. Excessive patterning or textures will not be used, as this can be misconstrued by Patients. High-contrasting colours in the combinations noted in Section 5.13.2 Signage are not permitted;

5.12.5.1(6) Use contrasting colours to highlight distinct features of the environment to enhance visibility;

5.12.5.1(7) Avoid the use of pastel colours, which may be difficult for older adults to differentiate;

5.12.5.1(8) Use the matching colours to camouflage features to reduce unwanted use, such as exits or restricted areas;

5.12.5.1(9) Use colour cueing or coding techniques in conjunction with assistive devices to improve navigation through and use of the physical environment;

5.12.5.1(10) Provide Component colour palettes appropriate for the emotional and psychological needs of the Patients; and

5.12.5.1(11) Avoid glare-creating finishes.

5.12.6 Artwork

5.12.6.1 Artwork means artwork, artifacts and archives to be included in the Design of the Facility. Artwork includes the Owner's procured artwork and/or public artwork, which can be of various sizes and consist of multiple components to be displayed together.

5.12.6.2 Artwork will form an integral part of the Design of the Facility.

5.12.6.3 Project Co will display artwork both inside and outside the Facility to advance the Owner's goal of:

5.12.6.3(1) Improving the quality of the environment by reinforcing the impression of a caring environment and by creating a sense of space through strong ties to the local community;

5.12.6.3(2) Reinforcing the Owner's Identity; and

5.12.6.3(3) Forming a positive distraction for Patients and promoting social interaction and social support as well as a sense of ownership among Patients and Staff.

5.12.6.4 The Owner intends to visibly represent its commitment to Indigenous Reconciliation through artwork; refer to Section 3.14 Fulfilling the Owner's Commitment to Reconciliation and Cultural Humility for further requirements.

5.12.6.5 Project Co will:

5.12.6.5(1) Incorporate artwork in the Wayfinding strategy for the Facility;

5.12.6.5(2) Design the Facility to support the Owner's art program by providing and identifying for the Owner effective and appropriate locations for major and minor artworks throughout the Facility;

5.12.6.5(3) Provide lighting specifically designed to enhance the display of all artworks;

5.12.6.5(4) Provide all necessary structural support and seismic restraint in accordance with the VBBL. Provide Vandal Resistant mounting and other protective measures for particular artworks as required. Provide all necessary power and data required for digital artwork installations;

5.12.6.5(5) Consider the development of major interior and exterior public pathways as galleries with hanging and display systems that can accommodate complete size and spacing flexibility in mounting;

5.12.6.5(6) Use artwork at strategic locations for memory cueing; and

5.12.6.5(7) Work in concert with the Owner to coordinate and manage artwork that is owned by the Owner or to be procured by the Owner.

5.12.6.6 Owner's Artifacts and Archives

5.12.6.6(1) Project Co will incorporate the Owner's artifacts and archives, as described in the Artifacts and Archives Planning document, in the Design of the Facility.

5.12.6.6(2) Project Co will display artifacts and archives throughout the Facility:

5.12.6.6(2)(a) In prominent gathering places such as the Main Entrance Lobby, Enclosed Atrium, major circulation pathways and waiting areas; and

5.12.6.6(2)(b) To create a distributed archives museum, by strategically locating these throughout the Facility.

5.12.6.6(3) Project Co will utilize the archives to provide a distributed archives museum as a positive distraction, an educational resource and an integral component on the Wayfinding strategy.

5.12.6.6(4) Project Co will include in the Design of the Facility the following artifacts:

5.12.6.6(4)(a) Represented in their existing physical form:

5.12.6.6.4.(a).1 Figurine/statue located at the top of Burrard Building.

5.12.6.6(4)(b) Represented in either their existing form and/or alternate form:

5.12.6.6.4.(b).1 Nursing Alumni Wall; and

5.12.6.6.4.(b).2 Nursing Alumni Graduation photos (framed series).

5.12.6.6(4)(c) Represented in an alternate form:

5.12.6.6.4.(c).1 Red brick exterior cladding. Use red brick in alternative display(s), for example as a surface for pedestrian walkways, a feature wall, or artwork (interior or exterior);

5.12.6.6.4.(c).2 Entrance archways. Incorporate the era (look and feel) within the modern context;

5.12.6.6.4.(c).3 Arched windows. Incorporate arched windows and curved lines;

5.12.6.6.4.(c).4 Coloured and/or treated glass. Incorporate stained glass, tinted glass or leaded glass; and

5.12.6.6.4.(c).5 Cross or crosses. Incorporate on the exterior façade of the Facility.

5.12.6.6(5) Project Co will include in the Design of the Facility the following archives:

5.12.6.6(5)(a) Represented in their existing physical form:

5.12.6.6.5.(a).1 Nursing uniform from St. Paul’s Hospital School of Nursing (in display case, built-in or free-standing);

5.12.6.6.5.(a).2 Small historical medical and office equipment;

5.12.6.6.5.(a).3 Mid-size historical medical equipment such as bassinets; and

5.12.6.6.5.(a).4 Large-size historical medical equipment such as a full-size skeleton (hanging) for medical education.

5.12.6.6(5)(b) Represented in either their existing form and/or alternate form:

5.12.6.6.5.(b).1 Photographs;
5.12.6.6.5.(b).2 Architectural drawings; and
5.12.6.6.5.(b).3 Documents.

5.12.6.6(6) The alternate forms described above may include digital representations or incorporation of the artifacts or archives in other forms of display.

5.12.6.6(7) The format, display form, and placement of all artwork, artifacts and archives will be determined in consultation with the Owner.

5.12.6.6(8) Project Co will remove, relocate and install the Owner's artifacts and archives.

5.12.6.6(9) Project Co will, through the Design of the Facility, display artifacts and archives to enhance and support the story-telling of the Owner's Identify and history.

5.13 Wayfinding and Signage

5.13.1 Interior Wayfinding

5.13.1.1 Project Co will design the Wayfinding system and signage to be fully integrated with the design of the Facility and to be site specific. Refer to Appendix 3G [Wayfinding and Signage] for the Owner requirements.

5.13.1.2 Project Co will coordinate any additional Wayfinding standards and Wayfinding language that Project Co will be required to follow.

5.13.1.3 Project Co will:

5.13.1.3(1) Provide a simple configuration of the Facility's General Circulation systems and functions that eases Wayfinding by minimizing the navigational choices presented to Patients and visitors. Signs and Wayfinding Assets will then assist with Wayfinding decisions by progressively disclosing information and helping to create a welcoming tone;

5.13.1.3(2) Locate major destinations, such as Component or department entrances, directly off of entry spaces and/or along primary General Circulation paths, and make waiting areas as open as possible to circulation routes without forming part of the circulation corridors;

5.13.1.3(3) Provide significant recognizable, easily named and identified elements in key locations that can become ‘meeting points’ for Patients and visitors;

5.13.1.3(4) Design public-use elevator and stair lobbies and General Circulation routes to be distinct from service routes and other non-public routes; and

5.13.1.3(5) All fixed-position maps will be oriented to reflect the direction from which they are viewed. Maps will be accompanied by a directory listing services and departments that can be cross-referenced against the map.

5.13.2 Signage

5.13.2.1 Signage Design will express the Owner’s Identity and incorporate elder-friendly principles so that signage is easily understandable by Patients and families using it for first time, including through the following requirements:

5.13.2.1(1) Colour will be used tactically, with the use of red reserved for Emergency. Colour coding will be used sparingly to facilitate Wayfinding as accent elements to create zones and areas;

5.13.2.1(2) Signs will be made as large as appropriately possible given their required viewing distances for the posting area;

5.13.2.1(3) Signs will be uncluttered and logically structured, using consistent non-technical, non-medical, jargon-free language appropriate for a sixth-grade reading level;

5.13.2.1(4) Directional signs will be posted at intersections and key decision points and placed regularly along long sightlines such as in hallways. Signs will be placed in consistent positions at all major intersections throughout each area and unit; and

5.13.2.1(5) Regulatory signs, such as prohibition and mandatory signs; warning signs, such as caution and danger signs; and identification signs, such as rooms, titles, names, or numbers will be tactile with the use of braille as described in Appendix 3G [Wayfinding and Signage].

5.13.2.2 Project Co will provide all signage required for the Facility in accordance with the following requirements:

5.13.2.2(1) Signage will be highly visible in day and nighttime conditions, clear, concise, and well differentiated from surrounding information, notices, advertising, etc. Use high-colour contrast combinations on signs with light-coloured letters on a dark, matte-finish background such as black, brown or dark red;

5.13.2.2(2) Avoid the following colour combinations:

5.13.2.2(2)(a) Yellow on black;

5.13.2.2(2)(b) Yellow on green;

5.13.2.2(2)(c) Green on blue; and

5.13.2.2(2)(d) Red on green.

5.13.2.2(3) The use of red will be minimized except to signify Emergency

5.13.2.2(4) Font size will be at least 16 mm high on small signs and 40 mm high on larger signs. Where used, tactile letters will be raised 1 mm. Use the combination of upper- and lower-case lettering;

5.13.2.2(5) Signage will be resistant to graffiti, tampering and physical damage and be of a material that will stand up to routine repeated cleaning;

5.13.2.2(6) Use international symbols or simple, explanatory graphics where applicable so that signs are understandable to Patients and visitors who do not or cannot read English;

5.13.2.2(7) Provide signage that directs visitors to all Patient destinations and all other departments. Prioritize Patient destinations over non-Patient destinations;

5.13.2.2(8) Use overhead directional signage, which will either be suspended from a ceiling or bulkhead or be mounted directly over doors. No directional signage will be incorporated into flooring;

5.13.2.2(9) Post directional signage in consistent locations at all major intersections throughout each area and unit.

5.13.2.2(10) Avoid signage systems with gaps, reveals or elements that are hard to clean. Where signs consist of multiple pieces, all components will be permanently affixed or mechanically lockable with all components secured so that they may not be disassembled by the public.

5.13.2.2(11) All signs will be affixed to walls or other surfaces such that they are secure and cannot be used as weapons.

5.13.2.2(12) Locate maps and directories at Facility Entrances, Reception, Facility and Component entry areas and key decision points such as elevator lobbies;

5.13.2.2(13) Install wall-mounted signs at an intermediate height suitable for both persons standing upright and those using mobility aids

including wheelchairs, between 910 mm and 1.32 m AFF. Exact sign installation height will be determined on Site with the Owner's Representative;

5.13.2.2(14) Orient all important signs, including all Patient destination signs, to be perpendicular to the line of Patient travel on approach;

5.13.2.2(15) Avoid multi-layered naming hierarchies and complex numbering systems;

5.13.2.2(16) In addition to the existing donor elements to be relocated and featured in the Facility and Section 5.13.5, Project Co will provide spaces for new Donor Recognition elements as follows:

5.13.2.2(16)(a) Located in proximity to the Main Entrance Lobby;

5.13.2.2(16)(b) Located in each of the public Waiting rooms or Component entry and other specific rooms where the Owner may construct a feature to recognize donors, and other supporters of the Facility; and

5.13.2.2(16)(c) Each space is to be provided with power and data. Precise locations to be determined in consultation with the Owner.

5.13.2.2(17) Signage in Mental Health Areas will be attached to walls with concealed Tamper Resistant fasteners and have beveled edges to prevent the signage from being removed and used as a weapon. Refer to Fraser Health Emergency Department Quality Process Improvements and Model of Care Fraser Health Emergency Network, October 2017.

5.13.2.3 Design the internal directional signs using a progressive disclosure methodology for Wayfinding to include:

5.13.2.3(1) A main map and directory installed at main public entrances and lobbies. The map will include the current floor and a key plan of the Facility in relation to the overall Health Campus. The directory will include all Components and public services within the Facility along with the floor they are in. Similar maps and directories will be located at entrances to floor levels with content targeted specifically to the floor. Simple schematic maps will be provided at the entrances to all Components. All maps and directories will be clearly visible from the corridor;

5.13.2.3(2) A progressive disclosure series of signage from the entrances to each of the Components or departments located in the Facility and listed on the directories that are visible from the corridor;

5.13.2.3(3) Installation of signage at each point at which a directional decision is required;

5.13.2.3(4) In the elevator lobby on each floor where every Public Passenger Elevator and Patient Transfer/Staff Service Elevator stops, provide:

5.13.2.3(4)(a) directional signage clearly visible from the entrance;

5.13.2.3(4)(b) the floor number on the elevator door jambs;

5.13.2.3(4)(c) the floor number in a highly visible format on the wall across from the elevator doors upon exit;

5.13.2.3(4)(d) for public elevators also provide a map and directory within the lobby tailored to the floor; and

5.13.2.3(4)(e) double the above where the elevators open in different orientations so that each elevator exit has a complete set of signs;

5.13.2.3(5) Provide a directory of departments and services on each level within each Public Passenger Elevator and Patient Transfer/Staff Service Elevator cab;

5.13.2.3(6) Provide a graphic panel or dimensional lettering at each Component entry, reception area, waiting rooms, elevator lobby, Staff lounge and within the department at Care Team Stations. Coordinate the graphic panel with the departmental signage; and

5.13.2.3(7) Use consistent terminology and location of signage.

5.13.2.4 Door signage to identify every space (e.g. rooms, alcoves, corridors and stairwells) in the Facility. Door signage will:

5.13.2.4(1) be located in a consistent location for every space in the Facility;

5.13.2.4(2) indicate restrictions on entry and warn of hazards, including “Laser in use” and “Radiology in use” signage;

5.13.2.4(3) not be obscured by the emergency systems and code blue system call; and

5.13.2.4(4) be consistent with the following room numbering protocol:

5.13.2.4(4)(a) each room has a unique identification number in accordance with the Owner’s numbering standard.

5.13.2.4(4)(b) rooms are numbered in a manner that reflects normal movement through the Facility and through its departments;

5.13.2.4(4)(c) labelling anticipates a person attempting to follow numbering along corridors in sequence;

5.13.2.4(4)(d) blocks of numbers are periodically skipped to allow for Future Expansion of the numbering;

5.13.2.4(4)(e) each Patient room will have a unique number as well as a unique identification number (see (a) above);

5.13.2.4(4)(f) numbering of spaces will follow a logical sequence for ease of navigation by Patients and visitors, such as Bay 1, Bay 2, Bay 3, and so on;

5.13.2.4(4)(g) each room and space requires a unique number. It is important that room numbers be determined early in Design and maintained following occupancy;

5.13.2.4(4)(h) follow the same numbering system on Design and Construction documentation for all disciplines (architectural, mechanical, electrical, etc.); and

5.13.2.4(4)(i) each Operating Room and Interventional Suite will have its theatre number installed above the doors inside the theatre in addition to the room number sign outside the theatre.

5.13.2.5 Administrative space signage will be provided with a pocket to insert specific information such as name of occupant. Room signage for utility rooms will be designed to be less evident than general room signage. Non-weaponizable blade signs may be used to identify vending areas and waiting areas, so long as not installed in Mental Health Areas;

5.13.2.6 Unobtrusive door tags with the room's architectural identification number will be provided for all door frames and for all spaces with architectural identification numbers. The positioning of such labels will be consistent throughout the Facility;

5.13.2.7 Provide department directories in all Patient areas of the Facility. Provide room signage with a pocket to insert information at all rooms within the Facility where Patients are receiving care or treatment.

5.13.2.8 Restricted access and card access signage for all elevators not intended for public use;

5.13.2.9 Directional signage is required at each stairwell level;

5.13.2.10 Door signage will:

5.13.2.10(1) indicate restrictions on entry and warn of hazards;

5.13.2.10(2) have consistent locations and terminology; and

5.13.2.10(3) not be obscured by the emergency systems and Code Blue system call;

5.13.2.11 Room signage will be clearly visible from both sides of the corridor approaching the room or space. In addition, provide a smaller sign located beside the door with both the room Wayfinding number and the BMS identification numbers;

5.13.2.12 Final signage wording and Wayfinding numbering will be determined in consultation with the Owner.

5.13.2.13 Provide violence prevention signage at all entrances and other areas as determined by JOHSC and Ministry of Health.

5.13.2.14 Clinical Indicator Signage

5.13.2.14(1) Provide signage for all Patient Rooms and additional spaces as indicated in Appendix 3A [Clinical Specifications and Functional Space Requirements] which include the design criteria listed below. Final design and locations of signage will include:

5.13.2.14(1)(a) A locking tab system operable with one hand;

5.13.2.14(1)(b) Ability to be customized using up to 12 manufacturer-supplied icons to clearly communicate Patient information. Icons can be placed on both left and right side of the sign;

5.13.2.14(1)(c) Supplied with header and coordinated with Patient room number signage;

5.13.2.14(1)(d) Single or dual occupancy configurations, as required; and

5.13.2.14(1)(e) Supply signs for hinged or sliding doors, as required.

5.13.2.14(2) Provide sufficient wall space beside Patient room doors for mounting and proper operation of signs and allow for clear sightlines;

5.13.2.14(3) Supply all complete signage, including manufacturer-supplied icons and all necessary mounting accessories.

5.13.2.14(4) Comply with infection control requirements for cleaning and maintenance. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs

5.13.2.14(5) Acceptable product is the Standard Patient Care Sign series by L&H Sign Company or an acceptable alternative as reviewed by the Owner.

5.13.3 Digital Signage

5.13.3.1 Include digital signage near all public Facility entry points, including entrances from the exterior and from any connected underground parking or buildings. Signs will be paired near entrances, with one sign serving as a directory and the other with generic poster-style information.

5.13.3.2 Directory-style digital signage will be included at the entrances to all flexible Clinical Spaces.

5.13.3.3 Digital signs will have a minimum 60” diagonal screen with minimum 1080p resolution and a non-glare surface. Portrait formats will be used unless content dictates otherwise.

5.13.3.4 Content driving controllers (PC’s) will be recessed into walls or ceilings near screen.

5.13.3.5 The screen enclosure will not be less than 686 mm or more than 2.13 m AFF. The profile of the screen, its frame and mounting hardware will not exceed 100 mm from the wall.

5.13.3.6 All screens and controllers will be secured, and serviceable via secure hinges, access panels or similar methods. All components will be Tamper Resistant and all access panels will be keyed and secure. Build quality will be suitable for the population and location

5.13.3.7 All touchable interactive content will be accessible not lower than 380 mm and not higher than 1.22 m AFF. There will be no obstructions within 254 mm of the furthest touchable part of the screen.

5.13.4 Interactive Kiosks

5.13.4.1 Include Wayfinding kiosks at entry points into the hospital, including entrances from the exterior and from any connected underground parking areas or buildings.

5.13.4.2 Wayfinding kiosks will be landscape in orientation with a minimum of a 40” diagonal screen with minimum 1080p resolution and a non-glare surface.

5.13.4.3 Patient registration kiosks will be landscape in orientation with a minimum 19” screen with privacy blinders on the left and right.

5.13.4.4 Content driving controllers (PC's) will be incorporated into the design of all kiosks, and not external to them.

5.13.4.5 All touchable interactive content will be accessible not lower than 380 mm and not higher than 1220 AFF. There will be no obstructions within 254 mm of the furthest touchable part of the screen.

5.13.4.6 All kiosks will be Tamper Resistant, and all access panels will be keyed and secure. Quality will be suitable for the population and location.

5.13.5 Donor Recognition

5.13.5.1 Donor Recognition signs, plaques or other assets must be visually distinct from Wayfinding signs and assets, so the information presented is not confused. The visual language of the donor sign system will highlight the special nature of the donation, through use of material, colour or other visual characteristics. Ensure Donor Recognition works cohesively across recognition opportunities and is built with adaptability in mind.

5.13.5.2 Donor Recognition signage must be either wall mounted or on a permanent structure located away from obstructions in visibly prominent locations.

5.13.5.3 Project Co will design and locate all Donor Recognition signage in consultation with the Owner.

5.13.5.4 Lights of Hope

5.13.5.4(1) The Lights of Hope is an annual fundraiser that recognizes donors through an exterior lighting display. Project Co will incorporate elements of the fundraiser into the grounds of the Facility. For details of the display refer to Appendix 3G [Wayfinding and Signage]. This will include:

5.13.5.4.1.(a).1 Structural components incorporated into the landscaping so that the physical display may be assembled without impacting the environment;

5.13.5.4.1.(a).2 Exterior power outlets so that trees may be decorated with string lights;

5.13.5.4.1.(a).3 An identified space for the lighting ceremony; and

5.13.5.4.1.(a).4 A permanent installation in a public space recognizing the campaign.

5.13.5.5 Donor Walls

5.13.5.5(1) Project Co will provide donor recognition walls and installations as described in Appendix 3G [Wayfinding and Signage] for the following:

5.13.5.5(1)(a) A campaign donor wall will be provided in a prominent and highly visible public interior area. The donor wall will anticipate 500-600 names, recognizing donors who have contributed $10,000+ at completion of campaign. Donor wall will incorporate at least one 60” interactive touchscreen with accompanying PC controller and content management software.

5.13.5.5(1)(b) A Foundation donor wall will be provided and will anticipate 1200-1300 names recognizing donors who have contributed $10,000+. The Foundation donor will be updated annually. The donor wall will be located in a prominent and visible area with space for visitors to view up-close and potentially interact with. Donor wall will incorporate at least one 60” interactive touchscreen with accompanying PC controller and content management software.

5.13.5.5(1)(c) A Founding Donor piece will incorporate 15-20 names in a permanent installation. Recognizing donors who have contributed $1 million+ to the campaign between April 1, 2017 and December 31, 2019. A Founding Donor piece will be a commissioned art piece to be procured by the Owner as set out in Section 5.12.6 Artwork. The piece will be installed in perpetuity in a prominent and visible location.

5.13.5.5(1)(d) A Heart Donor Wall will be provided that anticipates 200-250 names recognizing donors who have contributed $10,000+ to the Heart department. It will be installed in a prominent location near the Cardiac department.

5.13.5.5(1)(e) A Renal Donor Wall will be provided that anticipates 75 names, recognizing donors who have contributed $10,000+ to the Renal department. It will be installed in a prominent location near the Renal department.

5.13.5.5(1)(f) An ‘It’s Happening’ Donor Wall will be provided to recognize Facility and Health Campus Staff who give gifts of $1,000+ between February 2019 and January 2020.The donor wall will be located in a high-traffic Staff area.

5.13.5.5(1)(g) A historical recognition wall will be provided to acknowledge named spaces. This will be a large wall incorporating a minimum of 100 permanently installed names.

5.13.5.6 Interior Named Spaces and Donor Recognition Plaques

5.13.5.6(1) One Donor Recognition plaque at minimum of 30” x 16” to contain 150 words will be provided at each of the following; Tony Louie Cardiac Wing; The B.C. Rotary Hearing & Balance Centre; Research Institute Building, Entrance Atrium; Waiting Rooms; Operating Rooms, Conference Rooms & Learning Theatres; Clinics, Intervention (diagnostics); Lab Pathology; Maternity Centre; other Inpatient and; Critical Care units.

5.13.5.6(2) Project Co must coordinate with the Foundation to provide dimensional lettering and a plaque placed in a prominent area will be provided for named spaces with gifts over $1 million. Dimensional letters start at 3.5” height for $1 million and 5.5” for $2 million.

5.13.5.6(3) Vinyl wrap covering elevator doors will be provided to acknowledge major donors or Foundation initiatives.

5.13.5.6(4) Donor named departments, programs, and rooms will be considered (e.g. The Teck Emergency versus Emergency).

5.13.5.6(5) An indoor recognition plaque must be provided anticipating 300 names, recognizing those who have contributed $25,000+. Exact sizing and design will be determined in consultation with the Owner.

5.13.5.6(6) Project Co will work with the St. Paul’s Foundation to provide solutions spaces beside doors for Patient rooms, offices, and conference rooms for consideration of recognition plaques.

5.14 Building Security and Safety

5.14.1 Basic Requirements

5.14.1.1 Provide wall finishes, Anti-Barricade doors, glazing, ceiling systems, fasteners and fittings, mechanical systems and electrical systems in accordance with the Risk Category designation described in Appendix 3N [Safety and Risk Reduction Matrix].

5.14.1.2 Where spaces are not specifically described in Appendix 3N [Safety and Risk Reduction Matrix], Project Co in consultation with the Owner will apply the appropriate Risk Category based on similar room types described in Appendix 3N [Safety and Risk Reduction Matrix] and the Owner’s intended use of the space.

5.14.1.3 Provide Vandal Resistant and Tamper Resistant features for all rooms and spaces which are accessible to the public. Vandal Resistant and Tamper Resistant features are not required for Back of House spaces that are only accessible by Staff through a secured or restricted corridor.

5.14.1.4 Provide an Anti-Barricade design for all rooms in which a Patient or Staff member may become barricaded in the room. These rooms include those accessible to the public through General Circulation.

5.14.1.5 Unless otherwise noted, all fasteners and fittings will be concealed type in public areas and on the Facility exterior. Where fasteners and fittings are required to be Tamper Resistant in Appendix 3N [Safety and Risk Reduction Matrix] they will:

5.14.1.5(1) Once installed, only be removable by Staff with a special driver or tools; and

5.14.1.5(2) Resist vandalism or disassembly by public or Patients

5.14.2 Mental Health Areas

5.14.2.1 Mental Health Area means Secure Outdoor Spaces and the rooms and spaces within the following Components in Appendix 3A [Clinical Specifications and Functional Space Requirements]:

5.14.2.1(1) ED Pod 4 (Mental Health);

5.14.2.1(2) C4.2 – IPU 08 Med Psych / Eating Disorders; and

5.14.2.1(3) Urban Health and Integrated Mental Health and Substance Use, including:

5.14.2.1(3)(a) Stabilization Unit;

5.14.2.1(3)(b) Outpatient Services; and

5.14.2.1(3)(c) Mental Health Inpatients.

5.14.3 Mental Health Area Requirements

5.14.3.1 For all Mental Health Areas, the materials and performance of these spaces will be commercial or institutional grade.

5.14.3.2 Where Ligature Resistant fixtures and accessories are required they will;

5.14.3.2(1) Eliminate ligature points with features that breakaway under load or have rounded and sloped edges so as not to provide an anchor point for a noose or other strangulation device;

5.14.3.2(2) Be durable and not easily be broken and therefore creating ligature points, sharp edges, or components that can be used as weapons.

5.14.3.3 Where Ligature Resistant door hardware is required, it will;

5.14.3.3(1) Be designed to reduce the risk of personal harm by restricting the attachment of a cord, rope, or bed sheet to the door and door hardware including; closers, hinges, knobs, locks, levers and handles through feature that include sloped or curved corners to eliminate attachment points.

5.14.3.4 Anti-Barricade means a room is designed such that the occupant cannot cordon themselves within the space or that an occupant cannot collapse against a door and be barricaded within the space.

5.14.3.5 The application of Anti-Barricade requirements is described in the door hardware groups and Appendix 3N [Safety and Risk Reduction Matrix]. The Owner considers the following as appropriate Anti-Barricade strategies unless noted otherwise:

5.14.3.5(1) Double action dual swing doors;

5.14.3.5(2) Doors which normally swing outward from the occupied space into the corridor or, in the case of Patient ensuite washrooms, swing outward into the Patient room; and

5.14.3.5(3) Rooms provided with more than one door and have two points of egress, i.e. dual egress.

5.14.3.6 Project Co will provide an Anti-Barricade design that meets the Owner's functional and safety requirements.

5.14.3.7 Where two means of egress are required, it is desirable to have the second means of egress discharge into a corridor. The Owner may accept the second means of egress discharging into an adjacent room, if unable to provide exit into a corridor.

5.14.3.8 Storage cabinets and equipment such televisions and multimedia devices in Clinical Spaces will be securely mounted and fixed to prevent, theft, tampering and vandalism. Devices such as television display screens and monitors will be wall-mounted and completely covered and protected with transparent, non-breakable polycarbonate type glazing securely fastened to the wall using Tamper Resistant screws; metal frames will not be used.

5.14.3.9 Provide security vestibules at locations as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]. For the security vestibules, provide interior automatic pairs with the following functions;

5.14.3.9(1) Provide inner (secure side) and outer (non-secure side) doors within the corridor to create a vestibule;

5.14.3.9(2) Inner and outer doors will be sequenced such that both doors can not be opened at the same time;

5.14.3.9(3) Spacing between the inner and outer doors will be as required by the Owner to suit clinical and security requirements;

5.14.3.9(4) No other openings such as doors into other spaces, are permitted from within the vestibule;

5.14.3.9(5) Provide presence/safety sensors; and

5.14.3.9(6) Provide card reader activation.

5.14.4 Secure Room Requirements

5.14.4.1 Secure Rooms will meet the requirements as set out in this Schedule and, unless otherwise specified, the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

5.14.4.2 Design will prevent Patients from being able to hide items in the ceiling or tamper with fixtures even if standing on the toilet fixture or other fixed Furniture.

5.14.4.3 Ceiling fixtures will not be within reach of a Patient standing on toilet or other fixed Furniture.

5.14.4.4 Coat hooks, towel bars or shelves to store items are not permitted.

5.14.4.5 Secure room door to swing outward 180 degrees into the Anteroom so that the door does not create an impediment to admitting a Patient. Provide a straight path from the Anteroom door into the Secure Room with both doors able to be fully open.

5.14.4.6 Wall structure to be of minimum 150 mm wide, hollow, 7.5 MPA, normal weight concrete block (Type D, C or B – reference CSA Standard A165.1- M) to underside of slab; with painted IRGWB finish and meets the requirements of Appendix 3C [Acoustic and Noise Control Measures]. Steel stud structured walls are not permitted.

5.14.4.7 Provide soft wall padding to increase Patient safety from hitting walls with their limbs or head and to reduce the need for chemical restraint or sedation. Soft wall padding to be minimum 64 mm thick, installed to minimum 2.44 m AFF level with padding flush to coved base.

5.14.4.8 All projections including mechanical, communications, and electrical devices in Secure Room will be ceiling mounted or located such that no device can be

accessed or tampered with by the assistance from any equipment, device or projection, such as a water closet.

5.14.4.9 Provide the ability for Staff to observe all four corners of the Secure Room from the door window in the Secure Room Anteroom.

5.14.4.10 Controls for the Secure Room exterior window blinds will be accessed from the Secure Room Anteroom.

5.14.4.11 For structural support of the Secure Room door and to protect the integrity of the adjacent wall in resisting and distributing forces caused by door use, provide the following:

5.14.4.11(1) Vertically install one 15 mm steel rebar from slab to ceiling in the first void of the wall opening on each side of the door;

5.14.4.11(2) Horizontally install one 15 mm steel rebar in the lintel blocks;

5.14.4.11(3) The bar will be bent to engage the blocks to each side of the door opening a minimum vertical distance of 457 mm;

5.14.4.11(4) Tie the horizontal and vertical rebar together;

5.14.4.11(5) Fully grout walls for a distance of 457 mm around the perimeter of the cell door opening with a high yield mortar;

5.14.4.11(6) High yield mortar will also be used to fill any voids containing rebar;

5.14.4.11(7) Fill the wall voids adjacent to the lintel; and

5.14.4.11(8) Position rebar to avoid conflict with door hardware installation.

5.14.5 Security and Safety Risk Mitigation

5.14.5.1 Project Co will include the following risk mitigation requirements at minimum:

5.14.5.1(1) Ingestion: The Facility will eliminate the opportunity for Patients to break apart or disassemble and ingest elements in the space or use them for any means of self-harm. For building elements that are breakable, they will be designed in such a way that the components are held in place upon breaking. Provide pick-proof joint sealant at all exposed joints in Patient occupied areas that otherwise provide the Patient an opportunity to damage the finish.

5.14.5.1(2) Weapons: The Patient environment will not have spaces where weapons and contraband can be hidden. In addition, the environment will minimize opportunities where the environment itself can be used as a weapon.

5.14.5.1(3) Interior Glazed Screens and Doors: Interior glazing in Patient areas will be safe, secure and meet the applicable fire rating required by VBBL without restricting the view. Wired glass is not permitted in the Facility.

5.14.5.1(4) Mental Health Inpatient Unit Exterior Courtyard: The Design will maximize views without providing sight lines into Patient rooms. The security fencing and guardrails will be visually attractive, non-institutional, Ligature Resistant, and non-climbable and have options for both transparency and privacy. Seating and planting elements will be fixed and located far enough from the edge so that they do not aid in scaling the safety perimeter.

5.14.5.1(5) Wandering: Clinical Spaces will be designed with passive cues that enable Patients with cognitive deficits to navigate to those areas that are meaningful to them without inadvertently intruding on other Patients' spaces.

5.14.5.1(6) Fixtures: Mechanical and electrical fixtures will be non-institutional, Tamper Resistant, Ligature Resistant, non-weaponizable and will be easy to replace, without impacting the surrounding environment/ assembly if damaged, in order to maintain a safe, clean and comfortable environment for Patients and Staff. Fasteners will be Tamper Resistant and all supporting elements will have concealed fasteners. There will be no access panels in Patient Rooms, ensuite washrooms or in any treatment space.

5.14.6 CPTED Principles

5.14.6.1 Project Co will incorporate the following CPTED principles into the architectural, environmental and systems designs to enhance safety and security throughout the Facility, with particular attention in Mental Health Areas:

5.14.6.1(1) Ownership – A space that becomes personalised is one that incurs value in the individuals that identify with it. A design that encourages ownership also creates pride and responsibility.

5.14.6.1(2) Territoriality – Physical or representational boundaries that indicate ownership of a space.

5.14.6.1(3) Clustering – Co-location of groups of Staff/Patients to encourage familiarity, thereby making the presence of strangers more apparent.

5.14.6.1(4) Utilization – Planning that ensures that there are not under-utilized or over-utilized spaces.

5.14.6.1(5) Lighting – The backbone of any deterrence strategy, thoughtful application of lighting, both interior and exterior, is a significant component of a successful security plan.

5.14.6.1(6) Surveillance, Passive – A strategy of planning supported by transparent architectural elements and lighting to facilitate surveillance without reliance on technology.

5.14.6.1(7) Surveillance, Active – The uniform application of fixed monitoring devices/technology to indicate that the campus is a secure and safe environment for Patients, Staff and the community.

5.14.6.1(8) Control Points, Access – Access controls measures will be implemented uniformly with a real time and scalable level of screening, reporting and authorization.

5.14.6.1(9) Control Points, Perimeter Control – Fixed elements such as fences, guards and walls that secure and control access to the Facility.

5.14.6.1(10) The security camera system is to be legible, which means that where it is visible, it will be recognizable and standardized throughout the Facility. Cameras will be recognizable as a camera and the same type of camera will be used throughout the Component. Wayfinding signage will notify Patients and families of the presence of cameras.

5.15 Storage Room for Hazardous Substances

5.15.1 Provide an enclosed storage for waste formalin and liquid Nitrogen tanks in O5.17 Store-Hazardous Waste, at a location not normally occupied by Staff or visitors nor where other combustible substances are present. The storage room will be clearly identified by signage.

5.15.2 Storage walls will be constructed with reinforced concrete or grout-filled CMU designed to withstand chemical explosions.

5.15.3 Provide blast-proof doors and self-closing hardware with locks to prevent unauthorized entry.

5.15.4 Provide adequate lighting.

5.15.5 The storage room will be adequate ventilation and discharged directly to the outdoors.

5.15.6 The storage room design and storage cabinets (if applicable) will be in compliance with Part 5 of the Occupational Health and Safety Regulations, including the latest amendments, Vancouver Building Bylaw, and B.C. Fire Code.

PART 6. FACILITIES CONSTRUCTION SUBGROUP SPECIFICATIONS

6.1 Procurement and Contracting Requirements (Division 1)

6.1.1 Refer to the Agreement for requirements.

6.2 Existing Conditions (Division 2)

6.2.1 Project Co acknowledges visiting the Site, at its option and prior to the execution of the Agreement, and performing further sub-surface investigation, drilling and sampling, material testing, exploratory excavations, and pre-construction monitoring, at its own expense and after receiving written permission from the Owner.

6.3 Concrete (Division 3)

6.3.1 General Requirements

6.3.1.1 Design and construct cast in place concrete of appropriate properties for the intended use in accordance with the requirements of all applicable codes and specifications.

6.3.1.2 Design concrete for the applicable concrete exposure class.

6.3.1.3 Maximize the fly ash content of the mix consistent to ensure satisfactory concrete performance properties. All cast in place concrete will be placed, consolidated and finished by a competent tradesman holding a Certificate of Qualification awarded by B.C. Industry Training Authority or acceptable alternative as reviewed by the Owner. All precast concrete elements will be supplied from a precast concrete plant certified to Canadian Precast Concrete Quality Assurance (CPCQA) Certification Program.

6.3.1.4 Provide reinforced concrete walls in O10.6 Store-NM Radioactive Waste designed to provide adequate shielding for Staff and the public, in accordance to the recommendations and regulations by the Canadian Nuclear Safety Commission, the International Atomic Energy Agency, Vancouver Building Bylaw and WorkSafeBC.

6.3.2 Design and Performance Requirements

6.3.2.1 Inspect and test cast in place concrete and concrete materials through a CSA certified testing laboratory in accordance with CAN/CSA A23.1. Comply with CAN/CSA A23.2 for Non-Destructive Methods for Testing Concrete.

6.3.2.2 Ensure inspection and testing of precast concrete materials and workmanship by the precast concrete contractor as part of its quality control program in accordance with all applicable standards. Maintain plant records and ensure quality control as required by CSA A251 and in accordance with this Agreement.

6.3.2.3 Finish concrete floors with a smooth, dense, steel trowel finish with a Class A Slab and floor finish in accordance with CAN/CSA A23.1/A23.2, except where stricter requirements are needed to suit the proposed occupancy or equipment that will be located in the space.

6.3.2.4 Repair cracks in concrete floors and walls to suit the floor finish and long-term serviceability requirements of the floor.

6.3.2.5 Comply with CAN/CSA A23.1/A23.2 to minimize honey combing or patching in exposed Architectural Concrete. Honeycombing and bug holes will be repaired immediately under the direction of Project Co's Structural Engineer-of-Record.

6.3.2.6 Provide Architectural Concrete for exposed concrete in areas used by Staff, Patients or public. Identify the proposed surface finishes intended for Architectural Concrete in each relevant Submittal.

6.3.2.7 Architectural Concrete will have smooth and flat surface of uniform colour with sandblast finish including sealer throughout and anti-graffiti coating where in potential contact with human touch.

6.3.2.8 Provide vapour barrier under slabs-on-grade, at locations excluding the Tanked Foundation, in the form of continuous (over-lapped with taped seams) minimum 10 mil sheets with a water vapor transmission rate of less than 0.008 perms.

6.3.2.9 See Section 6.5.2 for concrete topping on metal deck requirements.

6.3.2.10 Where no applied finish is required, seal concrete surfaces to resist penetration and staining from food products, bodily fluids, cleaning compounds, etc. Apply and maintain sealers in accordance with manufacturer's recommendations.

6.3.2.11 Build slopes for drainage using concrete topping in loading dock and garbage enclosure areas to prevent surface water ponding and flowing into adjacent areas.

6.3.2.12 Design exterior vehicle ramps to accommodate a hydronic glycol snow melt system where required by Section 7.5.8.1(24).

6.3.3 Precast Architectural Concrete Veneer

6.3.3.1 System Description: Thin veneer precast Architectural Concrete panels reinforced with stainless steel prestressed tendons mounted in a back ventilated Rain Screen fashion.

6.3.3.2 The design standards for the precast concrete veneer will include:

6.3.3.2(1) PCI MNL 117: Prestressed Concrete Institute Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

6.3.3.2(2) CSA A23.1/A23.2: Concrete materials and methods of concrete construction/Test methods and standard practices for concrete

6.3.3.2(3) CPCI (Canadian Precast / Prestressed Concrete Institute) - Architectural Precast Concrete Technical Guide.

6.3.3.3 The precast concrete will conform to the following design criteria:

6.3.3.3(1) Concrete

6.3.3.3(1)(a) Compressive strength: 35 MPa at 28 days;

6.3.3.3(1)(b) Entrained air: 5-8% as per ACI 318;

6.3.3.3(1)(c) Aggregates: ASTM C33;

6.3.3.3(1)(d) Cement: ASTM C150 and CSA-A3000;

6.3.3.3(1)(e) Air entraining admixtures: ASTM C260; and

6.3.3.3(1)(f) Color pigments: ASTM C979, inorganic natural iron oxide pigments.

6.3.3.3(2) Reinforcement

6.3.3.3(2)(a) Type 316 stainless steel prestressing tendons ASTM A492, ASTM A240 and Federal Standard RR-W-410D.

6.3.3.3(3) Embeds

6.3.3.3(3)(a) Type 316 stainless steel ASTM A240.

6.3.3.3(4) Rain screen attachment

6.3.3.3(4)(a) Furring, Clips, Brackets: G90 Galvanized Sheet per ASTM A653

6.3.3.3(4)(b) Fasteners: 300 series stainless steel

6.3.3.3(4)(c) Ventilated cavity depth: 20 mm

6.3.3.4 Acceptable manufacturers: Knife River, Enterprise Precast, Encon, Gage Brothers or acceptable alternative as reviewed by the Owner. The Basis of Design will be ARCIS panel by Altusgroup.

6.3.3.5 Provide warranty for 2 years.

6.3.3.6 Where floor drains are required, design and construct floors with minimum slope to drain of 2% (1:50) so as to prevent ponding of water or other fluids.

6.4 Masonry (Division 4)

6.4.1 Basic Requirements

6.4.1.1 Masonry construction may be considered, as reviewed with the Owner, for exterior walls and walls systems where permanence of finishes, both visually and functionally, and ease of maintenance are primary considerations in the exterior fabric of the Facility.

6.4.1.2 Masonry construction may be considered, as reviewed with the Owner, for interior walls and wall systems when priorities include permanence and maintenance, sound transmission control, fire resistance and separation requirements and security.

6.4.1.3 Face work will be laid plumb and true with all joints consistent in both width and colour.

6.4.1.4 Provide masonry sealers to all exposed faces of exterior masonry.

6.4.1.5 Provide appropriate control and expansion joints as masonry installation progresses.

6.4.1.6 Where a concrete masonry wall is used as a fire separation, provide appropriate firestopping for all penetrations.

6.4.1.7 Masonry construction below grade for exterior applications is not permitted.

6.4.2 Concrete Masonry Units

6.4.2.1 Concrete unit masonry may be considered for both independent exterior walls and in exterior wall systems as a structural backing to other finish materials or systems

6.4.2.2 Concrete masonry walls will be laterally restrained at their tops and bases

6.4.2.3 Concrete unit masonry for interior applications may be considered as an integrally finished material, as a base for applied finish and as a structural backing to other finish systems

6.4.2.4 Painted or unpainted concrete unit masonry will not be used as an exposed finish in clinical or public areas.

6.4.2.5 Where concrete unit masonry is used as the exposed finish including door and window wall openings, all exposed corners will be radiused.

6.4.2.6 Masonry Design and Construction will comply with Canadian Masonry Contractors Association (CMCA) Masonry Practices Manual.

6.4.2.7 Where a temperature difference is anticipated on either side of a concrete masonry wall, provide continuous insulation to prevent thermal conductivity, refer to Section 6.7 Thermal and Moisture Protection.

6.4.3 Brick Masonry

6.4.3.1 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. Exterior brick veneer cladding support is to be designed as a complete system to include all loading and attachments to all structural components including adjacent concrete, miscellaneous steel, load bearing steel stud framing, lateral bracing and brick ties and will be carried out by a Professional Engineer

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

6.4.3.3 Brick masonry in interior applications is to have integral finish and construction compatible with the Owner's infection prevention and control requirements, refer to Section 5.11 Infection Control.

6.4.4 Stone Masonry

6.4.4.1 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 advocated by NRCC. Provide for drainage of water entering envelope cavity wall system.

6.4.4.2 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.30 mm minimum thickness.

6.4.4.3 Manufactured stone products will not be used.

6.4.4.4 Stone masonry will be designed for maximum deflection of L/360 of assembly's clear span.

6.4.4.5 Stone masonry installation will conform to CSA S304 and CSA A371.

6.4.4.6 Seismic performance will conform with CAN/CSA S832 and VBBL.

6.4.4.7 Stone anchors will conform to CSA A370. Dowels will be stainless steel, ASTM A276, Type 304. Fasteners for anchors will be stainless steel bolts ASTM F593.

6.4.4.7(1) Provide thermally-broken sub-girts.

6.4.4.8 Provide water repellant coating comprising of modified silane/siloxane monomers and polymers in a clear penetrating sealer conforming to ASTM E-514.

6.4.4.9 Provide anti-graffiti coatings as required.

6.5 Metals (Division 5)

6.5.1 Basic Requirements

6.5.1.1 Provide structural steel, steel deck, miscellaneous metal fabrications, and cold-formed steel studs as set out in this section.

6.5.1.2 Project Co may use load bearing steel studs as a component of the exterior wall systems to support exterior wall finishes and form an integral part of the perimeter envelope.

6.5.1.3 Load bearing steel studs will be independent of the principal structural system.

6.5.2 Performance Requirements

6.5.2.1 Design structural steel, steel deck, and cold-formed steel stud systems to comply with the deflection and vibration criteria set out in Section 5.9 Structural Design.

6.5.2.2 Erection tolerances for steel construction will be in accordance with CSA S16 Section 29.3.

6.5.2.3 Concrete topping slabs will be finished with a smooth, dense, steel trowel finish with a Class A Slab and floor finish in accordance with CSA A23.1.

6.5.2.4 Steel floor and roof construction will be designed to account for the deflection of steel beams, joists, and girders due to the wet weight of concrete topping slabs. Floor levelness tolerances will be maintained. The Design of the structure will account for the additional concrete ponding weight.

6.5.2.5 Project Co will monitor curing of concrete topping slabs on steel deck and will ensure crack control of such slabs to avoid random surface shrinkage cracking and radial cracking around re-entrant corners. At minimum, Project Co will implement the following details and procedures:

6.5.2.5(1) Minimize wet weight deflections of steel decking and supporting structure;

6.5.2.5(2) Place concrete in alternate bays. Avoid placing large areas at one time;

6.5.2.5(3) Use concrete topping with a low Design slump. Add superplasticizer to increase slump for placing and finishing;

6.5.2.5(4) Provide extra topping slab reinforcement around openings, columns, and at corners;

6.5.2.5(5) Reinforce topping slabs with a minimum 10 m at 300 mm centres each way chaired a minimum 20 mm above steel deck;

6.5.2.5(6) Avoid placing topping slabs on hot or windy days;

6.5.2.5(7) Wet cure topping slab for a minimum of three days using soaked burlap covered with polyethylene or similar methods;

6.5.2.5(8) Use 14 mm or larger aggregate topping mix;

6.5.2.5(9) Provide extra topping slab reinforcement around openings, columns, and at corners, over beams;

6.5.2.5(10) Wet cure topping slabs for a minimum of three days using soaked burlap covered with polyethylene or similar methods.

6.5.2.6 Cracks in concrete topping slabs will be repaired to suit the floor finish and long-term serviceability requirements of the floor

6.5.2.7 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

6.5.2.8 Steel floor/roof decking plus the concrete topping slab thickness will satisfy the requirements of a ULC-rated assembly meeting the code requirements. Applied fireproofing material is not to be used to achieve required floor deck fire rating

6.5.2.9 Use a CSA certified testing laboratory to provide quality assurance testing and monitoring of workmanship using testing procedures specified in the CAN/CSA standards listed in Section 2.4 of this Schedule to verify soundness of representative shop and field welds.

6.5.2.10 All welding is to be performed by welders certified by the Canadian Welding bureau to the requirements of CAN/CSA W47.1. Project Co will provide certification that all welders comply with this requirement, if requested by the Owner.

6.5.2.11 Fire proofing will be mechanically fastened compressed mineral wool fire protection board. Spray on fire proofing applications are not acceptable.

6.5.3 Load-Bearing Steel Studs

6.5.3.1 Design, detail and construct load bearing steel stud Design and Construction to comply with all applicable CAN/CSA standards.

6.5.3.2 Ensure all load bearing steel stud construction is designed by a professional engineer registered in the Province of British Columbia.

6.5.3.3 Ensure the steel stud manufacturer is certified in accordance with CSSBI Standard 30M06 and all applicable CAN/CSA standards.

6.5.3.4 Conform to the Association of Wall and Ceiling Contractor’s Specification Standards Manual (AWCC).

6.5.3.5 Limit maximum deflection under specified wind loads to L/360 (L/720 for masonry veneers), unless a smaller maximum deflection is specifically required due to wall finishes.

6.5.3.6 Design components to accommodate erection tolerances of the structure.

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

6.5.3.8 Design steel studs to take into account the anchorage of other materials being supported including sub-girts supporting metal cladding and composite panels, soffit finishes and the provision of lateral support at window heads.

6.5.3.9 Provide appropriate firestopping at all penetrations through fire-rated assemblies in conformance to the VBBL and BC Fire Code.

6.5.3.10 Design all guardrails and handrails to their usage classification and per applicable codes.

6.5.3.11 Provide a durable painted finish for steel guardrails.

6.5.3.12 Provide a manufactured pre-finish for stainless steel or aluminum guardrails.

6.5.4 Structural Steel

6.5.4.1 Quality Requirements

6.5.4.1(1) Quality assurance testing and monitoring of workmanship to be carried out by an approved testing laboratory using testing procedures as specified in the CAN/CSA standards listed in Section 2.4 of this Schedule, including CSA S16 Design of Steel Structures, to verify soundness of representative shop and field welds. Test all full strength welds.

6.5.4.1(2) Material quality including sourcing and welding quality will be monitored and approved by an independent testing agency.

6.5.4.1(3) Exterior exposed structural steel will be hot dipped galvanized to 600 g/m2, in accordance with CSA G164 Hot Dip Galvanizing of Irregularly Shaped Articles and, where visible to the public, Patients and Staff, painted with either a quality two-part epoxy paint system with one coat epoxy zinc rich primer, one coat high build epoxy coating and two coats of polyurethane coating or, where feasible, a powder coating. All fasteners will be either hot-dipped galvanized or stainless steel.

6.5.4.1(4) All dissimilar metal components in contact and subject to potential galvanic corrosion will be galvanically isolated with insulation such as polyamide washers.

6.5.4.1(5) All exposed structural steel and its fitting connecting to exterior grade subject to potential de-icing chemicals/salts and damage from snow removal will be supported on 150 mm high concrete pedestals

6.5.5 Cold-Formed Metal Framing

6.5.5.1 Overriding Principles

6.5.5.1(1) Load bearing and non-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.

6.5.5.1(2) Rain Screen walls utilizing cold-formed metal framing will be non-load bearing.

6.5.5.1(3) Load bearing steel studs will be independent of the principle structural system.

6.5.5.1(4) Utilize cold-formed metal framing systems as part of Rain Screen systems, including tested air barrier assemblies.

6.5.5.2 Quality Requirements

6.5.5.2(1) Cold-formed metal framing Design will be carried out by a Professional Engineer; Construction will comply with CSA-S136 North American Specification for Design of Cold Formed Steel Structural Members.

6.5.5.2(2) The steel stud manufacturer will be certified in accordance with CSSBI 30M Standard for Steel Building Systems and all applicable CAN/CSA standards including CSA A660 Certification of Manufacturers of Steel Building Systems.

6.5.5.2(3) Conform to the Association of Wall and Ceiling Contractor's Specification Standards Manual (AWCC).

6.5.5.3 Performance Requirements

6.5.5.3(1) Limit maximum deflection under specified wind loads to L/360, unless a smaller maximum deflection is specifically required due to wall finishes.

6.5.5.3(2) Design components to accommodate erection tolerances of the structure.

6.5.5.3(3) Design wind bearing stud end connections to accommodate floor/roof deflections and to ensure that studs are not loaded axially.

6.5.5.3(4) Design steel studs to take into account the anchorage of other materials being supported including: sub-girts supporting metal cladding and composite panels, soffit finishes and the provision of lateral support at window heads.

6.5.5.3(5) Where studs are used to receive ARGWB or IRGWB panels, they will meet either of the following requirements:

6.5.5.3(5)(a) have a design thickness not less than 0.0312 in (0.792 mm) design thickness; or

6.5.5.3(5)(b) be 20 EQ (20-gauge equivalent) steel studs having a design thickness of 0.0205 inch (0.521 mm) and meeting the requirements of ASTM C840-18 for the application and finishing of ARGWB or IRGWB panels. Acceptable product is the Bailey 18 Hardboard Stud manufactured by Bailey Metal Products or an acceptable alternative as reviewed by the Owner; and

6.5.5.3(5)(c) comply with Sections 4.34.3 and 8.1 of Specification ASTM C645.

6.5.5.3(6) Walls formed of studs subject to the requirements of Section 6.5.5.3(5) will comply with Appendix 3C [Acoustic and Noise Control Measures].

6.5.6 Miscellaneous Metals

6.5.6.1 Basic Requirements:

6.5.6.1(1) Provide continuous raised steel rails along the floor, corner guards and bumpers constructed of extra heavy-duty steel angles and plates to protect the Back of House corridors at the loading dock floor level to the receiving and breakdown areas within the Logistics Centre where wheeled dollies, pallet jacks, and tow motor traffic is anticipated.

6.5.6.1(2) Paint all steel rails, corner guards and bumpers in hazard yellow or as otherwise required by the Owner.

6.5.6.2 Quality Requirements:

6.5.6.2(1) Primers and paints of miscellaneous metals will conform to MPI Architectural Specification Standards Manual.

6.5.6.2(2) Exterior elements will be hot-dipped galvanized with 600 g/m2 to CAN/CSA G164 Hot Dip Galvanizing of Irregularly Shaped Articles and, where visible to the public, Patients and Staff, painted with either a quality two-part epoxy paint system with one coat epoxy zinc rich primer, one coat high build epoxy coating and two coats of polyurethane coating or, where feasible, a powder coating.

6.5.6.3 Performance Requirements:

6.5.6.3(1) Welding to be in accordance with CSA W59-13 Welded Steel Construction (Metal Arc Welding).

6.5.7 Metal Fabrications

6.5.7.1 Project Co will provide all shop fabricated stainless steel items, including:

6.5.7.1(1) Countertops;

6.5.7.1(2) Wall panels with access doors including wall panels as infill between equipment, such as MDRD cart washers, instrument washers, pass throughs and sterilizers with piano hinged doors;

6.5.7.1(3) Integral sinks, counters, removable under-counter shelves, backsplash and skirt;

6.5.7.1(4) Exhaust hoods as required; and

6.5.7.1(5) Wall caps for partial height walls in MDRD, as required

6.5.7.2 Stainless Steel Sinks, Counters and Assemblies

6.5.7.2(1) Project Co will provide all sinks and accessories to meet the Owner's functional and operational requirements as described in this Schedule including Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.5.7.2(2) Stainless integral sinks will be provided for all utility sinks and process sinks as per the minimum quantities and locations outlined in Appendix 3J [Sinks Matrix].

6.5.7.2(3) Provide stainless steel sinks in MDRD as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and per the minimum requirements outlined in Appendix 3J [Sinks Matrix] which will include:

6.5.7.2(3)(a) Height adjustable design, triple compartments with water spray hoses and water guns;

6.5.7.2(3)(b) Sink faucets supplied with reverse osmosis water;

6.5.7.2(3)(c) Lighting for each sink location;

6.5.7.2(3)(d) Sink bays paired in back-to-back position, separated by half-height wall fitted with continuous wet wall panel system;

6.5.7.2(3)(e) Sink bays with local exhaust ventilation above each sink;

6.5.7.2(3)(f) Sink bays with splash / water resistant electrical and data outlets;

6.5.7.2(3)(g) Surfaces sloped to adjacent drain boards where required; and

6.5.7.2(3)(h) Drain outlets with removable stainless steel strainers, where required.

6.5.7.2(4) Provide the following stainless steel sink accessories:

6.5.7.2(4)(a) Sinks with removable under-counter shelf, backsplash and skirts with indented mount for taps;

6.5.7.2(4)(b) Over-counter shelves;

6.5.7.2(4)(c) Exhaust shrouds to span sinks;

6.5.7.2(4)(d) Vacuum canister holders;

6.5.7.2(4)(e) Dividers between counters or sinks;

6.5.7.2(4)(f) Removable sink covers; and

6.5.7.2(4)(g) Exhaust shrouds.

6.5.7.3 Stainless Steel Countertops and Workbenches

6.5.7.3(1) Provide stainless steel counter tops designed to withstand minimum 100 kg (200 lbs) point load.

6.5.7.3(2) Fabrication tolerances for stainless steel are as follows unless otherwise noted:

6.5.7.3(2)(a) Squareness: 3 mm maximum difference in diagonal measurements;

6.5.7.3(2)(b) Maximum offset between faces: 1.5 mm;

6.5.7.3(2)(c) Maximum misalignment of adjacent members: 1.5 mm;

6.5.7.3(2)(d) Maximum bow: 3 mm in 1.2 m; and

6.5.7.3(2)(e) Maximum deviation from plane: 1.5 mm in 1.2 m.

6.5.7.3(3) Provide stainless steel countertops and workbenches in the following areas at minimum, including where required in Appendix 3A and wherever otherwise required by the Owner to meet its functional and infection control requirements. This section

will be read in conjunction with the Equipment requirements listed in Appendix 2E [Equipment and Furniture].

6.5.7.3(3)(a) Main Laboratory Component, also refer to Section 6.12.2.9 Laboratory Requirements;

6.5.7.3(3)(b) Morgue and Autopsy Component;

6.5.7.3(3)(c) MDRD Component;

6.5.7.3(3)(d) All areas, except those for administrative and staff support, in the Main Pharmacy and Specialty Pharmacy Components, including:

- 6.5.7.3.3.(d).1 Receiving / Stores Area spaces;
- 6.5.7.3.3.(d).2 Order Entry Area spaces;
- 6.5.7.3.3.(d).3 Drug Distribution Area spaces; and
- 6.5.7.3.3.(d).4 Sterile Preparation Area spaces.

6.5.7.3(3)(e) All Operating Rooms and Interventional Suites;

6.5.7.3(3)(f) Surgical and Interventional Services support spaces, including:

- 6.5.7.3.3.(f).1 Soiled Hold-Case Carts; and
- 6.5.7.3.3.(f).2 Specimen Holding.

6.5.7.3(3)(g) All areas where food is prepared or stored, including:

- 6.5.7.3.3.(g).1 Central Food Production areas;
- 6.5.7.3.3.(g).2 Complete Nourishments;
- 6.5.7.3.3.(g).3 Nutrition Centres; and
- 6.5.7.3.3.(g).4 Serveries.

6.5.7.3(3)(h) All areas where reprocessing of instruments or equipment is performed, including:

- 6.5.7.3.3.(h).1 the Scope Reprocessing area in the Scopes and Minor Procedures Zone;
- 6.5.7.3.3.(h).2 the Satellite Scope Reprocessing area in the Outpatient Care Centre;
- 6.5.7.3.3.(h).3 the Decontamination Area in Biomedical Engineering; and
- 6.5.7.3.3.(h).4 Alcove-Splint Cleaning;

6.5.7.3(3)(i) All Soiled Utility rooms, including:

- 6.5.7.3.3.(i).1 Soiled Utility-Perfusion.

6.5.7.3(3)(j) O1.4 Decontamination Zone

6.5.7.3(3)(k) All areas where cleaning and disinfecting is performed.

6.5.7.4 Stainless Steel Pass Through Windows/Cabinet

6.5.7.4(1) Provide stainless steel, fully welded body, bio-designed pass through windows for transferring parts and equipment, as indicated in Appendix 3A [Clinical Specifications and Functional Space Requirements] such as:

6.5.7.4(1)(a) A1.1.14 Decontamination Room

6.5.7.4(1)(b) E2.1.10 Washroom-Patient

6.5.7.4(1)(c) F2.2.10 and F2.3.7 Washroom-Patient

6.5.7.4(1)(d) H1.3.2.10 Satellite Scope Reprocessing-Soiled

6.5.7.4(1)(e) G1.4.1 Lab-Frozen Section

6.5.7.4(1)(f) J1.6.2 Anteroom-Hazardous Drugs

6.5.7.4(1)(g) J1.6.4 Clean Room-Non-Hazardous

6.5.7.4(1)(h) J1.6.5 Anteroom-Non-Hazardous Drugs

6.5.7.4(1)(i) J1.6.6 Store-Completed IV Products

6.5.7.4(1)(j) J2.9 Anteroom-Hazardous

6.5.7.4(1)(k) J4.7.12 Mycobacteriology Room-High Risk

6.5.7.4(1)(l) J5.10 Washroom-Patient

6.5.7.4(1)(m) O2.1.6 Instrument Return

6.5.7.4(1)(n) O2.1.4 Workroom-Decontamination

6.5.7.4(2) Pass Through requirements include the following:

6.5.7.4(2)(a) Manual slide up/down windows;

6.5.7.4(2)(b) Continuous set down;

6.5.7.4(2)(c) Dimension of window frames will be as determined in consultation with the Owner to meet equipment and other functional requirements;

6.5.7.4(2)(d) Stainless steel doors in heavy-duty stainless steel frames, with continuous stainless steel hinges;

6.5.7.4(2)(e) Tempered safety glass viewing windows;

6.5.7.4(2)(f) Stainless steel over-centre compression latches;

6.5.7.4(2)(g) Silicone bulb gaskets;

6.5.7.4(2)(h) Provide interlocks between the sending and receiving sides where required by the Owner;

6.5.7.4(2)(i) Double wall construction with built-in mechanical interlock; and

6.5.7.4(2)(j) Facilitates cleaning.

6.5.7.5 Stainless Steel Material Requirements

6.5.7.5(1) Provide stainless steel meeting the following requirements:

6.5.7.5(1)(a) Provide highest architectural quality in various forms, straight and true;

6.5.7.5(1)(b) Scratches, scars, creases, buckles, ripples or chatter marks will not be accepted;

6.5.7.5(1)(c) Finished surfaces exposed to view will be free of pitting, seam marks, roller marks, oil canning, stains, discolorations or other imperfections;

6.5.7.5(1)(d) Provide finish surfaces suitable for polishing, where required;

6.5.7.5(1)(e) Sheet, Strip, Plate and Flat Bar: ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar, 304 grade stainless steel; and

6.5.7.5(1)(f) Nuts, Bolts, Screws, Washers and Other Fastenings: 304 grade stainless steel.

6.5.7.5(2) Stainless steel countertops will meet the following requirements:

6.5.7.5(2)(a) Comply with ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip;

6.5.7.5(2)(b) Provide minimum 1.52 mm thick, 316 grade, No. 4 Satin Finish 1 side, 180 grid finish. Ensure direction of grain matches throughout units;

6.5.7.5(2)(c) Provide sound-deaden tops reinforced with waterproof plywood core, bonded to tops with waterproof contact cement. Seal underside of top (plywood core) with a waterproof finish;

6.5.7.5(2)(d) Provide marine edge unless otherwise noted or required by the Owner;

6.5.7.5(2)(e) Provide a formed backsplash as an integral part of the counter tops, radiused where the backsplash occurs;

6.5.7.5(2)(f) Bond all backsplashes to marine-grade plywood core, bonded the same as specified for the tops;

6.5.7.5(2)(g) Fabricate countertops, backsplash, and front aprons out of one piece of stainless steel; and

6.5.7.5(2)(h) Weld counter and sink assemblies into single units without seams or joints. Drill backsplash, tops and sinks to receive plumbing and electrical fittings.

6.5.7.5(3) Stainless steel sinks will meet the following requirements:

6.5.7.5(3)(a) Comply with ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip;

6.5.7.5(3)(b) Provide minimum 1.9 mm thick, 316 grade, No. 4 Satin Finish 1 side, 180 grid finish. Ensure direction of grain matches throughout units;

6.5.7.5(3)(c) Provide integrally formed sinks with all-welded, rounded corners having minimum 25 mm radius, seamless construction, and ground, polished with all traces of welding removed; and

6.5.7.5(3)(d) Joints and welds will be polished to a uniform No. 4 satin finish.

6.5.7.6 Suspended Steel Grid for Therapy Equipment

6.5.7.6(1) Provide engineered structural steel grid suspended from structure above for therapy equipment attachment in the areas as listed below:

6.5.7.6(1)(a) K2.2.3 Assessment/Treatment Room

6.5.7.6(1)(b) L1.2.2 Assessment/Treatment Room-Large

6.5.7.6(1)(c) L1.2.3 Assessment/Treatment Bay

6.5.7.6(1)(d) L2.2 Assessment/Treatment Room

6.5.7.6(1)(e) L3.2.3 Assessment/Treatment Room

6.5.7.6(2) Finishes for the suspended grid will meet the functional requirements of the Owner.

6.5.7.6(3) Provide seismic design in compliance with the VBBL.

6.6 Wood, Plastics and Composites (Division 6)

6.6.1 Basic Requirements

6.6.1.1 Provide all rough carpentry, wood backing materials, backing boards for mechanical rooms and electrical/Communications Rooms (minimum 2.4 m AFF), roof sheathing, copings, cant strips, finish carpentry and architectural woodwork, including exterior fascia's, cabinets, casework, frames, panelling, ceiling battens, trim, installation of doors and hardware, and other wood-related products and applications as required.

6.6.1.2 Provide wood, plastics and composites to support functionality as defined in Appendix 3A [Clinical Specifications and Functional Space Requirements] and as required by the Owner for the operation of the Facility.

6.6.1.3 Do not use products containing added urea formaldehyde in the Facility.

6.6.1.4 Use pressure treated wood for exterior exposed wood.

6.6.2 Performance Requirements

6.6.2.1 Conform to Architectural Woodwork Standards, as issued by Architectural Woodwork Manufacturer's Association of Canada (AWMAC). Typically comply with 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.

6.6.2.2 Provide adhesives that are non-toxic, low VOC, and use non-solvent glue complying with AWMAC Quality Standards Manual, Canadian Eco-Logo program, and the associated LEED credits.

6.6.2.3 Provide seismic anchorage on all cabinets and shelving over 1.2 m high or where units are likely to be a hazard from overturning.

6.6.3 Millwork and Modular Casework

6.6.3.1 Quantity Requirements

6.6.3.1(1) Project Co will provide Millwork and Modular Casework for the Facility as required to meet the Owner's functional and operational requirements as described in this Schedule including Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.6.3.1(2) Project Co will provide Millwork and Modular Casework according to the category of each space listed Appendix 3L [Millwork and Modular Casework Matrix].

6.6.3.1(3) The category will be calculated based on the amount of Millwork or Modular Casework in the space expressed as a percentage of the total NSM program area of that space.

6.6.3.1(4) Regardless of whether the Millwork or Modular Casework is floor mounted or wall-mounted, the amount will be calculated as the horizontal area footprint projected onto the total floor area. Refer to Millwork and Modular Casework Area Methodology Diagram, Attachment 1 to the Appendix 3L [Millwork and Modular Casework Matrix].

6.6.3.1(5) The category and minimum length dimensions provided in Appendix 3L [Millwork and Modular Casework Matrix] are intended to describe the minimum requirements and will be increased as required to accommodate the Equipment listed in Appendix 2E [Equipment and Furniture] and to accommodate the functionality requirements of the Owner as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]

6.6.3.1(6) The greater quantity requirement between the category and minimum length dimensions provided in Appendix 3L [Millwork and Modular Casework Matrix] will govern.

6.6.3.1(7) Refer to Food Services and Equipment section for Millwork requirements specific to Food Services.

6.6.3.2 Basic Requirement

6.6.3.2(1) Project Co will provide Millwork and Modular Casework in the quantities, dimensions, design and layout, including heights, spacing of drawers, doors, cupboards and openings, to meet the functional requirements of the Owner including Section 5.11 Infection Control.

6.6.3.2(2) Where upper and/or lower cupboards are indicated on Appendix 3L [Millwork and Modular Casework Matrix], provide the same length of cupboards to match the minimum Millwork length.

6.6.3.2(3) Project Co may use Modular Casework to satisfy the requirements of Millwork provided it meets the functionality requirements of Owner as described in the Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.6.3.2(4) Where Modular Casework has been identified as required by a check mark in Appendix 3L [Millwork and Modular Casework Matrix], Project Co will provide a Modular Casework solution in lieu of Millwork, as required to allow proper function and operation in that room or area.

6.6.3.2(5) At all upper cabinets or cupboards; provide either GWB bulkhead or matching panels extended full height to underside of the ceiling to close in the top of the unit.

6.6.3.2(6) Provide upper and/or lower cupboards designed to fit binders stacked vertically.

6.6.3.2(7) Provide upper and/or lower cupboards with sliding doors where required.

6.6.3.2(8) Project Co will incorporate multifunctional printers and scanners into the Millwork design by providing counters placed at an ergonomically appropriate height to set the printer such that Staff can easily reach the device without use of steps.

6.6.3.2(9) Project Co will provide downtime chart storage at minimum, at locations described in Appendix 3L [Millwork and Modular Casework Matrix]. Downtime chart storage will consist of minimum 1.8 m high x 1.2 m wide shelving units comprised of multiple rows of shelves designed to store charts.

6.6.3.2(10) In addition to the requirements set out in Appendix 3L [Millwork and Modular Casework Matrix], Project Co will provide workbenches in the locations described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and where otherwise required by the Owner to meet its functional Requirements.

6.6.3.2(11) Where the quantity of workbenches is described in Appendix 3A [Clinical Specifications and Functional Space Requirements] as "workbenches for (X persons)", Project Co will provide one workbench per person.

6.6.3.2(12) Project Co will provide all workstations and workbenches in the FMO shops and work with the Owner to achieve the desired configuration and quantity of Millwork meeting and exceeding the minimum requirements. Each workbench will have work surface dimensions of 762 mm x 2.43 m (2.5 ft x 8 ft), or as required by the Owner.

6.6.3.3 Performance Requirements

6.6.3.3(1) All bottoms of sink cabinet boxes and areas that may come into contact with water will have a marine-grade plywood substrate. Do not use fibreboard or particle board.

6.6.3.3(2) Use marine-grade plywood substrate for countertops. Do not use fibreboard or particle board. Where appropriate, provide support brackets (knee bracing) to support countertops throughout the Facility. Do not support countertops with legs extending to the floor.

6.6.3.3(3) For Millwork cabinets, seal all wood surfaces and edges. All door, drawer and other exposed Millwork edges will have applied a minimum 3 mm PVC edge strip, heat applied. All PVC edging to match tone of adjacent Millwork. There will be no edge conditions where plastic laminate abuts plastic laminate.

6.6.3.3(4) Adhesives will be non-toxic, low VOC, non-solvent glue to comply with AWMAC Quality Standards Manual, Canadian ‘Eco-Logo’ program, and the applicable LEED credits.

6.6.3.3(5) Provide a Millwork base equal to the height of the flash cove flooring for flash cove flooring to return up at all floor mounted lower cabinet locations.

6.6.3.3(6) Provide built in valance lighting underneath upper cupboards, except in locations where ceiling pot lights are determined to be acceptable to the Owner.

6.6.3.4 Coordination with Services and Systems

6.6.3.4(1) Incorporate all required mechanical, electrical and communication services into the Millwork and Modular Casework so that wires, cords, vents and pipes are hidden from view.

6.6.3.4(2) Project Co is responsible for coordination of all fixtures, including plumbing, to be provided.

6.6.3.4(3) For locations where countertops, workbenches or workstations are flush to the wall, provisions for cord management through and under the work surface will be provided.

6.6.3.4(4) Provide access panels to all services to allow for future adjustment.

6.6.3.4(5) Coordinate with Equipment indicated in Appendix 2E [Equipment and Furniture] and Appendix 3F [Food Services Equipment List].

6.6.3.5 Hardware Requirements

6.6.3.5(1) All doors and drawers will be provided with locks. Keying will be as determined in consultation with the Owner.

6.6.3.5(2) All hardware to be stainless steel of durable quality to meet the standards of AINSI/BHMA grade 1 Cabinet Hardware.

6.6.3.6 Millwork Requirements

6.6.3.6(1) Provide Millwork that meets the following requirements:

6.6.3.6(1)(a) Core for doors will consist of plywood;

6.6.3.6(1)(b) Core for all other panel products will consist of hardwood plywood;

6.6.3.6(1)(c) Laminate grade: general purpose grade, standard duty, and minimum 1.06 mm thick;

6.6.3.6(1)(d) Plastic laminate to both sides of doors and drawer fronts;

6.6.3.6(1)(e) Liner grade for semi-exposed parts: minimum thickness of 0.76 mm, used on the following: semi-exposed shelves, interior portions of case bodies, all surfaces of drawer boxes;

6.6.3.6(1)(f) Seal all surfaces and edges to meet infection control requirements, refer to Section 5.11 Infection Control;

6.6.3.6(1)(g) All cabinets will be flush overlay construction; and

6.6.3.6(1)(h) Design such that no sharp edges are exposed.

6.6.3.7 Modular Casework Requirements

6.6.3.7(1) Modular Casework means a composition of factory produced components that are replaceable, reconfigurable and interchangeable in the future by the Owner.

6.6.3.7(2) Modular Casework will have the capability to be easily rearranged to change configuration or to include additional modules.

6.6.3.7(3) Project Co will provide all workbenches, shelves, workstations, storage, and cabinets as described in Appendix 3L [Millwork and Modular Casework Matrix] and to meet the functional and operational requirements of the Owner as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.6.3.7(4) Project Co will provide Modular Casework in the following Components where activities and equipment include; cleaning, processing, assembling, storing, balancing, researching, preparing including where coagulation, cytometry and microscopes and as indicated in Appendix 3L [Millwork and Modular Casework Matrix].

6.6.3.8 Solid Polymer Fabricated Surface Requirements

6.6.3.8(1) Provide solid polymer fabricated surfacing consisting of reacted monomers and resins, mineral fillers and pigments manufactured in sheets of 13 mm nominal thickness.

6.6.3.8(2) Solid polymer fabricated surfacing will be:

6.6.3.8(2)(a) Solid, non-porous, impervious, homogeneous, hygienic, renewable, and will feature inconspicuous hygienic seams;

6.6.3.8(2)(b) Resistant to caustic action of chemicals or agents used by the Owner;

6.6.3.8(2)(c) Free from conspicuous internal strengthening fibers; and

6.6.3.8(2)(d) Designed with sufficient strength for handling, placement and utilization stresses.

6.6.3.8(3) Provide solid polymer fabricated surfacing for all counters required in Appendix 3L [Millwork and Modular Casework Matrix] that incorporate lavatory sinks, utility sinks and kitchen sinks as described in the Appendix 3J [Sinks Matrix], with the exception of where counters are required to be stainless steel such as Soiled Utility rooms.

6.6.3.8(4) For Pharmacy areas, countertops will be solid polymer fabricated with integral sinks, which will provide long-term durability and resists chipping and staining from medical agents expected to be used.

6.6.3.8(5) For the laboratory pathology areas such as Frozen Section, provide laboratory grade solid surfacing acrylic resin counters.

6.6.3.8(6) Provide surfaces with:

6.6.3.8(6)(a) Uniform matte, satin, or gloss finish; and

6.6.3.8(6)(b) No sharp corners or exposed edges. Exposed top and bottom edges will be radiused minimum 7 mm. Outside corners will be radiused minimum 25 mm.

6.6.3.8(7) Provide solid surfacing with the following properties:

6.6.3.8(7)(a) Flexural Strength: ASTM D790, 68.9 kPa (10,000 psi);

6.6.3.8(7)(b) Abrasion Resistance: ANSI/IAPMO Z124.6, pass;

6.6.3.8(7)(c) Fungi Resistance: ASTM G21, rating 0 (no effect);

6.6.3.8(7)(d) Stain Resistance: ANSI/IAPMO Z124.6, pass; and

6.6.3.8(7)(e) Flame Spread Test: ASTM E84, 10 or less, Class A.

6.6.3.9 Plastic Laminate Countertops and Work Surface Requirements

6.6.3.9(1) For administrative areas without sinks, where stainless steel, solid polymer or other surface is not required by this Schedule, provide plastic laminate countertops and work surfaces which meet the following requirements:

6.6.3.9(1)(a) High pressure plastic laminate: general purpose grade, standard duty, minimum 1.06 mm thick;

6.6.3.9(1)(b) Core: western softwood plywood in compliance with CSA 0151-M1978, good one side, solid two sides, for use as plastic laminate cores. Provide liner grade backer sheet to the underside of all countertops; and

6.6.3.9(1)(c) Countertops to be minimum 38 to 40 mm thick and have continuous hardwood edge of the same thickness with 7 mm radius double round top and bottom, stained and finished to match counter.

6.6.3.10 Hardwood Countertops and Work Surface Requirements

6.6.3.10(1) Provide butcher block counter tops at workbenches in the following areas, at minimum, including in all spaces where required in Appendix 3A [Clinical Specifications and Functional Requirements] and wherever otherwise required by the Owner to meet its functional requirements:

6.6.3.10(1)(a) Testing/Assembly Area;

6.6.3.10(1)(b) Workroom-Dialysis Technicians;

6.6.3.10(1)(c) Each Workroom-Biomedical Engineering;

6.6.3.10(1)(d) Biomedical Engineering Component; and

6.6.3.10(1)(e) FMO Component.

6.6.3.10(2) Provide butcher block counter tops with solid edge banding construction meeting the following requirements:

6.6.3.10(2)(a) Butcher Block Countertop: 50 mm (2 inch) thick solid laminated wood top; and

6.6.3.10(2)(b) Countertop Core: 19 mm (3/4 inch) plywood.

6.6.3.11 Recycling Accommodation

6.6.3.11(1) Where recycling accommodation is checked as required in Appendix 3L [Millwork and Modular Casework Matrix], provide a Modular Casework solution as follows:

6.6.3.11(1)(a) Freestanding 5, 4 or 3 opening unit systems;

6.6.3.11(1)(b) Provide changeable messaging display on each waste disposal and recycling bin;

6.6.3.11(1)(c) Provide access to enable ease of servicing;

6.6.3.11(1)(d) Provide interchangeable inserts to create a recycling centre that fits the needs of the Owner;

6.6.3.11(1)(e) Provide shaped inserts and recycling icons that provide clear direction for disposal and recycling; and

6.6.3.11(1)(f) Meet the following minimum size requirements:

6.6.3.11.1.(f).1 5-opening will be 36″H x 60″W x 25″D;
6.6.3.11.1.(f).2 4-opening will be 36″H x 48"W x 25"D; and
6.6.3.11.1.(f).3 3-opening will be 36"H x 36"W x 18"D.

6.6.3.11(1)(g) Provide 3-opening recycling accommodations at all public entrances to the Facility.

6.6.3.11(1)(h) All recycling accommodations will be accessible to Persons with Disabilities.

6.6.3.11(1)(i) Confirm compatibility with standard recycling bins.

6.6.3.12 Medication Room Requirements

6.6.3.12(1) Provide modular, standardized storage and stocking systems including bins as required by the Owner to meet functional requirements.

6.6.3.12(2) Provide the ability to store medications at eye-level height.

6.6.3.12(3) Provide sufficient capacity in the storage and stocking systems to avoid overcrowding of medication stock.

6.6.3.12(4) Provide ability for medications to be arranged alphabetically by drug formulation.

6.6.3.12(5) Provide the ability for high risk medications to be stored away and separately from other medications.

6.6.3.12(6) Provide the ability for Staff to easily and safely locate medications and supplies.

6.6.3.12(7) Design the storage and stocking system ergonomically based on the range of motion of Staff to provide easy access to medications, workstations and supplies.

6.6.3.13 Pharmacy Requirements

6.6.3.13(1) General Approach

6.6.3.13(1)(a) Project Co will provide pharmacy Millwork and Modular Casework:

6.6.3.13.1.(a).1 appropriate for the specific and specialized functions to be performed by Staff using the Millwork and Modular Casework;

6.6.3.13.1.(a).2 providing end users with an ergonomic working environment that is suited to their specific needs, including with height-adjustable work surfaces where required; and

6.6.3.13.1.(a).3 having structural rigidity and chemical resistivity to withstand the service conditions to which they are exposed.

6.6.3.13(1)(b) All workbench tops will be chemical resistant to meet the requirements of UPS 797 and 800 standards.

6.6.3.13(1)(c) Provide all pharmacy workbenches with cabinets for a minimum 50% of the length of the benches.

6.6.3.13(1)(d) Millwork and Modular Casework will be

6.6.3.13.1.(d).1 versatile and accommodate a flexible and adaptable fit (reconfiguration) within the overall design; and

6.6.3.13.1.(d).2 freestanding where possible to accommodate open pharmacy spaces and allow for easy reconfiguration and movement within the pharmacy space.

6.6.3.14 Pneumatic Tube Station Requirements

6.6.3.14(1) Project Co will provide directly adjacent to the PTS a dedicated, standing height Millwork counter top with two (2) deep drawers below and storage for a minimum of six (6) carriers. The exact number of carriers will be as determined in consultation with the Owner.

6.6.3.15 Sacred Space Requirements

6.6.3.15(1) Provide freestanding Modular Casework structures or wall-mounted Millwork installations as follows:

6.6.3.15(1)(a) All Nations Sacred Space Millwork

6.6.3.15.1.(a).1 Use cedar for finishing work and Millwork. Pine and fir may be considered;

6.6.3.15.1.(a).2 Provide built-in benches arranged in a circle;

6.6.3.15.1.(a).3 Provide a 914 mm long counter with lower storage cupboard for storage of traditional medicines;

6.6.3.15.1.(a).4 Provide a Millwork cabinet with doors intended to conceal a large flat screen TV when not in use; and

6.6.3.15.1.(a).5 Designed to accommodate digital displays so the digital interface is easily accessed.

6.6.3.16 Patient Wardrobe Requirements

6.6.3.16(1) Project Co will provide wardrobes in the spaces listed in Appendix 3L [Millwork and Modular Casework Matrix]. The minimum Millwork/Modular Casework length specified is exclusive of the length of the wardrobe.

6.6.3.16(2) The Patient wardrobe will:

6.6.3.16(2)(a) Have a sloped top to prevent objects from being stored on top of the wardrobe and prevent dust collection;

6.6.3.16(2)(b) Have a combination of cupboards, compartments, drawers and a clothing rod for storage of personal items;

6.6.3.16(2)(c) Have locks on all cupboards and drawers;

6.6.3.16(2)(d) Have light supplied from a lighting fixture located inside the wardrobe when room lighting is not positioned to provide 50 Lux in the wardrobe with a person standing in front of it;

6.6.3.16(2)(e) Be Ligature Resistant, doors and drawers are not acceptable in Mental Health Areas; and

6.6.3.16(2)(f) Have minimum interior dimensions of 610 mm in width, 610 mm in depth, and 2.2 m in height.

6.7 Thermal and Moisture Protection (Division 7)

6.7.1 Basic Requirements

6.7.1.1 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.

6.7.1.2 Mock-ups

6.7.1.2(1) Approximately two weeks prior to scheduled commencement of cladding installation and associated work, convene pre-installation meeting and mock-up at Project site or at an off-premise facility to be located within the GVRD as may be required by and at no expense to the Owner. Cladding mock-up to be attended by cladding installer, representative of the cladding manufacturer, window manufacturer, window installer, Project Co's Contractor, Architect, Owner, Building Envelope Consultant, and other representatives directly concerned with the performance of the work. Record discussions of conference and decisions and agreements or disagreements reached and furnish copy of record to each party attending. Submit to the Owner all building envelope test results, witnessed by the Building Envelope Consultant.

6.7.1.2(2) Physical mock-ups will include the following at a minimum:

6.7.1.2(2)(a) Wall assemblies for claddings included in the approved Design, including roof and parapet conditions;

6.7.1.2(2)(b) Intermediate exterior vertical and horizontal joints for dissimilar cladding or material interface;

6.7.1.2(2)(c) Interior and exterior Architectural Concrete walls;

6.7.1.2(2)(d) Inside and outside exterior corner conditions; and

6.7.1.2(2)(e) Below grade Tanked Foundation waterproofing for under raft slab membrane, wall membrane, permanent raft slab soil anchors and service conduit penetrations.

6.7.1.3 Design construction assemblies to prevent the ingress of moisture through Tanked Foundation walls and raft slab below grade to meet the following requirements:

6.7.1.3(1) The exterior foundation walls and raft slab below grade are to be protected using a continuous fully reinforced membrane waterproofing system in combination with concrete cold-joint waterproofing to prevent moisture ingress below grade.

6.7.1.3(2) The below grade waterproofing protection system will meet the requirements of the City's current Ground Water Management Bulletin.

6.7.1.3(3) Ground anchors or any other means of stabilizing the shoring wall for the excavation will be designed to be installed fully on the outside of the plane of the waterproofing membrane of the walls of the Tanked Foundation.

6.7.1.3(4) De-tensioning of ground anchors, if required, will be carried out without creating openings in the permanent wall of the Tanked Foundation.

6.7.1.4 Provide fire-resistance rated exterior and interior walls as required by VBBL and locate these separations to minimize impact on clinical adjacencies and flows.

6.7.1.5 Provide resistance to the propagation and spread of fire for exterior walls and interior walls designated as fire-resistance rated separations where appropriate.

6.7.2 Performance Requirements

6.7.2.1 Waterproofing

6.7.2.1(1) Provide waterproofing to prevent moisture ingress to occupied spaces below grade.

6.7.2.1(1)(a) Waterproofing will be provided to prevent water ingress into below-grade structures and will cover the entirety of below-grade vertical concrete walls and raft slab, including to resist hydrostatic head indicated in Project Co's Geotechnical Report.

6.7.2.1(1)(b) The waterproofing membrane system is to provide a minimum 10-year leak-free performance warranty in accordance with the following standards: CAN / CSA-A23.2-04 "Concrete Materials and Methods of Concrete Construction / Methods of Test for Concrete" and CAN / CSA .

6.7.2.1(1)(c) Acceptable Products: Soprema Canada reinforced Colphene BSW H and BSW V sheet-applied Tanked Foundation waterproofing system designed for vertical and horizontal waterproofing (or acceptable alternative).

6.7.2.1(1)(d) Acceptable product for two-component cold joint waterproofing include: Kryton International Inc.: “Krystol Waterstop System” used with “Krystol Waterstop Grout” (or acceptable alternative).

6.7.2.1(2) Provide waterproof membranes in exterior walls as part of the building envelope and integral with Rain Screen or cavity wall assemblies.

6.7.2.1(3) Self-Adhesive membrane air barriers conforming to CAN/CGSB 37-GP-56M – Membrane, Modified, Bituminous, Prefabricated, and reinforced for Roofing.

6.7.2.1(3)(a) Approved Products: Sopraseal Stick 1100T Self-Adhesive Membrane as manufactured by Soprema Inc., Protecto Wrap, Protecto Seal 45 as manufactured by Protecto Wrap, 3M - 3015 Self-Adhered Air Barrier Membrane manufactured by 3M Company, or acceptable alternative as reviewed by the Owner.

6.7.2.1(4) Dam the floor under key mechanical equipment in the mechanical penthouse, mechanical rooms and mechanical shafts with a continuous curb and waterproofing to contain the water. Provide floor drains.

6.7.3 Vapour Barriers

6.7.3.1 Prevent water vapour transmission and condensation in wall assemblies, roofing assemblies, and under concrete slabs-on-grade within the Facility perimeter by means of a continuous vapour barrier membrane:

6.7.3.1(1) Vapour Retarder Film conforming to CAN/CGSB-51.34-M86 - Vapour Barrier, Polyethylene Sheet for Use in Building Construction;

6.7.3.1(2) Polyethylene, (6 mils) thickness, or Self-Adhered Air/Vapour/Moisture Barrier Membranes conforming to CAN/CGSB 37-GP-56M – Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing;

6.7.3.1(3) Acceptable materials include Sopraseal Stick 1100T Self-Adhered Air/Vapour/Moisture Barrier Membrane manufactured by Soprema Inc., 3M - 3015 Self-Adhered Air/Vapour/Moisture Barrier Membrane, manufactured by 3M Company, Sopravap'r VP Self-Adhered Vapour Permeable Membrane manufactured by Soprema Inc., or acceptable alternative as reviewed by the Owner.

6.7.3.1(4) Minimum membrane thickness of Self-Adhered Vapour Barrier Membrane to be used in Roofing Assemblies to be per RCABC Warranty requirements.

6.7.3.1(5) For Tanked Foundation waterproofing system refer to Section 6.7.2.1 Waterproofing.

6.7.3.2 At underslab conditions, at parking, provide continuous vapour barrier not less than 0.25 mm (10 mil) thick plastic sheet complying with ASTM E1745, Class A.

6.7.3.2(1) Water Vapour Permeance: ASTM F1249, not more than 1.7ng/Pa-s-sq.m (0.03 perms);

6.7.3.2(2) Puncture Resistance: ASTM D1709, not less than 2,200 grams; and

6.7.3.2(3) Tensile Strength: ASTM D882, not less than 7.9 kN/m (45 lbf/in).

6.7.3.3 At underslab conditions, at finished floors, provide continuous vapour barrier not less than 0.38 mm (15 mil) thick plastic sheet complying with ASTM E1745, Class A.

6.7.3.3(1) Water Vapour Permeance: ASTM F1249, not more than 0.6 ng/Pa-s-sq.m (0.01 perms);

6.7.3.3(2) Puncture Resistance: ASTM D1709, not less than 3,200 grams; and

6.7.3.3(3) Tensile Strength: ASTM D882, not less than 12.6kN/m (70lbf/in).

6.7.3.4 Conduct dew-point analysis to determine correct placement of vapour barrier within wall and roof assemblies.

6.7.3.5 Coordinate locations of thermal insulation, waterproof membranes, and air and vapour barriers to prevent creation of dew point, resulting in condensation within assemblies.

6.7.4 Air Barriers

6.7.4.1 Prevent air leakage caused by air pressure across the wall and roof assembly by means of air barrier assemblies.

6.7.4.2 Air barrier testing will be conducted in compliance with City's Green Buildings Policy for Rezoning and VBBL (if applicable);

6.7.4.3 Self-Adhesive membrane air barriers conforming to CGSB 37-GP-56M – Membrane, Modified, Bituminous, Prefabricated, and reinforced for Roofing;

6.7.4.4 Approved Materials: Sopraseal Stick 1100T Self-Adhered Air/Vapour/Moisture Barrier Membrane manufactured by Soprema Inc., 3M - 3015 Self-Adhered

Air/Vapour/Moisture Barrier Membrane, manufactured by 3M Company, Sopravap'r VP Self-Adhered Vapour Permeable Membrane manufactured by Soprema Inc., or acceptable alternative as reviewed by the Owner.

6.7.4.5 Provide air barrier assemblies that:

6.7.4.5(1) 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 Facility elements including the roof; and

6.7.4.5(2) 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.

6.7.4.5(3) Self-Adhesive air barrier membrane conforming to CGSB 37-GP-56M – Membrane, Modified, Bituminous, Prefabricated, and reinforced for Roofing;

6.7.4.5(4) Acceptable products include Sopraseal Stick 1100T Self-Adhesive Membrane as manufactured by Soprema Inc., Protecto Wrap, Protecto Seal 45 as manufactured by Protecto Wrap, 3M - 3015 Self-Adhered Air Barrier Membrane manufactured by 3M Company, or acceptable alternative as reviewed by the Owner.

6.7.5 Thermal Protection

6.7.5.1 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.

6.7.5.2 Use thermal protection materials of a type and quality that will provide consistent environmental quality to enclosed spaces.

6.7.5.3 Use foamed plastic insulation that is CFC-free and HCFC-free and in compliance with the Province of British Columbia Ozone Depleting Substances Regulations.

6.7.5.3(1) Acceptable products include: "Polar Foam PF-7300-0 Soya" by Polyurethane Foam Systems Inc., or "Walltite Eco v.2 by BASF Canada Inc., Type 3 air barrier CFC free or an acceptable alternative as reviewed by the Owner.

6.7.5.4 Extruded Polystyrene (Exterior Walls) will conform to CAN / ULC-S701, Type 2

6.7.5.4(1) Acceptable rigid, extruded, closed-cell polystyrene foam insulation as manufactured by Dow Chemical Canada ULC, or acceptable alternative as reviewed by the Owner.

6.7.5.5 Mineral Wool Insulation in fire rated assemblies will conform to the VBBL requirements for fire rated assemblies.

6.7.5.5(1) Acceptable mineral wool insulation includes Roxul AFB by Rockwool or acceptable alternative as reviewed by the Owner.

6.7.5.6 Thermal Batt Insulation will conform to CAN / ULC-S702.

6.7.5.6(1) Acceptable manufacturer for thermal batt insulation includes Johns Manville International Canada Inc. or acceptable alternative as reviewed by the Owner.

6.7.5.7 In all circumstances, any foamed plastic insulation applications where exposed will require a code compliant fire rated thermal protective cover/barrier.

6.7.5.7(1) R20 (U-Value 0.05) for exterior walls; and

6.7.5.7(2) R30 (U-Value 0.033) for roof areas.

6.7.5.8 or higher as necessary to achieve targeted energy performance.

6.7.6 Roofing

6.7.6.1 Comply with the RCABC Guarantee Corp latest standards and requirements for a ten (10) year Guarantee as published in the RCABC Roofing Practices Manual. Perform roofing quality inspections as required by the RCABC to obtain the RCABC warranty.

6.7.6.2 Provide a complete horizontal barrier to the exterior using SBS modified bitumen roofing system (multi-ply) for all roofs in accordance with the following standards:

6.7.6.2(1) Base sheet: Conforming to CGSB 37-GP-56-M and ASTM D6162, Type II;

6.7.6.2(2) Base sheet flashing: Conforming to CGSB 37-GP-56M;

6.7.6.2(3) Cap Sheet and Cap Sheet Flashings: Conforming to CGSB 37-GP-56-M and ASTM D6162, Type II;

6.7.6.2(4) Traffic Cap Sheet: Conforming to CGSB 37-GP-56-M.

6.7.6.3 Minimum membrane thickness of Self-Adhered Vapour Barrier Membrane to be used in Roofing Assemblies to be per RCABC Warranty requirements.

6.7.6.4 Approved products for two (2) ply roof membrane systems, all from one manufacturer as approved for torch-applied base sheet and base sheet striping and torch-applied cap sheet and cap sheet stripping systems providing compliance with ULC Standards for a Class A Roof all as manufactured by Soprema Inc., or acceptable alternative, as listed in RCABC Approved Products Listing and reviewed by the Owner.

6.7.6.5 Approximately two weeks prior to scheduled commencement of roofing installation and associated work, convene pre-installation meeting at Site with installer,

installer of each component of associated work, installers of deck or substrate construction to receiving roofing work, installers of roof-top units and other work in and around roofing that will precede or follow roofing work (including mechanical work), representative of approved primary materials manufacturer, Project Co, Architect, Owner, and other representatives directly concerned with performance of the work. Record discussions of conference and decisions and agreements or disagreements reached and furnish copy of record to each party attending. "Protection" - Prevent traffic over completed roofing except where required by work above roof level. Comply with precautions deemed necessary by the Owner. Repair damage caused by non-compliance with the Owner's requirements. At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed work and materials out of storage.

6.7.6.6 Provide roofing assemblies that will withstand air pressures caused by aircraft utilizing the Future Heliport approaches and landings.

6.7.6.7 Comply with RCABC Roofing Practices Manual "Acceptable Materials List," including:

6.7.6.7(1) Flexible membrane for reflective roofs – Elastomeric or Thermoplastic (single-ply system), Energy Star compliant, highly reflective, and high emissivity, of at least 0.9 when tested in accordance with ASTM 408

6.7.6.8 Roof assembly Design including deck, vapour barrier, insulation, board stock, and membranes will comply with the VBBL for fire classifications and with RGC requirements for wind uplift requirements, as well as requirements for live loads, dead loads, snow loads and wind uplift. Comply with UL 580 Class 60 wind uplift classification.

6.7.6.9 Use foamed plastic insulation that is CFC- and HCFC-free and in compliance with the Province of British Columbia Ozone Depleting Substances Regulations.

6.7.6.9(1) Sprayed Polyurethane Insulation: Approved Products: "Polar Foam PF-7300-0 Soya" by Polyurethane Foam Systems Inc., or "Walltite Eco v.2" by BASF Canada Inc., Type 3 air barrier CFC free.

6.7.6.10 Provide a complete horizontal barrier to weather and climate using one of the roofing systems.

6.7.6.11 Roofing systems will include the following components:

6.7.6.11(1) Flashings and sheet metal;

6.7.6.11(2) Thermal insulation;

6.7.6.11(2)(a) Acceptable rigid insulation at roofs include Type 4 extruded expanded closed-cellular foam structure

as manufactured by Dow Chemical Canada, or acceptable alternative as reviewed by the Owner.

6.7.6.11(3) SRI complying with LEED requirements;

6.7.6.11(4) Roofing specialties and accessories required for completion including roof penetration housings for rooftop communications pathway system;

6.7.6.11(5) Interior access systems to roof areas;

6.7.6.11(6) Protection from pedestrian traffic and solar radiation; and

6.7.6.11(7) Roof drainage, including overflow scuppers.

6.7.6.12 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 flashings. Ensure that sheet metal components comply with wind uplift requirements established for roofing system

6.7.6.13 References for sheet metal flashings include: Roofing Contractors Association of British Columbia (RCABC). "Roofing Practices in British Columbia", Sheet Metal and Air Conditioning Contractors National Association (SMACNA), CSA HA Series-Mi 980, "CSA Standards for Aluminum and Aluminum Alloys", ASTM A653 / A653M-06 "Standard Specification for Steel Sheet, Zinc Coated (Galvanized), Zinc-Iron Alloy Coated (Galvanealed) or 55% Aluminum-zinc alloy coated (Galvalum) by Hot dip process.

6.7.6.14 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. In designing the Facility, including any roof systems, ensure that entrance ways are protected from sliding snow and ice and that there are no accumulations of snow and ice in roof valleys.

6.7.6.15 Ponding of water on roofs will not be accepted.

6.7.6.16 For flat roofs, drains will be positioned a minimum of 2 m away from unguarded roof edges.

6.7.6.17 All wood that is exposed to the exterior will be covered by an overhang or provided with flashing above of wood members, with drip edges that protect the wood from water exposure.

6.7.6.18 For the rooftop communications pathway system, provide roof penetration housings consisting of the following:

6.7.6.18(1) 2 mm thick aluminum housing and curb;

6.7.6.18(2) UV protected powder coated finish at 0.05 mm;

6.7.6.18(3) Stainless steel fasteners;

6.7.6.18(4) Gasketed lid to housing and housing to curb connection joints to ensure compliance to ICC 2015 Air Permeance Levels; and

6.7.6.18(5) Constructed to withstand VBBL-required wind loading.

6.7.7 Fire and Smoke Protection

6.7.7.1 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.

6.7.7.2 Apply protection around penetrations through vertical and horizontal fire-resistance rated separations.

6.7.7.3 Use firestopping and smoke seal systems that consist of asbestos-free materials and systems, capable of maintaining an effective barrier against flame, smoke, and gases.

6.7.7.4 Use firestopping that:

6.7.7.4(1) is compatible with substrates;

6.7.7.4(2) allows for movement caused by thermal cycles; and

6.7.7.4(3) prevents the transmission of vibrations from pipe, conduit or duct to structure and structure to pipe, conduit or duct.

6.7.7.5 When more than one product is required for an assembly, use products that are compatible with one another and from the same manufacturer. Products will comply with requirements established by ULC-tested assemblies.

6.7.7.5(1) is compatible with substrates;

6.7.7.5(2) allows for movement caused by thermal cycles; and

6.7.7.5(3) prevents the transmission of vibrations from pipe, conduit or duct to structure and structure to pipe, conduit or duct.

6.7.7.6 When more than one product is required for an assembly, use products that are compatible with one another and from the same manufacturer.

6.7.7.7 Are silicone-based and guaranteed not to re-emulsify if subject to wetting or standing water. Do not use acrylic-based coatings and sealants.

6.7.7.8 Is installed by an FM Global approved firestop contractor or an UL-qualified firestop contractor.

6.7.7.9 Is capable of maintaining an effective barrier against flame, smoke and gases when tested to CAN/ULC-S115 or ASTM E814 or UL 1479, acceptable to all applicable authorities having jurisdiction, and not exceeding opening sizes for which they are intended.

6.7.7.10 Are designed to allow for the 25% spare capacity of the corresponding Building System.

6.7.7.11 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.

6.7.8 Sealants

6.7.8.1 All sealants and sealant primers used on the interior of the Facility will comply with the requirements of LEED - low VOC.

6.7.8.2 Provide sealant around and over cavities, in or behind surface elements to meet infection control requirements, refer to Section 5.11 Infection Control. Sealant around door frames will include joints at bottom of door frames between floor finish and frames.

6.7.8.3 Sealed joints between dissimilar or similar materials to allow a smooth or even transitions.

6.7.8.4 Sealed expansion or controls joints in the building envelope systems or structural systems to allow movement.

6.7.8.5 Provide security pick proof sealants at all interior joints in Mental Health Areas.

6.7.8.6 Apply sealant materials to achieve:

6.7.8.6(1) Seals to the building envelope systems and around openings in the building envelope systems, as required to prevent water ingress;

6.7.8.6(2) Sealed joints between dissimilar or similar materials to allow a smooth or even transitions; and

6.7.8.6(3) Sealed expansion or controls joints in the building envelope systems or structural systems to allow movement.

6.7.8.7 Provide sealants to meet the following standards:

6.7.8.7(1) CAN / CGSB-19.24-M90 – Multi-Component, Chemical Curing Sealing Compound; and

6.7.8.7(2) CAN / CGSB-19.13-M87 – Sealing Compound, One Component, Elastomeric, Chemical Curing.

6.7.8.8 Acceptable sealants will include Polyurethane Single Component-Tremco Dymonic, Dow Corning 795 Silicone Building Sealant, Dow Corning 790 Silicone Waterproofing Sealant, Silicone Sealant (for sealing butt glazing).

6.7.8.9 Do not use unsealed joints in Clinical Spaces.

6.7.8.10 For the exterior, use sealants to completely and continuously fill all joints.

6.7.8.11 For the interior, use one component, acrylic emulsion, paintable type sealants at all frames to completely fill joints between dissimilar materials in order to:

6.7.8.11(1) Seal all door frames to floor;

6.7.8.11(2) Seal all top edge of equipment rails and wood hand, bumper and crash rails to wall.

6.7.8.12 Use silicone caulking that is mildew-resistant and impervious to water for caulking washroom plumbing fixtures.

6.7.8.13 Use sealants with self-levelling properties for expansion and control joints in concrete floors using two-component epoxy urethane sealants.

6.7.8.14 Use non-sag sealants for exterior vertical expansion and control joints in masonry or wall cladding.

6.7.8.15 Use sealants that allow for minimum 25% movement in joint width.

6.7.8.16 In corridors and other traffic areas used by AGV carts, laundry carts, supply carts, material handling equipment etc., use traffic bearing type sealants suitable to support imposed load without deformation or failure.

6.7.9 Traffic Coatings

6.7.9.1 Provide traffic coatings to prevent the ingress of moisture and protect suspended structural concrete floor slabs from vehicular and pedestrian traffic at a minimum in the following locations:

6.7.9.1(1) Underground parking structures;

6.7.9.1(2) Energy Centre;

6.7.9.1(3) Mechanical rooms;

6.7.9.1(4) MDRD, including where concrete is exposed such as at equipment pits;.

6.7.9.1(5) Operational Support Component except for administrative areas;

6.7.9.1(6) Loading dock; and

6.7.9.1(7) Ambulance Garage

6.7.9.2 Use traffic coating that complies with the following:

6.7.9.2(1) Membrane: Fluid applied aliphatic polyurethane waterproof traffic membrane, colour as selected by the Owner, liquid applied, two component 100% solids, and meeting or exceeding the following specifications:

6.7.9.2(1)(a)	Property ASTM Test Result
6.7.9.2(1)(b)	Tensile Strength D638 9.1 MPa
6.7.9.2(1)(c)	Elongation at Break D638 435%
6.7.9.2(1)(d)	Tear Strength D624 38.2 KN/mm
6.7.9.2(1)(e)	Hardness D2240 80 Shore A
6.7.9.2(1)(f)	Abrasion Resistance wear course (cs-17 wheel) D4068
6.7.9.2(1)(g)	Maximum Weight loss of 22 mg/1000 cycles

6.7.9.2(2) References include: STM C957-06 Standard Specification for High Solids Content, cold Liquid - Applied Elastomeric waterproofing membrane with Integral Wearing Surface, City Building Bylaw 2014, CAN / CSA-S4 13-07 (R2012), "Parking Structures".

6.7.9.2(3) Acceptable products include "Sonoshield Sonoguard" manufactured by Sonneborn / BASF, "Urelastic 5000 / 6000 TC Deck Waterproof Membrane" manufactured by Universal Polymers Inc., or acceptable alternative as reviewed by the Owner.

6.7.9.2(4) Topping: Polyurethane compound wear course. Install additional layer at all drive isles, entrance/exit, ramps, and expansion joints to Manufacturer’s recommendations. Ensure that the topping will provide sufficient traction during adverse weather conditions;

6.7.9.2(5) Filler and Primer: As recommended by membrane manufacturer;

6.7.9.2(6) Sealant: Polyurethane type, compatible with system and adjacent materials.

6.7.9.3 Provide fluid applied integral flashings at all locations where a horizontal surface butts a vertical surface. Apply the membrane over the prepared surfaces at a minimum thickness of 500 microns thick and extend the membrane a minimum of 10 cm on vertical and horizontal surfaces.

6.8 Openings (Division 8)

6.8.1 Basic Requirements

6.8.1.1 Provide white matte translucent privacy film on window and door and glazing where required for privacy by the Owner.

6.8.1.2 Project Co will, in collaboration with the Owner, review the extent of glazing in doors, and balance the extent of observation and the privacy requirements of the occupants of the room.

6.8.1.3 Subject to any other glazing specifications set out in this Section, at minimum provide all exterior and interior glazing of tempered-laminated glass.

6.8.1.4 Installation methods and locations for doors, frames and hardware will comply with the standards of the Door and Hardware Institute (DHI) for Hospitals Facilities unless otherwise indicated in the Design and Construction Specifications.

6.8.2 Doors

6.8.2.1 Basic Requirements

6.8.2.1(1) For spaces listed in Appendix 3A [Clinical Specifications and Functional Space Requirements], provide the minimum width; minimum quantity, and type of door described in Appendix 3M [Door Requirements Matrix].

6.8.2.1(2) At all corridor doors, including secured and fire separation doors, where Patient wheelchair/stretcher/bed movement is expected, including doors into or between major departments, restricted zones or activity areas, provide automatic doors activated by touch-free controls located at a height accessible to Persons with Disabilities on the inside and outside of the doors. Doors will be configured for push-pull manual operation in addition to automatic operation. Timing of door controls, including distance from the opening, will be designed and adjusted by Project Co before Service Commencement to facilitate individuals moving Patients, stretchers or other large equipment through the doors.

6.8.2.1(3) One (1) public washroom and one (1) Staff washroom per floor (2 washrooms per floor level) that is publicly accessible in the Facility will accommodate a bariatric wheelchair. Doors to this room will be on automatic openers.

6.8.2.1(4) For door acoustical requirements, refer to Appendix 3C [Acoustic and Noise Control Measures]. Provide acoustic seals and drop seals as required;

6.8.2.1(5) Doors will not swing into corridors, obstruct traffic flow or reduce the minimum required corridor width.

6.8.2.1(6) Provide sealed double glazing in aluminum frame sliding doors, sliding doors to be without floor tracks, and be provided with emergency swing breakout.

6.8.2.1(7) Provide doors and door frames that will withstand the varying and high levels of humidity and impact while maintaining their inherent aesthetic and functional capacities.

6.8.2.1(8) Wood doors will not be used for service or Staff Back of House entrances to Component due to high traffic of transfers and equipment/supply movements.

6.8.2.1(9) For the process-oriented Components such as FMO, Energy Centre, Laboratory, Pharmacy, MDRD and Biomedical Engineering, provide doors in addition to those listed in Appendix 3M [Door Requirements Matrix] as required by the Owner to suit its functional requirements based on the Design.

6.8.2.1(10) For all doors: floor mounted rails, slides and/or locking pins are not permitted, top mount only. Provide extensions for top bolts for over-height doors so operable hardware is within 1.8 m AFF.

6.8.2.1(11) Operating Room and Interventional Suite doors will be of a quality that allows for the required seal to maintain HVAC as well as acoustical privacy.

6.8.2.1(12) Provide glazing in interior and exterior doors to allow for proper security, Line of Sight, and as a means of achieving Direct Natural Light or Borrowed Light.

6.8.2.1(13) Exterior doors will meet the requirements of ASHRAE 90.1. All exterior doors will be thermally broken.

6.8.2.2 Washroom Door Requirements

6.8.2.2(1) All Patient washroom doors including ensuite washrooms will be designed as Ligature Resistant and Anti-Barricade. Doors will either swing out into the adjacent room or be dual swing. Provide a key override for emergency Staff access.

6.8.2.2(2) All Patient ensuite washroom doors described as Door Type K in the Appendix 3M [Door Requirements Matrix] will be Ligature Resistant and Anti-Barricade that are specifically designed for behavioural health and will include:

6.8.2.2(2)(a) Door panel with sloping top held down 300 mm from the top of the door frame; and

6.8.2.2(2)(b) Door panel raised above the floor 300 mm.

6.8.2.2(2)(c) Door hardware will be Ligature Resistant and Anti-Barricade design.

6.8.2.3 Size Requirements for Doors

6.8.2.3(1) The door widths described in Appendix 3M [Door Requirements Matrix] are minimum door slab width dimensions for swing doors and minimum clear opening width dimensions for sliding doors, and will be widened as follows:

6.8.2.3(1)(a) To allow equipment or supplies to be easily moved in and out of the space;

6.8.2.3(1)(b) To allow Patients and visitors in wheelchairs or other mobility aids;

6.8.2.3(1)(c) To enable multiple Staff to accompany a Patient on a stretcher where required; and.

6.8.2.3(1)(d) As otherwise required by the Owner to meet the functional requirements of the space.

6.8.2.4 Bariatric Requirements for Doors.

6.8.2.4(1) Swing doors for bariatric Patients will have a clear floor area beside the latch edge that extends the full height of the door, for 940 mm on the pull side and 640 mm on the push side.

6.8.2.4(2) Provide a clear dimension extending 2.4 m on the pull side and 1.725 m on the push side for bariatric Patient rooms and 1.8 m on the pull side and 1.725 m on the push side for all other bariatric doors.

6.8.2.4(3) Sliding doors for bariatric Patients will have a clear floor area beside the latch edge that extends the full height of the door of 600 mm on both sides of the door.

6.8.2.4(4) The minimum bariatric door width will be 1.53 m clear in a double door configuration (1.07 m and 460 mm).

6.8.2.5 NICU Patient Room Requirements for Doors

6.8.2.5(1) Provide a sliding door or other door type to provide family privacy within NICU Patient Rooms. Door(s) will divide the family zone

from the Patient zone and provide acoustic privacy for undisturbed sleep and privacy as a family. Curtains will not be acceptable.

6.8.2.6 Operating Room and Interventional Suite Requirements for Doors

6.8.2.6(1) The Patient entrance into each Operating Room and Interventional Suite will be configured in relation to the alcoves located outside of the room, such as Alcove-Scrub Station and Alcove-Stretcher, to create a recessed space within the room of appropriate width to allow each panel of the double doors to fold when open against the party wall shared with an alcove, ensuring that the door panel does not swing into useable space inside the room.

6.8.3 Wood Doors

6.8.3.1 Project Co will provide flush wood core doors for the Facility including the following:

6.8.3.1(1) solid core flush doors with plastic laminate faces;

6.8.3.1(2) fire rated flush wood core doors;

6.8.3.1(3) all transoms, glass lites non-rated, fire rated and stops and openings; and

6.8.3.1(4) sealed door edges.

6.8.3.2 Wood doors will have hardware and finishes that suit the intended function and aesthetics of the Facility. All wood door edges will be sealed.

6.8.3.3 In locations requiring radiation shielding, line doors with lead and label such doors with lead thickness. Doors in walls will have the same radiation shielding as the walls in which they are located, unless otherwise required by the Radiation Protection Adviser.

6.8.3.4 Provide door frames, specially designed for the weight of the door, and with radiation shielding equivalent to the wall in which they are located. Where there are double doors, provide a shielded astragal.

6.8.3.5 Wood doors are not permitted in areas and service rooms (e.g., mechanical, electrical, communications, exit stairs, etc.).

6.8.3.6 Project Co will provide flush wood core doors will CSA approved wiring system and conduits for all electronic hardware and automatic door operators including openings to suit electronic and regular hardware.

6.8.3.7 Project Co will ensure doors are obtained from one (1) source by a single manufacturer.

6.8.3.8 Ensure fire rated doors comply with NFPA-80 and carry labels acceptable to the Governmental Authority; Site applied and stamped fire-labeling is not acceptable.

6.8.3.9 Construct doors with five (5) ply construction for plastic laminate faces in accordance with AWS and ANSI/WDMA I.S 1A standards unless otherwise indicated.

6.8.3.10 Provide doors which meet the STC ratings as specified in Appendix 3C [Acoustic and Noise Control Measures].

6.8.3.11 Performance Requirements

6.8.3.11(1) Provide flush wood core doors which comply with WDMA I.S 1A, Section C-13, Flush Wood Door Minimum Performance Standards, Duty Level: Extra Heavy Duty.

6.8.3.11(1)(a) Extra heavy duty doors will be provided throughout the Facility unless otherwise noted.

6.8.3.11(2) Provide fibre reinforced laminate door facing as follows:

6.8.3.11(2)(a) Fibre reinforced laminate, 1.9 mm (0.075 inches) thick, monolithic panel with 20% continuous glass fibres; with the following properties:

6.8.3.11.2.(a).1 Barcol Hardness: ASTM D2583, 35 typical.

6.8.3.11.2.(a).2 Wear Resistance: NEMA 3, 13: Minimum 3,500.

6.8.3.11.2.(a).3 Surface Burning: ASTM E84, Class A. .1 Flame Spread: 25 or less.

6.8.3.11.2.(a).4 Smoke Developed: 30 or less.

6.8.3.11(3) Provide standard duty non-rated flush wood Core Doors to meet the following requirements:

6.8.3.11(3)(a) Facing: as noted above.

6.8.3.11(3)(b) Core: Particle Board: ANSI A208.1; 449 kg/m3 – 513 kg/m3 (28 lb/ft3 – 32 lb/ft3) density solid particle core, mat-formed sanded both sides, thickness as recommended by AWI/AWMAC for specified requirements. Ensure items are classified M2 in accordance with ASTM E1333.

6.8.3.11(3)(c) Stiles: Minimum 11 mm thick (7/16”) thick hardwood laminated to 25 mm (1”) thick structural composite lumber or laminated veneer lumber bonded to core with matching sealed hardwood edge strips. Total Thickness: Manufacturer’s standard thickness

required to meet performance requirements specified herein.

6.8.3.11(3)(d) Rails: Minimum 30 mm thick (1-3/16”) thick hardwood, structural composite lumber or laminated veneer lumber bonded to core.

6.8.3.11(3)(e) Crossbands: Provide high-density composite crossbands in manufacturer’s standard thicknesses required to meet performance requirements specified herein. Ensure crossbands extend full width of door.

6.8.3.11(3)(f) Adhesive: Type I, Waterproof, as recommended by Product manufacturer for designated application and containing no added urea-formaldehyde.

6.8.3.11(3)(g) Standard duty doors will be provided for private offices and administrative rooms with a single workstation and single-occupant washrooms used only by Staff.

6.8.3.11(4) Provide heavy duty non-rated flush wood core doors at locations such as doors which have push bar exit devices or as otherwise required as follows:

6.8.3.11(4)(a) Facing: as noted above.

6.8.3.11(4)(b) Core: ASTM D5456 or ANSI I.S.4,structural composite lumber or laminated veneer lumber laminated using hot pressing process with Type 1 adhesive as specified herein. Floating cores are not acceptable.

6.8.3.11(4)(c) Stiles: Minimum 11 mm thick (7/16”) thick, hardwood, structural composite lumber or laminated veneer lumber bonded to core with matching sealed hardwood edge strips.

6.8.3.11(4)(d) Total Thickness: Manufacturer’s standard thickness required to meet performance requirements specified herein.

6.8.3.11(4)(e) Rails: Integrated.

6.8.3.11(4)(f) Crossbands: Provide high-density composite crossbands in manufacturer’s standard thicknesses required to meet performance requirements

specified herein. Ensure crossbands extend full width of door.

6.8.3.11(4)(g) Adhesive: Type I, Waterproof, as recommended by Product manufacturer for designated application and containing no added urea-formaldehyde.

6.8.3.11(4)(h) Heavy duty doors will be provided for the following spaces:

6.8.3.11.4.(h).1 Shared offices or spaces with multiple workstations;

6.8.3.11.4.(h).2 Change Room-Staff and Change/Foot Wash;

6.8.3.11.4.(h).3 Lounge-Staff, Lounge-Volunteer, Lounge-Medical Staff, Lounge-Learner and Training Room/Staff Lounge; and

6.8.3.11.4.(h).4 Exam Rooms in the Outpatient Care Centre, except those for which a radiation shielding system is required;

6.8.3.11(5) Provide fire-rated flush wood core doors which meet the following requirements:

6.8.3.11(5)(a) Facing: as noted above.

6.8.3.11(5)(b) Core: Incombustible mineral core to meet fire-resistance rating requirements specified herein.

6.8.3.11(5)(c) Stiles: Manufacturer’s standard stiles as required for fire rating.

6.8.3.11(5)(d) Rails: Manufacturer’s standard rails as required for fire rating.

6.8.3.11(5)(e) Interior Blocking: Approved fire-retardant reinforcement minimum 120 mm (4-3/4") high at top, bottom rails and at mid height of doors as required to secure surface applied hardware with screw meeting WDMA Extra Heavy-Duty Performance. Provide minimum 11 mm (7/16") hardwood blocking in accordance with WDMA standards. On doors over 900 mm (36") wide, provide additional approved fire-retardant reinforcement to hinge stile of door.

6.8.3.11(5)(f) Vision Framing: ULC labeled, Prime painted metal framing or fire rated wooden molding kit to match door faces.

6.8.3.11(6) Provide specialty doors to meet the following requirements:

6.8.3.11(6)(a) Sound Retardant Flush Wood Core Doors: Unless otherwise indicated, fabricate doors as follows:

6.8.3.11.6.(a).1 Facing: as noted above.

6.8.3.11.6.(a).2 Core: Acoustical sound attenuating core with proprietary sound attenuating material to achieve minimum STC ratings specified in Appendix 3C [Acoustic and Noise Control Measures] when tested in accordance with ASTM E90.

6.8.3.11.6.(a).3 Stiles: Manufacturer's standard stiles as required for sound attenuation rating.

6.8.3.11.6.(a).4 Rails: Manufacturer's standard rails as required for sound attenuation rating.

6.8.3.11.6.(a).5 Crossbands: Provide high-density composite crossbands in manufacturer's standard thicknesses required to meet performance requirements. Ensure crossbands extend full width of door.

6.8.3.11.6.(a).6 Sound Traps and Seals: as required for sound attenuation rating.

6.8.4 Hollow Metal Doors and Frames

6.8.4.1 Provide interior metal doors with flush face and no trims construction.

6.8.4.2 Doors with an inactive leaf will not be floor bolted. Bolt into frame instead.

6.8.4.3 Provide 16-gauge steel doors with vertical interlocking steel stiffeners and continuous welded edge seams for all doors over 915 mm wide. Provide high frequency hinge reinforcing to suit heavy weight hinges.

6.8.4.4 Provide 18-gauge steel doors with continuous welded edge seams for all doors up to 915 mm wide.

6.8.4.5 Provide exterior metal doors with:

6.8.4.5(1) flush face construction, continuously welded, seamless edge construction using steel sheet;

6.8.4.5(2) fully sealed weather cap on top of door

6.8.4.5(3) welded edge seams;

6.8.4.5(4) edge seams to correspond with door function and minimize maintenance needed; and

6.8.4.5(5) prepared surfaces to receive finishes that resist corrosion from exposure to weather. Provide with ZF180 coating; and

6.8.4.5(6) all exterior doors that open out will be capped to avoid water collecting in welding channels.

6.8.4.6 Provide pressed metal frames with:

6.8.4.6(1) fully welded construction. Provide fully welded 16 gauge frames. Provide high frequency hinge reinforcing to suit heavy weight hinges. Provide 12 gauge welded reinforcing for all surface applied door hardware;

6.8.4.6(2) thermally-broken door frames for exterior door; and

6.8.4.6(3) anchors to each jamb to suit wall type and receive the frame.

6.8.4.7 Provide door glazing as follows:

6.8.4.7(1) For exterior hollow metal door glazing, use sealed units with warm edge, in thermally-broken frames to prevent heat loss.

6.8.4.7(2) For interior hollow metal door glazing use tempered glass. Provide with safety label where required.

6.8.5 Automatic Sliding Doors

6.8.5.1 Provide automatic sliding doors complete with break-away capability for exiting. Exterior entrance vestibules will be designed such that both sets of doors will not be open at the same time.

6.8.5.2 Ensure door equipment will accommodate medium to heavy pedestrian traffic and up to the following weights for active leaf doors: 100 kg for bi-part doors and 200 kg for single slide doors.

6.8.5.3 Provide door operators, including the motion and presence detection system that are capable of operating within the temperature ranges existing at the Facility and ancillary buildings and unaffected by ambient light or ultrasonic interference.

6.8.5.4 Provide energy-saving devices to reduce conditioned air or heat loss.

6.8.5.5 Installation will be by a certified technician approved by the manufacturer.

6.8.5.6 Manufacturer will be Record-USA, Monroe, North Carolina, USA, or acceptable alternative as reviewed by the Owner.

6.8.5.7 Provide a complete sliding door package, including the following: framing, flush mounted header (mounted between jambs), sliding door panel(s), stationary panel(s), operators (belt drive only-linear rod not accepted), activation and safety devices, carrier assemblies, noise isolating roller track, threshold, and guide tracks, to match threshold dimensions on full breakout units.

6.8.5.8 Traffic patterns to be determined by Owner and set by installer using Record-USA exclusive S.M.A.R.T. panel per application.

6.8.5.9 Door and frame materials will comply with the following standards:

6.8.5.9(1) Header, frames, stiles and rails: 6063-T5;

6.8.5.9(2) Extruded bars, rods, profiles and tubes: ASTM B221;

6.8.5.9(3) Sheet and plate: ASTM B209; and

6.8.5.9(4) Framing Members: Will be manufacturer's standard extruded aluminum.

6.8.5.10 Provide bumper stop or cushioned stop on all automatic sliding doors.

6.8.5.11 Where automatic sliding doors have access control, Project Co will provide an interface between the automatic door opener and the access control system such that when the door is secured by access control, the secure side input devices are inactive unless there is a valid card-swipe.

6.8.6 Automatic Swing Doors

6.8.6.1 Use automatic swing doors, or automatic sliding doors as alternate will be as determined with the Owner for interior and exterior locations where required, including cross-corridor double-egress doors, entrances to departments, and areas where stretchers and equipment are frequently wheeled, and doors to exterior spaces that are required to be accessible to Persons with Disabilities. Project Co will ensure placement of door controls are accessible to Staff pushing wheeled equipment including Patient stretchers.

6.8.6.2 If used, provide directional motion sensor control devices that are unaffected by ambient light or ultrasonic frequencies. Motion sensors can be used in place of a hands-free operation to activate auto door operators if Project Co can demonstrate to the Owner's satisfaction it meets their operational requirements.

6.8.6.3 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.

6.8.6.4 Implement longer hold-open times to accommodate the elderly and frail.

6.8.6.5 Where automatic swing doors have access control, Project Co will provide an interface between the automatic door opener and the access control system such that when the door is secured by access control, the secure side input devices are inactive unless there is a valid card-swipe.

6.8.7 Aluminum Entrances and Storefronts

6.8.7.1 Aluminum entrances and storefront framing and doors may form part of the exterior envelope of the Facility. Styles and rails will be oversized to avoid the failure of glazing unit and potential twisting and fastener failure of door frame assembly.

6.8.7.2 Provide glazed interior partitions to meet the functional requirements of the spaces as defined by Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.8.7.3 Provide aluminum doors within aluminum entrances and storefront.

6.8.7.4 Provide frames that are thermally-broken, flush glazed, aluminum sections, to accept insulating glass units.

6.8.7.5 Provide Rain Screen frames drained and vented system 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.

6.8.7.6 Provide aluminum swing entrance doors that are heavy-duty commercial or institutional grade, automatically operated, motion-detector controlled.

6.8.7.7 Finish to be permanent and resistant to corrosion caused by weather exposure and climate.

6.8.7.8 Provide a minimum 150 mm wide mid-rail at a height between 900 and 1.1 m AFF.

6.8.7.9 Swing doors will be provided with a continuous hinge. Pivot hinges are not acceptable.

6.8.7.10 Apply aluminum finish for exposed aluminum surfaces. Finish to be permanent and resistant to corrosion caused by weather exposure and climate.

6.8.7.11 Aluminium mullions will have a deflection limit in conformance with ASTM E330.

6.8.7.12 Acceptable architectural aluminium doors and frames will include Kawneer Trifab, Metro Aluminium, Columbia or acceptable alternative as reviewed by the Owner.

6.8.7.13 Provide the following warranties:

6.8.7.13(1) Framing, panels and glazing: 2 years

6.8.7.13(2) Aluminium breakshapes including oil-canning and delaminating: 2 years

6.8.8 Specialty Doors

6.8.8.1 Overhead Fabric Rolling Door

6.8.8.1(1) Provide commercial grade overhead rolling door with fabric door panel at the Ambulance Garage. Minimum door width will be 10 m

with the overall clear height to accommodate the largest anticipated BC Ambulance serving the Facility.

6.8.8.1(2) Door panel will be 3-ply, 2.54 mm thick fabric with vinyl loop seal on bottom bar. Material will be multi-layered, woven, dimensionally stable, puncture resistant, polymer impregnated, multifilament polyester fabric. Fabrics that are flexible both vertically and laterally are not accepted.

6.8.8.1(3) Side frames will be reinforced with front and rear wind bar guides and front and rear full-height weather seals to seal against the panel material. Two sets of factory-installed thru-beam safety photo eyes will be included.

6.8.8.1(4) Bottom bar will be capable of breaking away when hit from either direction without damaging or bending the bottom bar, safety astragal, or side covers and reassembled without tools. Breakaway and reversing signal is carried to the door controller via radio frequency. Use of coil cord to transmit signal to door controller is not accepted.

6.8.8.1(5) Bottom safety edge will allow door to reverse to its full open limit when coming into contact with an obstruction above floor line during downward travel.

6.8.8.1(6) Include “kill” switch to automatically shut off motor when door is impacted.

6.8.8.1(7) Provide separate counterbalance and fabric tensioning. Guided counterweights to be custom-sized for proper balancing of door. Independent tensioning system maintains constant panel tension. System to include polyester belting and UHMW spools. Use of springs or separate counterbalance and tensioning system is not accepted.

6.8.8.1(8) Provide heavy-duty three-phase, variable-speed AC drive provides soft acceleration and deceleration with independent opening and closing speeds, with manual override in case of power failure. Motor and electrical components will be factory wired to junction boxes in the head assembly. Motors using clutch or brake to start or stop door movement is not accepted.

6.8.8.1(9) Door panel speed will be adjustable, but factory set to open at 1.27 m/sec.

6.8.8.1(10) Provide absolute rotary encoder to regulate door travel limits. Limits are adjustable at the control panel, without the use of tools. The use of mechanical limit switches, or limit adjustments at the door operator are not accepted.

6.8.8.1(11) Door to have strapped wind bar, if necessary, which travels in its own guide rather than integrated into door panel. Integrated wind bars are not accepted.

6.8.8.1(12) Provide slated hood cover and door panel.

6.8.8.1(13) Electrical components:

6.8.8.1(13)(a) All electronic controls will be housed in a cUL listed, NEMA 4X-rated enclosure.

6.8.8.1(13)(b) Provide control panel at floor level with self-diagnostic display for informational message for installation, control adjustments and error reporting. Control panel will log all time and date stamped errors for at least 2 years, downloadable to a USB flashdrive.

6.8.8.1(13)(c) Provide programmable inputs and outputs accommodate special control applications without the need for additional electrical components.

6.8.8.1(13)(d) Provide wireless opening/closing capability and multi-button remotes for ambulance and Control-Security use, compatible with existing wireless remotes used by the BC Ambulance Service.

6.8.8.1(13)(e) Provide one-year limited warranty parts and labor on mechanical and electrical components and five-year limited warranty on door panel material.

6.8.8.1(14) Acceptable door will be Fast-Seal FS1000 by Rytec Doors or acceptable alternative as reviewed by the Owner.

6.8.8.2 Overhead Rolling Service Doors

6.8.8.2(1) Provide ULc listed heavy-duty, high-starting torque electric motor operation for all overhead doors, complete with manual override for times of power outage or motor failure, and inertia brakes, located on the drive shaft, to prevent curtain free fall. Restrain lateral movement of door curtain slats. Provide windlocks as required by door size or wind load requirements.

6.8.8.2(2) Provide interlocking flat slats, complete with bottom bar and contact type bottom astragal.

6.8.8.2(3) Where manually operated doors are required, provide inside lift handle and locking bar or chain hoist. Motor operation will be

provided on doors requiring constant usage. Chain operation will be by means of reduction gears and galvanized hand chain.

6.8.8.2(4) For fire doors, provide automatic closing device operated by fire door release device connected to fire alarm system.

6.8.8.2(5) Insulate overhead rolling service doors with a minimum insulation value of RSI-1.4 (R-8) and provide weather stripping / seals.

6.8.8.3 Overhead Rolling Security Grille

6.8.8.3(1) Provide grilles that allow visual access to secure areas including M2.1.3 Food Court and M2.1.2 Coffee Shop/Cafe.

6.8.8.3(2) Provide aluminum or steel guides that are: fabricated to withstand vertical and lateral loads; counterbalanced by helical torsion springs; and sound-deadened.

6.8.8.3(3) For manually operated closures, provide inside lift handle and locking bar or chain hoist. Provide motor operation on grilles requiring constant usage. Provide chain operation by means of reduction gears and heavy chrome plated hand chain.

6.8.8.3(4) Provide motor operation for any overhead doors to be operated by clinical Staff.

6.8.8.3(5) Provide motor operation for gates within the underground parking area of the Facility. For parking areas, gate will have card access control, timer control function and embed sensors for egress. Provide an adjacent man door with card access control at each gate.

6.8.8.4 Overhead Rolling Counter Shutters

6.8.8.4(1) Provide overhead rolling counter shutters at all reception desks, transaction counters and Serveries.

6.8.8.4(2) Provide shutter curtains fabricated with extruded aluminum, or galvanized steel interlocking flat slats, complete with guides of similar materials.

6.8.8.4(3) Provide motorized operation for overhead shutters with manual override and locking capability.

6.8.8.4(4) Provide monitored electric or photoelectric sensors for entrapment protection.

6.8.8.5 High-Speed Service Doors

6.8.8.5(1) Provide rolling high-speed service doors consisting of curtain material with knock-away capability for easy reassembly upon impact. After accidental impact, doors will be capable of reset from ground level without the use of ladders, tools or lift equipment.

6.8.8.5(2) The curtain material will consist of two (2) layers of styrene butadiene rubber (SBR) each 3.2 mm (1/8") thick, 70 durometer; sandwiched with 1-ply, 50kg (110 lbs.) polyester cord centre. The curtain will provide resiliency and flexibility at temperatures ranging from -40°F to +180°F (-40°C to +85°C).

6.8.8.5(3) Provide rolling high-speed service doors equipped with reversing sensing edge to stop and reverse door. The reversing edge will be replaceable without removing the bottom bar from the curtain. Doors will be constructed of steel, aluminum and SBR rubber/woven curtain and be equipped for operation by electric operator.

6.8.8.5(4) Electric door operators will be CSA/UL approved, heavy-duty gearhead type with pre-wired, number coded control cabinet. Motors will be totally enclosed, fan-cooled (TEFC) electric motors with high-starting torque, flange and foot mount, hoist-type, operating through a parallel helical gear reducer mechanism. Worm gear reducers will not be accepted.

6.8.8.5(5) Operator will be equipped with limit switches to control open and close door positions as well as brake system to stop and hold door in any position. Operator will be equipped with built-in manual emergency chain hoist. Built-in electrical interlock will prevent motor operation during use of manual chain hoist.

6.8.8.5(6) Control panel enclosure will be NEMA-4 and will be ULC listed. Drive system will be controlled by programmable logic controller (PLC) complete with inverter drive for soft start and soft stop door operation. Control panel will have adjustable closing timer, three push buttons for open, close and stop functions and a cycle counter. Control panels without inverter drive will not be accepted.

6.8.8.5(7) Acceptable door will be TNR Doors Model “HDS” Heavy Duty High Speed Doors or acceptable alternative as reviewed by the Owner.

6.8.8.6 Interior Sliding Doors

6.8.8.6(1) Unless otherwise noted, provide interior sliding doors as required in the Appendix 3M [Door Requirements Matrix] with recessed

mounted track, sliding and fixed panel(s) single glazed with 6.0 mm clear fully tempered glass with safety glazing labelling.

6.8.8.6(2) Provide interior glass sliding doors without floor track.

6.8.8.6(3) Provide interior sliding doors and interior glass sliding doors with break-out capability.

6.8.8.6(4) Provide visual cues/glazing film in transparent glass panels as appropriate to prevent collisions.

6.8.8.7 Side Folding Polycarbonate Grille

6.8.8.7(1) Project Co will provide bi-parting, manually operated side-folding grille complete with overhead track, locking posts, pocket door and storage enclosure for stacking. All necessary structural support complete with seismic bracing will be provided.

6.8.8.7(2) Curtain panel will be 184 mm wide with 102 mm high bottom and 133 mm high top plates of truss like aluminum and glazed with 3 mm fire-resistant polycarbonate with a 100 percent viewable area of 121 mm wide. Connect panels with two-piece vertical aluminum tubular hinges. Finish for exposed aluminum parts, including locking posts will be clear anodized. Curtain height will be adjustable up to 25 mm up or down without removal.

6.8.8.7(3) Posts will include:

6.8.8.7(3)(a) Wall channel or fixed end post as required, finish to match curtain panel;

6.8.8.7(3)(b) Bi-part lead post with cylinder exterior and interior thumb turn and drop bolt. Intermediate post will have interior drop bolt; and

6.8.8.7(3)(c) Floor sockets to accept drop bolt.

6.8.8.7(4) Overhead track will be heavy-duty extruded aluminum sections, 35 mm wide by 41 mm high, with continuous extruded profile seamed together by alignment bars and track pins. Track to accept 28mm inch nylon Trolleys and carry weight of complete curtain. Track will be concealed by the ceiling finish.

6.8.8.7(5) Provide two year warranty from time of installation for defective materials and workmanship.

6.8.8.7(6) Acceptable manufacturer will be Cornell ESC-31 or Overhead Door model 677 or acceptable alternative as reviewed by the Owner.

6.8.9 Door Sidelights

6.8.9.1 Provide door sidelights at minimum, at the locations described in Appendix 3M [Door Requirements Matrix] and at other locations where required to provide Line of Sight for Patient or Staff safety.

6.8.9.2 Provide interior windows and door sidelights consisting of minimum 6.0 mm thick clear fully tempered glass with safety glazing labelling.

6.8.9.3 Provide white matte translucent privacy film on door sidelight glazing which balances the extent of observation required and the privacy requirements of the occupants of the room.

6.8.9.4 Project Co will provide minimum 460 mm wide door sidelight glazing.

6.8.9.5 Provide the lower horizontal mullion of the door sidelight such that it is horizontally aligned with the adjacent handrail height to allow for extension of adjacent handrail.

6.8.9.6 Door sidelights will have minimum STC ratings as specified in Appendix 3C [Acoustic and Noise Control Measures]. The perimeters will be sealed to prevent sound leakage.

6.8.9.7 Refer to Drivers' Visibility Section 4.26.9 for additional door sidelight requirements.

6.8.10 Door Hardware

6.8.10.1 Basic Requirements

6.8.10.1(1) The Owner's goal is to limit the use of keys through door hardware technology. Location of card readers and other technologies are described in Section 7.10.4.

6.8.10.1(2) Refer to Appendix 3M [Door Requirements Matrix] for door hardware groups for each space listed in Appendix 3A [Clinical Specifications and Functional Space Requirements]. Doors, door hardware and controls will meet the Owner's functional requirements based on the Design.

6.8.10.1(3) For all exterior entrances not otherwise noted in Appendix 3M [Door Requirements Matrix] such as C4HA Outpatient Clinics Entrance and Food Court Entrances which are not listed in Appendix 3A [Clinical Specifications and Functional Space Requirements], provide door hardware to achieve the functionality described in door hardware groups; AO-10 and AO-11 below.

6.8.10.1(4) In Clinical Spaces, provide a permanent, non-toxic antimicrobial finish on door handles, push plates and pulls.

6.8.10.1(5) Doors in Patient-accessible spaces within Mental Health Areas will be provided with Ligature Resistant hardware and Tamper Resistant fasteners. Unless otherwise noted, locks and latches will be push/pull style that is Ligature Resistant and provides for hands-free operation.

6.8.10.1(6) All doors within Patient accessible corridors and at Component entrances that are closed due to VBBL requirements and/or controlled access requirements will be on automatic operators.

6.8.10.1(7) Provide automatic operators on doors in all corridors and service areas to facilitate the movement of materials, carts and equipment. Both leaves are to open allowing for maximum corridor width. Automatic opening hardware will be touch-free actuator type in all areas. The touch-free actuator type in all Staff and Patient areas will be a touchless switch, wave-to-open type sensor, designed for health care applications. Provide push button actuators as required at locations as determined in consultation with the Owner.

6.8.10.1(8) For card reader placement, key override, door contact, request to exit device, video door intercom, and remote release requirements, refer to Appendix 3P [Security Operation Matrix] and Section 7.10.4 Access Control, of this Schedule. The more stringent requirements applicable in each case will govern.

6.8.10.1(9) All doors throughout the Facility require a door hardware Evacuation Room Verification System including hinges and evacuation indicators that are highly visible in low light and smoke-filled environments to signal if the room is vacant or in-use. The Evacuation Room Verification System will indicate the status of the room during emergency conditions. The system will be activated when occupants have vacated the room and indicate if someone has re-entered the room. The system will enable the Fire Department to quickly assess the status of a room; if the device is in closed position then the room has been accessed and will be verified. If the door to a room is opened by more than one inch, the spring hinge will revert the system automatically to the closed position. The unit will not be reset from inside the room.

6.8.10.1(10) Project Co's Architectural Openings Consultant will attend in person and lead all door hardware meetings.

6.8.10.1(11) For all Anti-Barricade doors, provide kerfed-in seal with a pile insert for the door header and jamb, and a pile sweep at the door bottom, in compliance with door acoustic requirements.

6.8.10.1(12) For Outbreak Control Zone corridor doors, provide interior automatic pairs with card reader and hold open with the following features;

6.8.10.1(12)(a) Consist of inner and outer doors to create an anteroom. Sequenced so both doors cannot be open at the same time in an outbreak scenario;

6.8.10.1(12)(b) Presence/safety sensors;

6.8.10.1(12)(c) Actuated by card reader;

6.8.10.1(12)(d) Remote key switch to deactivate;

6.8.10.1(12)(e) Ability to be held open; and

6.8.10.1(12)(f) Perimeter seals.

6.8.10.1(13) Card reader access control is not required on Staff Washroom/Shower room doors if they are only accessible from within secure Staff locker rooms in which case provide a mortise privacy set with occupied indicator and ability to lock door when out of service.

6.8.10.1(14) Where Appendix 3A [Clinical Specifications and Functional Space Requirements] or applicable standards describe a vestibule or secure vestibule such as in Main Pharmacy, Specialty Pharmacy, Main Laboratories and entering or exiting MDRD, Project Co will provide doors consisting of interior automatic pairs with card reader and hold open with the following features;

6.8.10.1(14)(a) Consist of inner and outer doors to create a vestibule. Sequenced so both doors cannot be open at the same time;

6.8.10.1(14)(b) Presence/safety sensors;

6.8.10.1(14)(c) Actuated by card reader;

6.8.10.1(14)(d) Remote key switch to deactivate;

6.8.10.1(14)(e) Ability to be held open; and

6.8.10.1(14)(f) Perimeter seals.

6.8.10.1(14)(g) For additional requirements refer to Appendix 3P [Security Operation Matrix].

6.8.10.1(15) For the following rooms, equip all doors with door sweeps:

6.8.10.1(15)(a) Shop-Bed/Stretcher/Ceiling Lift;

6.8.10.1(15)(b) Shop-Plumbing;

6.8.10.1(15)(c) Shop-Mechanical;

6.8.10.1(15)(d) Shop-Welding;

6.8.10.1(15)(e) Shop-Electrical;

6.8.10.1(15)(f) Shop-Carpentry;

6.8.10.1(15)(g) Shop-Paint;

6.8.10.1(15)(h) Store-Construction Tools;

6.8.10.1(15)(i) Store-Parts/Supplies;

6.8.10.1(15)(j) Store-Pipe;

6.8.10.1(15)(k) Store-Construction Materials; and

6.8.10.1(15)(l) Shop-AGV.

6.8.10.2 Performance Requirements

6.8.10.2(1) Finish hardware will be heavy duty suitable for institutional use.

6.8.10.2(2) Hinges: ANSI Grade 1, warranted for the life of the Facility. Size hinges according to manufacturer's recommendations. Provide hinges with concealed maintenance free Teflon or plastic bearings and non-removable pins.

6.8.10.2(3) Continuous hinges: ANSI Grade 1, geared aluminum type. Provide removable serviceable power transfers where required.

6.8.10.2(4) Pivot hinges: ANSI Grade 1. Use pivot hinges only where standard or continuous hinges are not feasible. Size pivots according to manufactures' recommendations.

6.8.10.2(5) Wherever Ligature Resistant hardware is specified in the door hardware group, provide hospital tip hinges.

6.8.10.2(6) Locksets and latch sets: ANSI A156.13, fully mortised grade 1 type, lever handles will be solid material and provide a full return to the door. Provide lever handle locksets are with break-away/free-wheeling levers.

6.8.10.2(7) Deadbolts: ANSI A156.13, fully mortised grade 1 type

6.8.10.2(8) Door closers: ANSI A156.4, Grade 1 type. Provide concealed door closers in Clinical Spaces. Size all door closers to suit Facility conditions and in accordance with barrier-free accessibility codes. Provide delayed action closers at all locations. Do not locate door closers on the corridor side of openings. Provide through-bolt mounting for closers. Selectable hold open arms and spring-loaded stops are to be provided where applicable as determined in consultation with the Owner.

6.8.10.2(9) Exit devices: ANSI 156.3 Grade 1 type. All exit devices will be listed for accident hazard and fire exit. Latch retraction devices will require an inrush of 1amp or less and will not require proprietary power supplies. Vertical rod exit devices are to be concealed, less bottom rod type.

6.8.10.2(10) Door stops: Provide heavy duty wall stops. Floor stops and overhead are not permitted for safety and cleanliness reasons. Provide solid backing for wall stops.

6.8.10.2(11) Astragals: Provide full length astragals for all exterior and parkade doors. For lead lined doors, refer to 6.13 Special Construction (Division 13). Proved short lip strike plates where they conflict with astragals. The astragal is not to be cut to accommodate strike plates.

6.8.10.2(12) Flush bolts: Provide heavy duty automatic latching top bolts. Provide heavy duty manual bottom bolts with dust proof strikes, except in Clinical Spaces.

6.8.10.2(13) Manual sliding door hardware: Provide heavy duty tracks and hangers with a load capacity suitable for the door weight. Surface mounted track and hangers are to be concealed with facia and end caps. Provide all manual sliding doors with soft open/close hardware.

6.8.10.2(14) Perimeter seals: Provide seals with replaceable gaskets. Provide surface-mounted door bottoms that can be removed for servicing. Mortised/concealed door bottoms that require the door to be removed for servicing are not permitted. In areas where Ligature Resistant hardware is required, provide seals designed to break into segments. Refer to Appendix 3C [Acoustic and Noise Control Measures] for acoustic requirements and provide seals accordingly.

6.8.10.2(15) Power transfers: Conceal power transfers in the hinge.

6.8.10.2(16) Power supplies: Provide power supplies with relay boards that completely isolate hardware power from the access control system and individually fused outputs for each hardware device.

Provide a minimum of 25% room for expansion and 5Ah battery backup.

6.8.10.2(17) Request to exit devices: Locate request to exit devices in the door hardware wherever the hardware allows.

6.8.10.2(18) Door position switches: Provide double throw double pole door position switches.

6.8.10.2(19) Automatic swing door operators: Provide Record-USA series 8100 Electromechanical Automatic Operators or acceptable alternative as reviewed by the Owner. Provide operators with on-board timing sequencers, power close mode, dynamic stack pressure compensation and opening assist. Upon loss of power, manual opening force will not exceed 15 lbf. Provide door mounted safety sensors on both sides of doors with automatic operation. Provide a key switch located on the secure side to toggle function Auto/Open/Close.

6.8.10.2(20) Automatic sliding door operators: Provide Record-USA series 5100 Electromechanical Automatic Operators or acceptable alternative as reviewed by the Owner. Provide with electromechanical locking device and door leaf surveillance. Provide with request to exit device to release integrated lock. Provide safety sensors including sidelight protection sensors.

6.8.10.2(21) Delayed egress hardware: Except where required by VBBL, delayed egress hardware will not be used.

6.8.11 Door Hardware Groups

6.8.11.1 For each specified rooms(s) or area, the following door hardware will be utilized:

6.8.11.1(1) AO-01 – Interior Automatic Sliders

6.8.11.1(1)(a) Doors are to be automatic sliders with break-away doors for emergency egress where required by Code;

6.8.11.1(1)(b) Card reader;

6.8.11.1(1)(c) Presence/Safety sensors; and

6.8.11.1(1)(d) Touch-free actuator.

6.8.11.1(2) AO-02 – Interior Automatic single with card reader

6.8.11.1(2)(a) Doors are to be automatic swing; three position key switch (On/Off/Hold) for operator;

6.8.11.1(2)(b) Card reader;

6.8.11.1(2)(c) Presence/Safety sensors;

6.8.11.1(2)(d) Touch-free actuators;

6.8.11.1(2)(e) Hinges;

6.8.11.1(2)(f) Electric strike;

6.8.11.1(2)(g) Mortise lockset; and

6.8.11.1(2)(h) Door stop.

6.8.11.1(3) AO-03 – Interior Automatic single (touch-free without card reader)

6.8.11.1(3)(a) Doors are to be automatic swing; three position key switch (On/Off/Hold) for operator;

6.8.11.1(3)(b) Presence/Safety sensors;

6.8.11.1(3)(c) Touch-free actuators;

6.8.11.1(3)(d) Hinges;

6.8.11.1(3)(e) Push/Pull; and

6.8.11.1(3)(f) Door stop.

6.8.11.1(4) AO-10 – Entrances and Entry Vestibule (outer doors)

6.8.11.1(4)(a) Doors are to be fully automatic bi-parting sliding doors with breakout leaves to suit exiting requirements. Doors and hardware will be capable to accommodate heavy two-way pedestrian traffic. Doors will be reinforced for security when not in use;

6.8.11.1(4)(b) Doors to have the ability to remotely lock and unlock (scheduled, or by emergency lock-down);

6.8.11.1(4)(c) Provide concealed electro-mechanical locks in the operator housing to resist forced entry;

6.8.11.1(4)(d) Presence/Safety sensors;

6.8.11.1(4)(e) Touch-free actuators;

6.8.11.1(4)(f) Remote key switch to de-activate;

6.8.11.1(4)(g) Card reader;

6.8.11.1(4)(h) Perimeter seals (for acoustics and/or room pressurization); and

6.8.11.1(4)(i) These doors will have the capability to sequence opening time with the inner vestibule doors.

6.8.11.1(5) AO-11 - Main Entry Vestibule (inner doors)

6.8.11.1(5)(a) Doors are to be fully automatic bi-parting with recessed panic hardware for emergency egress;

6.8.11.1(5)(b) Presence/Safety sensors;

6.8.11.1(5)(c) Touch-free actuators;

6.8.11.1(5)(d) Remote key switch to de-activate; and

6.8.11.1(5)(e) These doors will have the capability to sequence opening time with the outer vestibule doors.

6.8.11.1(6) AO-12 – Interior Automatic pair with card reader

6.8.11.1(6)(a) Doors are to be automatic swing; three position key switch (On/Off/Hold) for operator;

6.8.11.1(6)(b) Presence/Safety sensors;

6.8.11.1(6)(c) Touch-free actuators;

6.8.11.1(6)(d) Remote key switch to de-activate; and

6.8.11.1(6)(e) Card reader.

6.8.11.1(7) CR-01 - Typical Card Reader Door (Single)

6.8.11.1(7)(a) Hinges;

6.8.11.1(7)(b) Concealed power transfer;

6.8.11.1(7)(c) Electronic mortise lock with request to exit;

6.8.11.1(7)(d) Door closer;

6.8.11.1(7)(e) Door stop;

6.8.11.1(7)(f) Door position switch (DPDT);

6.8.11.1(7)(g) Card reader; and

6.8.11.1(7)(h) Perimeter seals (for acoustics and/or room pressurization).

6.8.11.1(8) CR-03 - Typical Card Reader Door (Single) – Hold Open

6.8.11.1(8)(a) Consist of inner and outer doors to create an anteroom. Sequenced so both doors cannot be open at the same time;

6.8.11.1(8)(b) Hinges;

6.8.11.1(8)(c) Mortise passage;

6.8.11.1(8)(d) Magnetic lock;

6.8.11.1(8)(e) Door closer with holder;

6.8.11.1(8)(f) Door stop;

6.8.11.1(8)(g) Door position switch (DPDT);

6.8.11.1(8)(h) Card reader; and

6.8.11.1(8)(i) Door to be programmed to ignore door held open status.

6.8.11.1(9) CR-10 – Typical Card Reader Door (Pair)

6.8.11.1(9)(a) Hinges;

6.8.11.1(9)(b) Concealed power transfer;

6.8.11.1(9)(c) Flush-bolts;

6.8.11.1(9)(d) Electronic mortise lock with request to exit;

6.8.11.1(9)(e) Door closers;

6.8.11.1(9)(f) Door stops;

6.8.11.1(9)(g) Door position switches (DPDT); and

6.8.11.1(9)(h) Card reader.

6.8.11.1(10) CR-11 –Card Reader Door (Pair) Laser

6.8.11.1(10)(a) Hinges;

6.8.11.1(10)(b) Concealed power transfer;

6.8.11.1(10)(c) Flush-bolts;

6.8.11.1(10)(d) Push/Pull;

6.8.11.1(10)(e) Shear magnetic lock (both leaves);

6.8.11.1(10)(f) Door closers;

6.8.11.1(10)(g) Door stops;

6.8.11.1(10)(h) Door position switches (DPDT); and

6.8.11.1(10)(i) Pin code proximity reader.

6.8.11.1(10)(j) Door will be electronically locked when laser is in use.

6.8.11.1(11) IM-01 – Imaging Room single - Automatic

6.8.11.1(11)(a) Swing clear continuous hinges;

6.8.11.1(11)(b) Push/Pull;

6.8.11.1(11)(c) Shear magnetic lock;

6.8.11.1(11)(d) Automatic operator;

6.8.11.1(11)(e) Three position key switch (On/Off/Hold) for operator;

6.8.11.1(11)(f) Touch-free actuators;

6.8.11.1(11)(g) Door stops;

6.8.11.1(11)(h) Card reader;

6.8.11.1(11)(i) Perimeter seals (for acoustics and/or room pressurization); and

6.8.11.1(11)(j) Refer to Appendix 2E [Equipment and Furniture] for where laser equipment is required, doors are electronically locked when laser is in use.

6.8.11.1(12) IM-10 – Imaging Room pair - Automatic

6.8.11.1(12)(a) Swing clear continuous hinges;

6.8.11.1(12)(b) Push/Pull;

6.8.11.1(12)(c) Shear magnetic lock (both leaves);

6.8.11.1(12)(d) Automatic operator;

6.8.11.1(12)(e) Three position key switch (On/Off/Hold) for operator;

6.8.11.1(12)(f) Touch-free actuators;

6.8.11.1(12)(g) Door stops;

6.8.11.1(12)(h) Card reader;

6.8.11.1(12)(i) Perimeter seals (for acoustics and/or room pressurization); and

6.8.11.1(12)(j) Refer to Appendix 2E [Equipment and Furniture] for where laser equipment is required, doors are electronically locked when laser is in use.

6.8.11.1(13) OR-01 – OR single (sterile core)

6.8.11.1(13)(a) Heavy-duty pivot hinges;

6.8.11.1(13)(b) Push/Pull;

6.8.11.1(13)(c) Shear magnetic lock;

6.8.11.1(13)(d) Door closer with hold open;

6.8.11.1(13)(e) Door stop;

6.8.11.1(13)(f) Perimeter seals (for acoustics and/or room pressurization);

6.8.11.1(13)(g) Two labeled momentary switches, one inside, one outside, that will disable the door lock for 5 seconds without deactivating the laser; and

6.8.11.1(13)(h) Door is electronically locked when laser is in use.

6.8.11.1(14) OR-10 – OR pair - Automatic

6.8.11.1(14)(a) Swing clear continuous hinges;

6.8.11.1(14)(b) Push/Pull;

6.8.11.1(14)(c) Shear magnetic lock (both leaves);

6.8.11.1(14)(d) Automatic operator;

6.8.11.1(14)(e) Three position key switch (On/Off/Hold) for operator;

6.8.11.1(14)(f) Touch-free actuators;

6.8.11.1(14)(g) Door stops;

6.8.11.1(14)(h) Perimeter seals (for acoustics and/or room pressurization); and

6.8.11.1(14)(i) Refer to Appendix 2E [Equipment and Furniture] for where laser equipment is required, doors are electronically locked when laser is in use.

6.8.11.1(15) PP-01 – Push/Pull (single non-locking) – sterile core from corridor

6.8.11.1(15)(a) Hinges;

6.8.11.1(15)(b) Push/Pull;

6.8.11.1(15)(c) Door closer with hold open; and

6.8.11.1(15)(d) Door stop.

6.8.11.1(16) PP-10 - Push/Pull (double non-locking) – sterile core from corridor

6.8.11.1(16)(a) Hinges;

6.8.11.1(16)(b) Push/Pull;

6.8.11.1(16)(c) Door closer with hold open; and

6.8.11.1(16)(d) Door stop.

6.8.11.1(17) PP-11 - Alcove/Closet (pair)

6.8.11.1(17)(a) Hinges;

6.8.11.1(17)(b) Mortise dummy;

6.8.11.1(17)(c) Heavy duty roller latches; and

6.8.11.1(17)(d) Door stop/holders.

6.8.11.1(18) PR-01 - Patient Room Doors

6.8.11.1(18)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(18)(b) Small leaf can be released and pulled open from the corridor side;

6.8.11.1(18)(c) Continuous hinges;

6.8.11.1(18)(d) Face of door mounted flush-bolt (small leaf);

6.8.11.1(18)(e) Mortise passage;

6.8.11.1(18)(f) No door closers;

6.8.11.1(18)(g) Door stop (inswing and outswing);

6.8.11.1(18)(h) Perimeter seals (for acoustics and/or room pressurization); and

6.8.11.1(18)(i) Pile sweep.

6.8.11.1(19) PR-02 - Patient Room Doors – Mental Health Areas

6.8.11.1(19)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(19)(b) Continuous double acting power transfer hinges;

6.8.11.1(19)(c) Continuous safety stop;

6.8.11.1(19)(d) Electronic mortise lockset with privacy function;

6.8.11.1(19)(e) Card reader;

6.8.11.1(19)(f) No door closers; and

6.8.11.1(19)(g) Door stop (inswing and outswing).

6.8.11.1(20) PR-03 - Patient Room Doors – Hybrid swing

6.8.11.1(20)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(20)(b) Small leaf can be released and pulled open from the corridor side;

6.8.11.1(20)(c) Continuous hinges power transfer hinges;

6.8.11.1(20)(d) Face of door mounted flush-bolt (small leaf);

6.8.11.1(20)(e) Electronic mortise lockset;

6.8.11.1(20)(f) Card reader;

6.8.11.1(20)(g) No door closers;

6.8.11.1(20)(h) Door stop (inswing and outswing);

6.8.11.1(20)(i) Perimeter seals (for acoustics and/or room pressurization); and

6.8.11.1(20)(j) Pile sweep.

6.8.11.1(21) SL-PR-01 – Sliding Patient Room Doors

6.8.11.1(21)(a) Ligature Resistant;

6.8.11.1(21)(b) Classroom function lock (lockable from corridor side, cannot be locked from room side);

6.8.11.1(21)(c) Doors can slide, then fold and stack.

6.8.11.1(21)(d) Perimeter seals (for acoustics and/or room pressurization);

6.8.11.1(21)(e) Track and hangers; and

6.8.11.1(21)(f) Pulls.

6.8.11.1(22) SL-PR-02 – Sliding Patient Room Doors with card reader

6.8.11.1(22)(a) Ligature Resistant;

6.8.11.1(22)(b) Track and hangers;

6.8.11.1(22)(c) Pulls;

6.8.11.1(22)(d) Doors can slide, then fold and stack;

6.8.11.1(22)(e) Key switch (to change door from typical exam room function to isolation function);

6.8.11.1(22)(f) Shear magnetic lock (jamb mounted);

6.8.11.1(22)(g) Perimeter seals (for acoustics and/or room pressurization);

6.8.11.1(22)(h) Card reader; and

6.8.11.1(22)(i) Touch-free actuator room side for exiting (request to exit).

6.8.11.1(23) PW-01 - Patient Ensuite Bathrooms

6.8.11.1(23)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(23)(b) Door to swing into the bedroom side;

6.8.11.1(23)(c) Continuous hinge;

6.8.11.1(23)(d) No door closers;

6.8.11.1(23)(e) Flush pulls;

6.8.11.1(23)(f) Deadbolt (classroom function);

6.8.11.1(23)(g) Roller latch; and

6.8.11.1(23)(h) Door stop.

6.8.11.1(24) PW-02 - Patient Ensuite Bathrooms - Bariatric

6.8.11.1(24)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(24)(b) Both doors to swing into the bedroom side;

6.8.11.1(24)(c) Continuous hinges;

6.8.11.1(24)(d) No door closers;

6.8.11.1(24)(e) Flush pulls;

6.8.11.1(24)(f) Deadbolt (classroom function);

6.8.11.1(24)(g) Roller latches; and

6.8.11.1(24)(h) Door stops.

6.8.11.1(25) CW-01 - Patient Ensuite Bathrooms (Mental Health)

6.8.11.1(25)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(25)(b) Door to swing into the bedroom side;

6.8.11.1(25)(c) Continuous hinge;

6.8.11.1(25)(d) No door closers;

6.8.11.1(25)(e) Flush pulls;

6.8.11.1(25)(f) Deadbolt (classroom function);

6.8.11.1(25)(g) Roller latch; and

6.8.11.1(25)(h) Door stop.

6.8.11.1(26) S-PW-01 – Sliding Patient Ensuite Bathroom

6.8.11.1(26)(a) Soft close/Soft open sliding door hardware; and

6.8.11.1(26)(b) Pulls.

6.8.11.1(27) SPR-01 - Secure Room Doors

6.8.11.1(27)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(27)(b) Swing out of the secure room;

6.8.11.1(27)(c) Continuous hinge;

6.8.11.1(27)(d) Magnetic lock;

6.8.11.1(27)(e) 3-point locking mortise lock, 1 strike into head and two into the jamb – middle and lower;

6.8.11.1(27)(f) No door closers;

6.8.11.1(27)(g) Pass through window for food delivery to Patient – complete with acoustic seals and lockable from exterior of secure room.

6.8.11.1(27)(h) Wall-mounted door stop; and

6.8.11.1(27)(i) Be designed and constructed to comply with the requirements of the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

6.8.11.1(28) SPR-02 – Secure Room Anteroom Doors (outer)

6.8.11.1(28)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(28)(b) Outswing 180 degrees;

6.8.11.1(28)(c) Continuous hinge with power transfer;

6.8.11.1(28)(d) Electronic Mortise lock with request to exit;

6.8.11.1(28)(e) Card reader;

6.8.11.1(28)(f) No door closers; and

6.8.11.1(28)(g) Door stop.

6.8.11.1(29) IA-01 –Interview / Assessment (secondary egress door)

6.8.11.1(29)(a) Ligature Resistant;

6.8.11.1(29)(b) Mortise lockset; and

6.8.11.1(29)(c) Door stop.

6.8.11.1(30) IA-02 –Interview / Assessment with card reader (primary access door)

6.8.11.1(30)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(30)(b) Continuous double-acting hinge with power transfer;

6.8.11.1(30)(c) Continuous safety stop;

6.8.11.1(30)(d) Electronic mortise lock with request to exit;

6.8.11.1(30)(e) Door stop; and

6.8.11.1(30)(f) Card reader.

6.8.11.1(31) WR-01 –Washrooms, Single Occupant

6.8.11.1(31)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(31)(b) Continuous double acting hinge where door can't swing out;

6.8.11.1(31)(c) Continuous safety stop;

6.8.11.1(31)(d) Mortise privacy set with occupied indicator and ability to lock door when out of service; and

6.8.11.1(31)(e) Continuous perimeter door seal for user privacy.

6.8.11.1(32) WR-02 –Multiple Occupant

6.8.11.1(32)(a) Hinges;

6.8.11.1(32)(b) Deadbolt (classroom function);

6.8.11.1(32)(c) Push/Pull hardware;

6.8.11.1(32)(d) Closer; and

6.8.11.1(32)(e) Door stop.

6.8.11.1(33) WR-03 –Washrooms, Staff

6.8.11.1(33)(a) Hinges;

6.8.11.1(33)(b) Electronic mortise lock with card reader and privacy function;

6.8.11.1(33)(c) Closer; and

6.8.11.1(33)(d) Door stop.

6.8.11.1(34) WR-04 –Washrooms, Single Occupant Automatic

6.8.11.1(34)(a) Ligature Resistant /Anti-Barricade;

6.8.11.1(34)(b) Doors are to be automatic swing; three position key switch (On/Off/Hold) for operator;

6.8.11.1(34)(c) Presence/Safety sensors;

6.8.11.1(34)(d) Touch-free actuators;

6.8.11.1(34)(e) Hinges;

6.8.11.1(34)(f) Electric strike;

6.8.11.1(34)(g) Mortise lockset; and

6.8.11.1(34)(h) Door stop.

6.8.11.1(35) WR-05 –Washrooms, Accessible Staff Automatic

6.8.11.1(35)(a) Doors are to be automatic swing; three position key switch (On/Off/Hold) for operator;

6.8.11.1(35)(b) Presence/Safety sensors;

6.8.11.1(35)(c) Touch-free actuators;

6.8.11.1(35)(d) Hinges;

6.8.11.1(35)(e) Electric strike;

6.8.11.1(35)(f) Mortise lockset;

6.8.11.1(35)(g) Card reader; and

6.8.11.1(35)(h) Door stop.

6.8.11.1(36) SR-01 - Service Rooms

6.8.11.1(36)(a) Hinges;

6.8.11.1(36)(b) Mortise locksets;

6.8.11.1(36)(c) Door closer (where required);

6.8.11.1(36)(d) Door stop; and

6.8.11.1(36)(e) Perimeter seals (for acoustics and/or room pressurization).

6.8.11.1(37) SR-10 - Service Rooms (pairs)

6.8.11.1(37)(a) Hinges;

6.8.11.1(37)(b) Flush bolts;

6.8.11.1(37)(c) Mortise locksets;

6.8.11.1(37)(d) Door closer (where required);

6.8.11.1(37)(e) Coordinator (where required);

6.8.11.1(37)(f) Door stops;

6.8.11.1(37)(g) Astragal; and

6.8.11.1(37)(h) Perimeter seals (for acoustics and/or room pressurization).

6.8.11.1(38) CL-01 – Classroom Function – Single

6.8.11.1(38)(a) Hinges;

6.8.11.1(38)(b) Mortise lockset;

6.8.11.1(38)(c) Perimeter seals (for acoustics and/or room pressurization);

6.8.11.1(38)(d) Door closer; and

6.8.11.1(38)(e) Door stop.

6.8.11.1(39) CL-10 – Conference Room – Pairs

6.8.11.1(39)(a) Hinges;

6.8.11.1(39)(b) Flush bolts;

6.8.11.1(39)(c) Mortise lockset;

6.8.11.1(39)(d) Door closer with hold open (where required due to fire rating);

6.8.11.1(39)(e) Coordinator (where required due to fire rating);

6.8.11.1(39)(f) Door stops;

6.8.11.1(39)(g) Astragal; and

6.8.11.1(39)(h) Perimeter seals (for acoustics and/or room pressurization).

6.8.11.1(40) PA-01 - Typical Single Door (non-locking)

6.8.11.1(40)(a) Hinges;

6.8.11.1(40)(b) Mortise passage; and

6.8.11.1(40)(c) Door stop.

6.8.11.1(41) OF-01 - Typical Single Door (Offices)

6.8.11.1(41)(a) Hinges;

6.8.11.1(41)(b) Mortise lockset; and

6.8.11.1(41)(c) Door stop.

6.8.11.1(42) OF-02 - Typical Single Door - On-Call Rooms

6.8.11.1(42)(a) Hinges;

6.8.11.1(42)(b) Mortise lockset with occupied indicator; and

6.8.11.1(42)(c) Door stop.

6.8.11.1(43) SL-01 - Typical Sliding Passage Door (non-locking)

6.8.11.1(43)(a) Soft close/Soft open sliding door hardware; and

6.8.11.1(43)(b) Pulls.

6.8.11.1(44) SL-02 - Sliding Bi-pass Passage Door

6.8.11.1(44)(a) Track and hangers;

6.8.11.1(44)(b) Pulls; and

6.8.11.1(44)(c) Doors can slide then fold and stack.

6.8.11.1(45) SL-03 - Sliding Bi-pass Door (keyed both sides)

6.8.11.1(45)(a) Track and hangers;

6.8.11.1(45)(b) Double locking lockset (key from either side lock/unlocks both sides);

6.8.11.1(45)(c) Pulls; and

6.8.11.1(45)(d) Perimeter seals (for acoustics and/or room pressurization).

6.8.11.1(46) XC-01 - Cross-corridor doors on inpatient areas floors (Secure Double Egress). These doors are normally locked and can be released (scheduled, card reader, or in an emergency). Connected into the Patient wandering system.

6.8.11.1(46)(a) Hinges;

6.8.11.1(46)(b) Concealed power transfer;

6.8.11.1(46)(c) Exit hardware (request to exit provided in the door hardware);

6.8.11.1(46)(d) Magnetic locks;

6.8.11.1(46)(e) Door closers;

6.8.11.1(46)(f) Door stops;

6.8.11.1(46)(g) Perimeter seals (for acoustics and/or pressurization);

6.8.11.1(46)(h) Thresholds (where required);

6.8.11.1(46)(i) At secure vestibules provide the ability to interlock inner and outer doors; and

6.8.11.1(46)(j) Card reader.

6.8.11.1(47) ST-01 - Exit stairs from typical inpatient areas floors. These doors are normally locked and can be released (card reader or in 2nd stage fire alarm). Connected into the Patient wandering system as required by the Owner and described in this Schedule. Delayed egress with remote notification at Care Team Station. Always locked from the stair side.

6.8.11.1(47)(a) Hinges;

6.8.11.1(47)(b) Concealed power transfer;

6.8.11.1(47)(c) Exit hardware;

6.8.11.1(47)(d) Delayed egress;

6.8.11.1(47)(e) Door closers;

6.8.11.1(47)(f) Door stops;

6.8.11.1(47)(g) Perimeter seals (for acoustics and/or pressurization);

6.8.11.1(47)(h) Thresholds (where required); and

6.8.11.1(47)(i) Card reader.

6.8.11.1(48) ST-02 - Exit Stairs from Mental Health Areas, including Med/Psych and Eating Disorders. These doors are normally locked and can be released (card reader or in 2nd stage fire alarm). Connected into the Patient wandering system. Always locked from the stair side.

6.8.11.1(48)(a) Hinges;

6.8.11.1(48)(b) Concealed power transfer;

6.8.11.1(48)(c) Exit hardware;

6.8.11.1(48)(d) Magnetic locks (contained use area);

6.8.11.1(48)(e) Door closers;

6.8.11.1(48)(f) Door stops;

6.8.11.1(48)(g) Perimeter seals (for acoustics and/or pressurization);

6.8.11.1(48)(h) Thresholds (where required); and

6.8.11.1(48)(i) Card reader.

6.8.11.1(49) ST-03 - Exit Stairs from the Maternity. These doors are normally locked and can be released (card reader or in 2nd stage fire alarm). Delayed egress with remote notification at Care Team Station. Card reader access from both sides.

6.8.11.1(49)(a) Hinges;

6.8.11.1(49)(b) Concealed power transfer;

6.8.11.1(49)(c) Exit hardware;

6.8.11.1(49)(d) Delayed egress;

6.8.11.1(49)(e) Door closers;

6.8.11.1(49)(f) Door stops;

6.8.11.1(49)(g) Perimeter seals (for acoustics and/or pressurization);

6.8.11.1(49)(h) Thresholds (where required); and

6.8.11.1(49)(i) Card reader (both sides).

6.8.11.2 Provide a minimum of 2.135 m high door or door leaf, unless specifically required for access to services or other purposes where height is restricted.

6.8.11.3 Provide Patient room, Patient washrooms, laundry facility, and consult/interview rooms with hardware that allows the doors to stay in an open position and facilitates casual observance of Patients by the Staff.

6.8.11.4 For doors into or between major departments or activity areas through which cart and wheel chair traffic is anticipated on a routine basis, provide automatic activation by an electronic device or manual push button, located to allow emergency access without the necessity to stop movement. For all other doors through which cart, or frequent Patient or Staff traffic is anticipated on a routine basis, provide appropriate hardware or automatic activation that allows the doors to stay in an open position.

6.8.11.5 Provide concealed bearing swing clear hinges in these locations to provide greater access and protect the hinge edge of door from mobile equipment damage that

often results in misalignment and failure to close and latch to meet BC Fire Code requirements. These doors and other doors in the Facility, provide concealed bearing conventional door hinges.

6.8.11.6 Doors will not swing into ensuite washrooms.

6.8.11.7 Finish doors and frames with a suitable finish that prevents dirt and fingerprint accumulation and will be easily cleaned and disinfected.

6.8.11.8 Provide glazing in doors to allow Patient observation and operational safety of the spaces they serve, at minimum, as follows:

6.8.11.8(1) as indicated in Appendix 3M [Door Requirements Matrix]; and

6.8.11.8(2) in service room doors, except for mechanical, electrical, and Communications Rooms. The vision panel in these rooms will have a minimum size of 150 mm x 300 mm, or as permitted by code.

6.8.11.9 Provide blackout blinds and perimeter seals in doors where window treatment also requires blackout functionality as described in this Schedule; refer to Section 6.12.3.3.

6.8.11.10 Provide doors and door frames with the capability to withstand the varying and high levels of humidity and impact that occur typically within hospitals, and in specific rooms within these facilities, and maintain their inherent aesthetic and functional capacities.

6.8.11.11 Design doors at mechanical, electrical, plumbing and Communications Rooms to swing out, unless required otherwise by code, and be lockable through access control system.

6.8.11.12 Wicket and “door within a door” types of doors are not acceptable.

6.8.11.13 Provide doors into stairwells with glass vision panel (exit stairs and convenience stairs), as permitted by VBBL.

6.8.12 Keying

6.8.12.1 Provide factory master keyed cylinders with Schlage Everest 29 with Primus XP keyway to match the existing hospital. Cylinders are to be construction keyed. Permanent keys will be given directly to the Owner by the manufacturer. Four (4) keys will be supplied for each lock cylinder. Install permanent cylinders prior to Service Commencement.

6.8.12.2 Keying

6.8.12.2(1) Supply and install geographically exclusive, patent protected interchangeable core cylinders, patent to be to the minimum year 2029, 6 pin (factory recorded, factory pinned).

6.8.12.2(2) Implement a 4-level system.

6.8.12.2(3) Supply four (4) keys for each lock cylinder.

6.8.12.2(4) Keying groups will be assigned by the Owner.

6.8.12.2(5) New key bittings will be provided to and controlled by Owner.

6.8.12.2(6) Turn over keys from factory to the Owner.

6.8.12.2(7) Project Co will remove construction cores and install permanent cores under the direction of the Owner.

6.8.12.2(8) See Section 7.10 Electronic Safety and Security (Division 28) and Appendix 3M [Door Requirements Matrix] for additional requirements.

6.8.13 Windows

6.8.13.1 Size, configure, and adequately construct windows for areas that require daylight, views and/or natural ventilation. Refer to Access to Daylight and Views for minimum window size in certain areas.

6.8.13.2 Provide Borrowed Light deep into the Facility, either through interior windows to occupied rooms that do not have exterior windows or through other means. The intent is to borrow light to create a more comfortable and less closed-in environment that will benefit Staff and Patients alike.

6.8.13.3 Coordinate glazing heights with adjacent wall protection, handrails, and other accessories to achieve functional and aesthetic cohesiveness.

6.8.13.4 Framing members, mullions, and similar members to accept integral blinds to have adequate structural strength to support weight of glass and louvers. Frames are to be level, plumb, square, and in plane. Provisions are to be made in frames to receive required hardware and accessories. Integral blinds in exterior windows will be enclosed in separate cavity accessible from the inside of room for repair without the need to remove/replace the thermal unit assembly.

6.8.13.5 Exterior Windows

6.8.13.5(1) All exterior windows will conform to ASHRAE 90.1, complete with thermal breaks.

6.8.13.5(2) Size, configure, and adequately construct windows to suit rooms that require daylight, views and/or natural ventilation.

6.8.13.5(3) Provide window framing systems that are thermally-broken and designed based on principles of pressure equalized Rain Screen.

6.8.13.5(4) Unless a larger size of window is required to comply with other applicable requirements in this Schedule, exterior windows in Patient rooms will have a minimum area of 2.5 square metres and a minimum short dimension of 1.2 m. The vertical dimension of the window will be greater than the horizontal.

6.8.13.5(5) The exterior window in Secure Rooms will be designed and constructed to comply with the requirements of the provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

6.8.13.5(6) Exterior windows in occupied spaces, except in Secure Rooms, will be no less than 1.2 m x 1.2 m in size or larger as required to meet the provisions in Section 3.15 Quality of Daylight.

6.8.13.6 Interior Windows

6.8.13.6(1) Provide Borrowed Light through interior windows to occupied rooms that do not have exterior windows. The intent is to borrow light from areas that have windows and consequently create a more comfortable and less closed-in atmosphere.

6.8.13.6(2) For Secure Rooms and their associated Anterooms, provide an interior window (in-door observation panel) in each door in accordance with the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

6.8.13.6(3) Coordinate glazing heights with adjacent wall protection, handrails, and other accessories to achieve functional and aesthetic cohesiveness.

6.8.13.6(4) Provide interior windows in all conference rooms including;

6.8.13.6(4)(a) Conference/Meeting Room-XSmall

6.8.13.6(4)(b) Conference/Meeting Room-Small

6.8.13.6(4)(c) Conference/Meeting Room-Medium

6.8.13.6(4)(d) Conference/Meeting Room-XLarge-Dividable

6.8.13.6(4)(e) Conference/Meeting Room-XXLarge-Dividable

6.8.13.6(5) Provide interior windows complete with integral blinds between all Patient Rooms within the Critical Care Complex such that Staff at the Patient's bedside have a Line of Sight to the head of the Patient in the adjacent Patient Room. The minimum width of the interior window glazing will be minimum 2.4 m wide measured to

the outside face of the window frame. The height of the windowsill will be approximately 1.35 m AFF or as otherwise required to achieve the Line of Sight requirements. The window head height will align with the head of the door entering the room from the corridor.

6.8.13.6(6) The extent of glass in the conference room interior windows will be from floor to 2.1 m AFF and from interior wall to interior wall of the conference room facing the adjacent circulation corridor or conference room.

6.8.13.6(7) Provide roller blinds and/or privacy film on conference room interior windows for privacy.

6.8.13.6(8) Provide interior windows at the locations described in Appendix 3A [Clinical Specifications and Functional Space Requirements] to meet the following requirements:

6.8.13.6(8)(a) Location and extent of interior windows will be coordinated with wall-mounted equipment and Millwork. Where practicable, interior windows will span the full length of the wall in which they are placed to ensure Line of Sight for Staff;

6.8.13.6(8)(b) Interior windows will extend from the finished floor or, where placed above counters, from a height such that Staff working at the counter will have full Line of Sight, to a height AFF to align with the top of the adjacent door frames (approximately 2.1 m AFF);

6.8.13.6(8)(c) Mullions will be located so as not to block Line of Sight; and

6.8.13.6(8)(d) Area of glazing will be maximized in relation to mullions.

6.8.13.7 Security Transaction Windows

6.8.13.7(1) In addition to the glazing requirements described in Appendix 3N [Safety and Risk Reduction Matrix], Project Co will provide transaction windows with security glass Type INT-1 at locations including, at minimum:

6.8.13.7.1.(a).1 Registration/Triage;
6.8.13.7.1.(a).2 Control-Security;
6.8.13.7.1.(a).3 Wicket;
6.8.13.7.1.(a).4 Office – 2 Shared-Cashier;
6.8.13.7.1.(a).5 Care Team Stations;
6.8.13.7.1.(a).6 J4.1.3 Roller Conveyor

6.8.13.7.1.(a).7 J4.6.7 Non-public Issuing Wicket
6.8.13.7.1.(a).8 E1.0 Reception/Registration
6.8.13.7.1.(a).9 Outpatient Lab
6.8.13.7.1.(a).10 J1.1.2, J2.1 Waiting;
6.8.13.7.1.(a).11 Dispensing/Secure Vestibule;
6.8.13.7.1.(a).12 M1.2.1, M1.5.2 Wicket;
6.8.13.7.1.(a).13 M1.2.2 Office-2 Shared Cashier;
6.8.13.7.1.(a).14 M2.2.2 Cashier; and
6.8.13.7.1.(a).15 All other locations where wickets, transaction windows or similar are described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.8.13.7(2) The transaction windows will consist of lockable sliding glass panel(s) and/or a secure speaker hole/opening and backer system. Transaction windows with speaker hole/openings will consist of custom prefabricated panels with secure air passage as required for voice transmission.

6.8.13.7(3) Provide a shelf 38 mm thick with a recessed cash tray where cash transactions will occur. The shelf will be full width of window, centred under the glazing and finished with stainless steel 18-gauge #4 finish. At all transaction windows provide Millwork counters designed to suit the Owner's functional requirements as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.8.13.7(4) Provide transaction windows with a minimum width of 1.5 m (750 mm sliding panel and 750 mm fixed or combination thereof) unless otherwise required to meet the Owner's functional requirements including Line of Sight.

6.8.14 Aluminum Curtain Walls and Aluminum Windows

6.8.14.1 Provide Architectural Grade.

6.8.14.2 Incorporate in the curtain wall framing and 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.

6.8.14.3 Provide curtain wall framing and windows that incorporate a thermal-break.

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

6.8.14.5 Provide assemblies that resist local seismic conditions.

6.8.14.6 Provide integration with access control system.

6.8.14.7 Aluminum curtain wall will be fabricated to the following criteria:

6.8.14.7(1) Aluminium extrusions: CSA HA.5M alloy and temper 6063-T54

6.8.14.7(2) Aluminum sheet and panels: CSA HA.4M alloy and temper suitable for their purpose and finish. Minimum thickness to be 0.040".

6.8.14.7(3) Steel sections: CAM/CSA-G40-2M

6.8.14.7(4) Extrusions, channels, bars, rods and wire: ASTM B211 and ANSI H35.1 / H35AA6063 alloy, T6 temper

6.8.14.7(5) Fasteners: stainless steel

6.8.14.8 Acceptable curtainwall will include 1600 SSG Curtain Wall System by Kawneer, US Aluminium, Alumicor Ltd. or an acceptable alternative as reviewed by the Owner.

6.8.14.9 Provide a 10-year warranty for the curtainwall system and aluminum windows.

6.8.14.10 Mock-ups

6.8.14.10(1) Approximately two weeks prior to scheduled commencement of curtainwall or window installation and associated work, convene pre-installation meeting and mock-up at Project site or at an off-premise building to be located within the GVRD as may be required by and at no expense to the Owner. Window mock-up to be attended by window installer, representative of the window manufacturer, Project Co's Contractor, Architect, Owner, Building Envelope Consultant, and other representatives directly concerned with the performance of the work. Record discussions of conference and decisions and agreements or disagreements reached and furnish copy of record to each party attending.

6.8.14.10(2) Window mock-up to also include leak testing of mock-up window in accordance with ASTM E1105 – 15 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

6.8.14.10(3) Coordinate with and provide mock-up of entire exterior wall system, including cladding finishes, showing window head, sill and jamb interface conditions.

6.8.14.10(4) Submit to the Owner all building envelope test results, witnessed by the Building Envelope Consultant.

6.8.15 Skylights and Clerestory

6.8.15.1(1) Roof or skylight glazing may be provided to bring Borrowed Light into interior spaces to complement interior ambient lighting, as determined with the Owner.

6.8.15.1(2) For exposed aluminum surfaces, provide a finish that is permanent and resistant to corrosion resulting from weather exposure and climate.

6.8.15.1(3) Skylights and glazing will be designed or guarded to prevent personnel from falling through from roof level.

6.8.15.1(4) Skylights will comply with all applicable standards, including the Aluminum Association Standards (AAS), and the American Architectural Manufacturers Association (AAMA) field testing specifications.

6.8.15.1(5) Incorporate in skylights and clerestory 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.

6.8.15.1(6) Provide skylights and clerestory windows that incorporate a thermal break.

6.8.15.1(7) Roof or skylight glazing may be provided where natural light is required in interior spaces to augment or complement interior ambient lighting.

6.8.15.1(8) Provide skylights that are sealed double glazed in thermally-broken, internally drained Rain Screen type extruded aluminum frames. Plastic skylights are not to be used.

6.8.15.1(9) For exposed aluminum surfaces, provide a finish that is permanent and resistant to corrosion resulting from weather exposure and climate.

6.8.15.1(10) Refer to Section 3.15 for shading devices requirements.

6.8.15.1(11) When the Design provides for light through the roof, clerestory glazing is preferred over sloped glazing or skylights.

6.8.15.1(12) Glazing slope will be 30° or greater. A shallower slope may be acceptable to the Owner provided that the skylight meets all other requirements of this Schedule, including drainage provisions.

6.8.15.1(13) Ensure skylights, sloped glazing and clerestory windows are fully accessible for maintenance and cleaning from the interior and exterior of the buildings without disruption to their operations.

6.8.15.1(14) Ensure air seal and water seal connections to curbs and walls will be fully accessible and will not be dependent on construction sequence.

6.8.15.1(15) Provide drainage of water entering the glazing system to the exterior under all conditions.

6.8.15.1(16) Design glazing to prevent condensation on the interior face of the glazing or framing system. Provide interior gutters to catch water in the event condensation occurs. Drain condensation gutters to the interior.

6.8.15.1(17) Provide dry glazing.

6.8.16 Light Tubes

6.8.16.1(1) If light tubes are required for providing natural light to internal areas, provide a reflective light tube system that that will transmit the full range of natural light, ensuring a bright, clean and white light source.

6.8.16.1(2) Provide a daylight dimmer to control the level of light.

6.8.16.1(3) Coordinate the light tube solution with the other components of the ceiling design, including the artificial lighting, to provide an integrated design solution.

6.8.16.2 Roof Hatches

6.8.16.2(1) Minimize use of roof hatch accesses. If roof hatches are used to provide access to the roof for maintenance the minimum hatch size will be 762 mm x 762 mm.

6.8.17 Glass and Glazing

6.8.17.1 Glass and glazing materials and workmanship will conform to the Insulating Glass Manufacturers Association of Canada (IGMAC) Guidelines, and the Glazing Contractors Association of B.C. (GCA) Glazing Systems Specifications Manual.

6.8.17.2 Exterior and/or interior glass and glazing may be provided as integral components of the exterior building envelope, interior partitions and screens, exterior and interior doors, handrail balustrades in public areas, skylights and decorative and ornamental glazing.

6.8.17.3 The assembly will be designed to resist local seismic conditions as a post-disaster Facility.

6.8.17.4 Laminated safety glass will be used in single- glazed skylights and entry doors, or as the inboard light of a double-glazed skylight.

6.8.17.5 Type EXT-1 and EXT-3 will comply with 2000 ft-lb impact test as specified by New York State Office of Mental Health, Patient Safety Standards – Materials and Systems Guidelines and AAMA 501.8 Standard Test Method for Determination of Resistance to Human Impact of Window Systems Intended for Use in Psychiatric Applications.

6.8.17.6 Exterior Glazing Types:

6.8.17.6(1) Type EXT-1: For exterior glazing in higher risk areas as indicated in Appendix 3N [Safety and Risk Reduction Matrix], provide the following minimum requirements:

6.8.17.6(1)(a) Exterior: 6 mm clear tempered low 'E' glass;

6.8.17.6(1)(b) Cavity: 12.7 mm (1/2”) hermetically sealed argon filled airspace;

6.8.17.6(1)(c) Interior: 9 mm (7/16") Glass Clad Polycarbonate:

6.8.17.6(1)(d) 3 mm Clear Heat Strengthened

6.8.17.6(1)(e) 3 mm Lexan

6.8.17.6.1.(e).1 3 mm Clear Heat Strengthened

6.8.17.6(1)(f) Security film on #6 surface;

6.8.17.6(1)(g) Low ‘E’ Coating: On the #2 surface;

6.8.17.6(1)(h) Where integral blinds are required, adjust the cavity to suit the system.

6.8.17.6(2) Type EXT-2: For exterior glazing in lower risk areas as indicated in Appendix 3N [Safety and Risk Reduction Matrix], provide the following minimum requirements, provide the following minimum requirements:

6.8.17.6(2)(a) Exterior: 6 mm clear tempered low 'E' glass;

6.8.17.6(2)(b) Cavity: 12.7 mm (1/2”) hermetically sealed argon filled airspace;

6.8.17.6(2)(c) Interior: 6 mm clear tempered laminated glass:

6.8.17.6(2)(d) 3 mm clear tempered

6.8.17.6.2.(d).1 090 ionoplast interlayer

6.8.17.6.2.(d).2 3 mm clear tempered

6.8.17.6(2)(e) Low ‘E’: On the #2 surface;

6.8.17.6(3) Type EXT-3: For exterior glazing in Secure Rooms, provide the following minimum requirements:

6.8.17.6(3)(a) Exterior: 6 mm clear tempered low ‘E’ glass;

6.8.17.6(3)(b) Cavity: 12.7 mm (1/2”) hermetically sealed argon filled airspace;

6.8.17.6(3)(c) Interior: 9 mm (7/16") Glass Clad Polycarbonate:

6.8.17.6(3)(d) Security film on #6 surface;

6.8.17.6(3)(e) Low ‘E’ on the #2 surface;

6.8.17.6(3)(f) Where integral blinds are required, adjust the cavity to suit the system.

6.8.17.6(3)(g) Glass-clad polycarbonate performance:

6.8.17.6.3.(g).1 HP White HPW-TP-0500.02 Forced Entry Level 1 (Report WJE 972491); and

6.8.17.6.3.(g).2 HP White HPW-TP-0500.02 Ballistics Level A (Report HPW 7305-09A).

6.8.17.6(3)(h) Glass-clad polycarbonate applicable standards:

6.8.17.6.3.(h).1 ASTM C 1349-04;

6.8.17.6.3.(h).2 ASTM C 1048-04; and

6.8.17.6.3.(h).3 ASTM C 1036-06.

6.8.17.7 Security Film will be 3M 'ULTRA S600' or approved equal applied to the surface indicated and extend to the outer edge of the glass panel.

6.8.17.8 Interior Glazing Types:

6.8.17.8(1) Type INT-1: For interior windows, sidelights and door glazing in higher risk areas as indicated in Appendix 3N [Safety and Risk Reduction Matrix], provide the following minimum requirements, provide the following minimum requirements:

6.8.17.8(1)(a) 12 mm clear tempered laminated glass:

6.8.17.8.1.(a).1 3 mm Clear Tempered;

6.8.17.8.1.(a).2 6 mm Polycarbonate Lexan; and

6.8.17.8.1.(a).3 3 mm Clear Tempered.

6.8.17.8(2) Type INT-2: For interior windows, sidelights and door glazing in lower risk areas as indicated in Appendix 3N [Safety and Risk Reduction Matrix], provide the following minimum requirements, provide the following minimum requirements:

6.8.17.8(2)(a) 12 mm clear tempered laminated glass:

6.8.17.8.2.(a).1 6 mm Clear Tempered;

6.8.17.8.2.(a).2 1.5 mm PVB interlayer; and
6.8.17.8.2.(a).3 6 mm Clear Tempered.

6.8.17.8(3) Type INT-3: For interior windows, sidelights and door glazing in higher risk areas, as indicated in Appendix 3N [Safety and Risk Reduction Matrix], provide the following minimum requirements, provide the following minimum requirements:

6.8.17.8(3)(a) 12 mm clear tempered laminated glass:
6.8.17.8.3.(a).1 3 mm Clear Tempered;
6.8.17.8.3.(a).2 6 mm Polycarbonate Lexan; and
6.8.17.8.3.(a).3 3 mm Clear Tempered.

6.8.17.8(3)(b) Cavity to suit the system.

6.8.17.8(3)(c) 12 mm clear tempered laminated glass:
6.8.17.8.3.(c).1 3 mm Clear Tempered;
6.8.17.8.3.(c).2 6 mm Polycarbonate Lexan; and
6.8.17.8.3.(c).3 3 mm Clear Tempered.

6.8.17.9 One-Way Glass

6.8.17.9(1) Provide glass to create a one-way mirror in locations described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.8.17.9(2) Provide one-way glass which meets the following requirements:

6.8.17.9(2)(a) Creates a visual barrier between subjects and their observers while providing clear and discreet vision;

6.8.17.9(2)(b) Provides undetected surveillance to achieve privacy;

6.8.17.9(3) Performance Requirements

6.8.17.9(3)(a) Nominal Glass Thickness: 6 mm

6.8.17.9(3)(b) Glass Substrate: Grey

6.8.17.9(3)(c) Visible Transmittance (%): 11

6.8.17.9(3)(d) Visible Reflectance Glass Side (%): 16

6.8.17.9(4) Maintain privacy in the observing area through proper light level ratio of at least 8:1 from bright (subject) side to dark (observer) side or as otherwise required by the manufacturer.

6.8.17.10 Refer to Section 6.13.1 for lead lined glass requirements.

6.8.18 Mirrors

6.8.18.1 General Requirements

6.8.18.1(1) The quantity, locations and positioning of all mirrors will meet the Owner's operational and functional requirements.

6.8.18.2 Project Co will:

6.8.18.2(1) Provide portable mirrors of minimum 610 mm W x 460 mm D x 1.78 m H with two (2) swivel castors in all rehabilitation areas including;

6.8.18.2(1)(a) Rehab Gym-Cardiovascular;

6.8.18.2(1)(b) Rehab Gym-Group Exercise;

6.8.18.2(1)(c) Rehab Gym-Physiotherapy;

6.8.18.2(1)(d) Rehab Gym-Strength Training; and

6.8.18.2(1)(e) Mobility Gym.

6.8.18.2(2) Provide wall-mounted mirrors in all the following areas;

6.8.18.2(2)(a) Washrooms;

6.8.18.2(2)(b) Locker Rooms; and

6.8.18.2(2)(c) Change rooms or cubicles.

6.8.18.2(3) Provide unframed wall mirrors providing complete wall coverage along the long edge of the treatment plinth or stretcher in all physiotherapy treatment areas including:

6.8.18.2(3)(a) Assessment/Treatment Room-Large; and

6.8.18.2(3)(b) Assessment/Treatment Bay.

6.8.18.2(4) Provide wall-mounted posture mirrors and adjustable mirrors in all Patient Room-SRMC.

6.8.18.2(5) Provide Vandal Resistant mirrors that are unbreakable and securely fastened to the wall and do not distort the viewer's reflection in Mental Health Areas.

6.8.18.3 Corridor Requirements

6.8.18.3(1) Provide Vandal Resistant convex mirrors made from polycarbonate with a minimum tensile strength of 9,400 psi at all

intersections where stretchers, beds, equipment or carts are traveling.

6.8.18.3(2) Completely fill the cavity behind the mirrors with high-density water blown urethane foam.

6.8.18.3(3) Mirror perimeter will be secured with fully enclosed heavy-duty powder coated steel frame mounted flush with the wall and ceiling and with countersunk screw holes with Tamper Resistant fasteners.

6.8.18.3(4) Provide and install an additional 10% above those planned in the design phase as directed by the Owner based on review of post-occupancy operations prior to Total Completion.

6.8.18.4 Parking Area Requirements

6.8.18.4(1) Provide Vandal Resistant convex mirrors throughout underground parking where sightlines are compromised and/or at convergent corners.

6.8.18.5 Performance Requirements

6.8.18.5(1) Unless otherwise noted, mirrors will consist of 6 mm thick minimum float glass with electrolytically-applied copper plating and polished edges.

6.8.18.5(2) Grind smooth and polish all exposed mirror edges.

6.8.18.5(3) Channel frame mirrors will consist of one piece, stainless steel with a No. 1 quality, with minimum 6 mm thick float glass backed with electrolytically applied copper plating.

6.8.18.5(4) Mirrors will be high quality distortion-free glass.

6.9 Finishes (Division 9)

6.9.1 Basic Requirements

6.9.1.1 In areas where finishes and systems of installation will occur and water is anticipated to be present as part of repeated cleaning or other procedures, allow water to collect and exit without causing damage to the finishes or substrate.

6.9.1.2 For areas in which wear is a concern, such as areas with anticipated pedestrian or wheeled traffic, use durable finish materials able to withstand damage and easily replaceable in sections if damage does occur.

6.9.1.3 Give priority to infection prevention and control in the selection of finishes for all Clinical Spaces, refer to Section 5.11.

6.9.1.4 Select the appearance of finishes and colours to create and promote a natural healing environment, prevent glare, and minimize artificial lighting requirements.

6.9.1.5 Select materials to promote sustainability by, for instance, having low-emissivity or comprising of renewable resources.

6.9.1.6 Select finish materials that do not use known carcinogenic material or chemicals in their manufacture or disposal. Consult the Green Guide for Healthcare.

6.9.2 Gypsum Board

6.9.2.1 Do not apply GWB until bucks, anchors, blocking, insulation, vapour barrier, and electrical and mechanical work, which will be concealed after GWB application, are subject to pre-boarding inspections by the Owner.

6.9.2.2 Where GWB systems are required to provide fire resistance ratings, design wall assemblies tested by fire testing laboratories acceptable to the Governmental Authority.

6.9.2.3 GWB application and finishing will be fully coordinated with the work of other trades.

6.9.2.4 MMRGWB will be used behind wet wall panel system in showers or other wet areas (areas exposed to liquids and moisture). Reinforced cementitious board or cementitious backer unit may be used as an alternative to moisture-resistant GWB. Moisture-resistant GWB will be full height and extend from wall to wall in all areas exposed to liquids and moisture;

6.9.2.5 MMRGWB used in Mental Health Areas and Category 8A spaces as described in Appendix 3N [Safety and Risk Reduction Matrix] will comply with ASTM C1629 Level 2 for Hard Body Impact.

6.9.2.6 Provide ARGWB and/or IRGWB where required by Appendix 3N [Safety and Risk Reduction Matrix] or as otherwise indicated to suit the Owner’s functional requirements.

6.9.2.7 Provide ARGWB to minimum 1.2 m AFF in all corridors.

6.9.2.8 Use glass scrim exterior sheathing GWB wherever exterior GWB sheathing is required at exterior walls.

6.9.2.9 The bottom edge of GWB will be set at a minimum of 12 mm above the finished floor level, and the gap will be fully sealed.

6.9.2.10 Materials and workmanship for GWB and accessories will conform to the following:

6.9.2.10(1) AWCC Wall and Ceiling Specification Standards Manual;

6.9.2.10(2) Northwest Walls and Ceilings Bureau (NWCB) Recommended Levels for Finishing of Gypsum Board standard;

6.9.2.10(3) Applicable requirements of ASTM C754 for installation of steel framing;

6.9.2.10(4) Applicable requirements and recommendations of GA 216 Recommended Specifications for the Application and Finishing of Gypsum Board, except for more stringent requirements of manufacturer;

6.9.2.10(5) Conforming to: ASTM C1658, ASTM C1396, ASTM C1177 and ASTM C1629;

6.9.2.10(6) Soft-body impact penetration: to ASTM E695;

6.9.2.10(7) Applicable requirements and recommendations of Gypsum Association GA 216, Recommended Specifications for the Application and Finishing of Gypsum Board except for more stringent requirements of manufacturer;

6.9.2.10(8) Finish GWB in accordance with applicable requirements and recommendations of GA 214 Recommended Levels of Finish for Gypsum Board, Glass-Mat and Fiber-Reinforced Gypsum Panels, except for more stringent requirements of manufacturer;

6.9.2.10(9) Apply acoustical sealant to meet Appendix 3C [Acoustic and Noise Control Measures] in accordance with applicable requirements of ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications;

6.9.2.10(10) GWB shaft wall liner: conform to ASTM C1396, 0.25 mm minimum thickness;

6.9.2.10(11) Cement board: conform to ANSI A118.9, 12.5 mm cementitious tile backer board. High strength Portland cement building panel with self-adhesive glass tape;

6.9.2.11 Acceptable Products and Materials

6.9.2.11(1) GWB and Accessories: Listed products establish standard of quality and are manufactured by CGC Inc. Mississauga, Ontario or United States Gypsum Company (USG), Chicago, IL.

6.9.2.11(2) Steel Framing and Furring: Company acceptable to installer.

6.9.2.11(3) Grid Suspension Assemblies: Listed products establish standard of quality and are manufactured by CGC Inc. Mississauga, Ontario or United States Gypsum Company (USG), Chicago, IL.

6.9.2.11(4) Design for each type of GWB and related products is based on CGC Inc. products named. Subject to compliance with

requirements, provide the named product or a comparable product by one of the following:

6.9.2.11(4)(a) GWB: ASTM C1396/C1396M

(a).1.1 Thickness: 12.7 mm (1/2’’), 15.9 mm (5/8’’)

(a).1.2 Long Edges: Tapered

6.9.2.11(4)(b) GWB, Type X: ASTM C1396/C1396M

(b).1.1 Thickness: 12.7 mm (1/2’’) Type C, 15.9 mm (5/8’’) Type X, 15.9 mm (5/8’’) Type C

(b).1.2 Long Edges: Tapered

6.9.2.11(4)(c) Gypsum Ceiling Board: ASTM C1396/C1396M

(c).1.1 Thickness: 12.7 mm (1/2’’)

(c).1.2 Long Edges: Eased or Tapered

6.9.2.11(4)(d) ARGWB: ASTM C1629/C1629M. Within ASTM C1629, scores a Level 1 for Hard Body Impact.

(d).1.1 Thickness: 15.9 mm (5/8”);

(d).1.2 Long Edges: Tapered; and

(d).1.3 Mould Resistance: When tested in accordance with ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber, the panels score a 10.

6.9.2.11(4)(e) IRGWB: ASTM C1629/C1629M. Within ASTM C1629, scores a Level 2 for Hard Body Impact.

(e).1.1 Thickness: 15.9 mm (5/8’’);

(e).1.2 Long Edges: Tapered; and

(e).1.3 Mould-Resistance: When tested in accordance with ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber, the panels score a 10.

6.9.2.11(4)(f) MMRGWB ASTM C1658/C1658M. With moisture and mould-resistant core and fiberglass facers.

(f).1.1 Thickness: 12.7 mm (1/2’’), 15.9 mm (5/8’’) Type X;

(f).1.2 Long Edges: Tapered; and

(f).1.3 Mould Resistance: When tested in accordance with ASTM D3273, Standard Test Method for Resistance

to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber, the panels score 10.

(f).1.4 ASTM C1629 Level 2 for Hard Body Impact in Mental Health Areas and Category 8A spaces as described in Appendix 3N [Safety and Risk Reduction Matrix].

6.9.2.11(4)(g) Shaftwall systems:

(g).1.1 Liner boards: ASTM C1658, with fiberglass mat laminated to both sides;

(g).1.2 Thickness: 25.4 mm (1’’);

(g).1.3 Edges: Double beveled; and

(g).1.4 Mould Resistance: When tested in accordance with ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber, the panels score a 10.

6.9.2.11(4)(h) Exterior GWB for ceilings and soffits

(h).1.1 Glass-Mat Gypsum Sheathing Board: ASTM C1177, with fiberglass mat laminated to both sides and with manufacturer's standard edges. This panel can be used for exterior ceilings and soffit applications;

(h).1.2 Thickness: 12.7 mm (1/2’’), 15.9 mm (5/8’’) Type X;

(h).1.3 Edges: Square; and

(h).1.4 Mould Resistance: When tested in accordance with ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber, the panels score a 10.

6.9.2.11(4)(i) Tile backing panels;

(i).1.1 Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges;

(i).1.2 Thickness: 12.7 mm (1/2’’), 15.9 mm (5/8’’) Type X;

(i).1.3 Long Edges: Tapered;

(i).1.4 Mould Resistance: When tested in accordance with ASTM D3273, Standard; and

(i).1.5 Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber, the panels score a 10.

6.9.2.11(4)(j) Cementitious Backer Units: ANSI A118.9 and ASTM C1325, with manufacturer's standard edges.

(j).1.1 Thickness: 12.7 mm (1/2”).

6.9.2.11(4)(k) Edges: Tapered Glass mat surfaced gypsum sheathing board will be used wherever exterior gypsum sheathing is required at exterior walls.

6.9.2.12 Fasteners

6.9.2.12(1)(a) Fasteners for GWB: with corrosion resistant finish to ASTM C1002-01/ASTM C954 -04.

6.9.2.12(1)(b) For cement board: with corrosion resistant polymer finish.

6.9.2.12(1)(c) Tamper Resistant fasteners: Fasteners on all products and systems exposed to view and accessible to Patients to be Tamper Resistant, conforming to ISO standard 10664.

6.9.2.13 Ceilings

6.9.2.13(1) Ceiling finish for infection control purposes will comply with Section 5.11 and CSA Z8000-18, Section 12.2.5.4 Ceilings, including the requirements as defined for semi-restricted and restricted areas.

6.9.2.13(2) Architectural Ceilings

6.9.2.13(2)(a) Architectural ceilings will consist of decorative SACT, wood linear ceiling system or other architectural elements including lighting and GWB bulkheads.

6.9.2.13(2)(b) Architectural ceilings will serve as a contrasting feature to enhance the thematic décor, lighting and provide visual cues at gathering areas and points of transition along the Staff, public or Patient’s journey within the Facility. Areas where the Owner would

expect architectural ceilings to be applied include the following;

6.9.2.13.2.(b).1 Public Passenger Elevator lobbies;
6.9.2.13.2.(b).2 Reception Desks;
6.9.2.13.2.(b).3 Kiosks;
6.9.2.13.2.(b).4 Waiting areas and lounges;
6.9.2.13.2.(b).5 Main Entrance Lobby Component;
6.9.2.13.2.(b).6 Child Play Area;
6.9.2.13.2.(b).7 Coffee Shop/Café/Seating;
6.9.2.13.2.(b).8 Food Court Seating;
6.9.2.13.2.(b).9 Display/Retail Areas; and
6.9.2.13.2.(b).10 where Front of House corridors intersect.

6.9.2.13(3) Acoustic tiles: Non-directional, fissured pattern, white ceiling panel, trim edge detail square to fit a standard T-bar grid panel size.

6.9.2.13(4) Install SACT in the suspension system to provide reverberation control (NRC rating) and sound isolation (CAC rating) as required to suit the intended function of the room. The minimum NRC rating and CAC will be 0.70 and 35, respectively, except for in the following conditions:

6.9.2.13(4)(a) Where washable tiles are required to meet infection control requirements set out in Section 5.11, provide minimum NRC 0.50; and

6.9.2.13(4)(b) For multimedia rooms provide minimum NRC 0.70 (CAC not applicable).

6.9.2.13(5) Provide accessibility to the ceiling spaces where access is required to mechanical, electrical or other service systems.

6.9.2.13(6) Provide SACT for the normal occupancy condition range of 15°C–29°C and maximum 70% relative humidity. When the service use temperature and relative humidity are expected to exceed these ranges, use acoustical units specifically designed for such applications.

6.9.2.13(7) In areas where SACT panels will be frequently removed for plenum access such as corridors, provide acoustic tiles with excellent resistance to surface scratching, scuffing or chipping in accordance with Hess Rake Test.

6.9.2.13(8) SACT in all food preparation and food storage areas such as Alcove, Dirty Tray Cart, Food Service – Pantry, and Alcove, Family Nourishment will be washable. Provide wash resistance without compromising panel finish integrity, using a washability

tester in accordance with ATSM D4828 Standard Test Methods for Practical Washability of Organic Coatings.

6.9.2.13(9) Where required in restricted or semi restricted areas use SACT system that is monolithic, gasketed and clipped down. Perforated or highly textured tiles will not be used in these areas.

6.9.2.13(10) GWB Ceilings

6.9.2.13(10)(a) Construct GWB ceilings of 12.7 mm GWB where fire rating is not required. In fire rated rooms the GWB will be fire rated and the thickness of the GWB is to be determined by the rating required by VBBL. Finish GWB ceilings in accordance with the paint specifications outlined in Section 6.9.8.

6.9.2.13(10)(b) Provide GWB ceilings as indicated in the Appendix 3N [Safety and Risk Reduction Matrix], including the following, at minimum:

6.9.2.13.10.(b).1 Areas where a higher standard of infection prevention and control measures are required in accordance with Section 5.11.

6.9.2.13(10)(c) Provide ARGWB and IRGWB ceilings as set out in Appendix 3N [Safety and Risk Reduction Matrix] and in other spaces where a high risk Patient could be left unsupervised, as determined in consultation with the Owner.

6.9.2.13(10)(d) Pre-finished metal access hatch will match adjacent ceiling colour.

6.9.2.13(11) Suspended Ceiling components: Provide either traditional framed suspension system components or manufactured direct-hung grid suspension system as set out below:

6.9.2.13(11)(a) Grid Suspension Assemblies:

6.9.2.13.11.(a).1 Tie wire: ASTM A641 / A641M

(a).1.1 Diameter: minimum 1.291 mm;

(a).1.2 Coating: Class 1 zinc; and

(a).1.3 Temper: soft.

6.9.2.13.11.(a).2 Wire hangers: ASTM A641 / A641M

(a).2.1 Diameter: minimum 3.26 mm;

(a).2.2 Coating: Class 1 galvanized; and

(a).2.3 Temper: soft.

6.9.2.13.11.(a).3 Furring anchorages: ASTM C754

(a).3.1 Diameter: minimum 1.291 mm;

(a).3.2 Coating: galvanized; and

(a).3.3 Standard wire type clips, bolts, nails or screws.

6.9.2.13.11.(a).4 Hanger attachments:

(a).4.1 Cast-in-place or mechanically drilled concrete anchors: fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to five (5) times that imposed by construction as determined by testing in accordance with ASTM E488 by an independent testing agency;

(a).4.2 Composite deck anchors: “X-CW Ceiling Wire Assembly” by Hilti or acceptable alternative as reviewed by the Owner; and

(a).4.3 Attachment to structural steel components: comply with ASTM C754.

6.9.2.13.11.(a).5 Carrying channels: ASTM C645, cold-rolled commercial-grade streel.

(a).5.1 Minimum base metal thickness: 0.455 mm, not painted;

(a).5.1.1 GWB thickness: 0.836 mm (white);

(a).5.1.2 Cement board thickness: 1.367 mm (green);

(a).5.2 Dimensions of primary carrying member in suspended ceilings and of horizontal stiffeners or bracing in metal stud systems: 38 mm in height with 19 mm flanges.

6.9.2.13(11)(b) Grid Suspension System for Ceilings:

6.9.2.13.11.(b).1 ASTM C645-compliant direct-hung system composed of commercial-quality, cold-rolled steel main beams and cross-furring members that interlock with the following characteristics:

(b).1.1 Main tees: fire-rated heavy duty classification with integral reversible splice with knurled face; medium or intermediate duty classification may be acceptable on a case-by-case basis provided Project Co can demonstrate that the suspension grid is engineered for the intended loads and conditions;

(b).1.2 Cross members: fire-rated members with knurled face;

(b).1.3 Cross tees: 38 mm in height by 1.22 m nominal in length with 38 mm face;

(b).1.4 Accessory cross tees: complete with knurled faces;

(b).1.5 Wall mouldings: single web with knurled face;

(b).1.6 Accessories: transition clips, splice clips, wall attachment clips, splice plates and dome hubs for specific applications; and

(b).1.7 Finish: hot-dip galvanized.

6.9.3 Ceramic Tilework

6.9.3.1 Ceramic tilework will comply with all applicable standards, including the Terrazzo Tile and Marble Association of Canada (TTMAC) Specification Guide 09300 Tile Installation Manual.

6.9.3.2 For installations on wet and exterior surfaces, use floor tiles that have the following dynamic coefficients of friction (DCOF) in accordance with ANSI A137.1 American National Standard Specifications for Ceramic Tile:

6.9.3.2(1) Level Surfaces: Not less than 0.42 for interior wet and dry conditions, and not less than 0.65 for exterior wet and dry conditions.

6.9.3.2(2) Stair Treads: Not less than 0.55 for interior wet and dry conditions, and not less than 0.65 for exterior wet and dry conditions.

6.9.3.2(3) Ramp Surfaces interior and exterior: Not less than 0.65 wet and dry conditions.

6.9.3.3 For exterior installations, provide frost-resistant exterior tiles with a moisture absorption rating of 3.0% or less.

6.9.3.4 Provide a waterproof membrane under ceramic floor and wall tile in showers and other wet areas. The membrane will be trowel-applied, built-up, liquid-applied or sheet-applied.

6.9.3.5 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.

6.9.3.6 Set ceramic tile with latex modified mortar and grout with epoxy grout.

6.9.3.7 Only use ceramic tilework in public areas.

6.9.4 Ceilings

6.9.4.1 Ceiling reflectance will complement the lighting design.

6.9.4.2 Provide ceiling material as described in Appendix 3N [Safety and Risk Reduction Matrix].

6.9.4.3 All ceiling systems and ceiling finishes will comply with the following:

6.9.4.3(1) fire and smoke separation and fire resistance ratings will conform to the requirements of the VBBL;

6.9.4.3(2) suspended ceilings will comply with seismic resistance as required by VBBL; and

6.9.4.3(3) equivalent standards to the Specification Standards Manual as published by the Association of Wall and Ceiling Contractors of BC (AWCC).

6.9.4.4 Suspended Acoustic Ceiling Tile

6.9.4.4(1) SACT will be permitted in areas stated in Appendix 3N [Safety and Risk Reduction Matrix].

6.9.4.4(2) SACT will be non-directional, fissured pattern, Imperial dimension white ceiling panel, trim edge detail (square) to fit a standard 15/16” T-bar grid panel size. Acoustic ceiling tiles having other textures/finishes may be considered provided they meet acoustic and other requirements.

6.9.4.4(3) Provide the levels of sound attenuation required to suit the intended function of the room and as set out in Appendix 3C [Acoustic and Noise Control Measures].

6.9.4.4(4) Special surface-treated ceiling tiles, such as mylar, vinyl-faced or metal-faced tiles, may be used where maintenance and ease of cleaning are priorities as well as the accessibility and subject to acoustic requirements.

6.9.4.4(5) Provide acoustic panels that are appropriate for the normal occupancy condition range of 18°C - 28°C and maximum 70% relative humidity. When the service use temperature and relative humidity are expected to exceed these ranges, use acoustical units specifically designed for such applications.

6.9.4.4(6) Use tiles with scratch-resistant surfaces in any area where lay-in ceiling panels frequently need to be removed for plenum access.

6.9.4.5 Suspended Security Acoustic Ceiling Tile

6.9.4.5(1) As set out in Appendix 3N [Safety and Risk Reduction Matrix], provide SSACT to meeting the following requirements:

6.9.4.5(1)(a) Tamper Resistant;

6.9.4.5(1)(b) 18-gauge galvanized steel panels;

6.9.4.5(1)(c) Point load tested to withstand up to 850 lbs and a minimum of 430 lbs;

6.9.4.5(1)(d) Concealed locking;

6.9.4.5(1)(e) Durable, washable, scrubbable, soil resistant, impact resistant;

6.9.4.5(1)(f) NRC (0.80) with perforated panels and acoustical infill;

6.9.4.5(1)(g) Sound Blocking (CAC) up to 38;

6.9.4.5(1)(h) Light Reflectance up to 77%;

6.9.4.5(1)(i) Fire performance: Class A (FM), Class A (UL);

6.9.4.5(1)(j) Installs on heavy-duty suspension system. System capable of withstanding 600 impacts with 200 foot-pound of energy. Screw-in point load plank system tested to withstand 960 - 3,100 lbs of force; and

6.9.4.5(1)(k) Acceptable product will be Armstrong Secure Lock, or acceptable alternative as reviewed by the Owner.

6.9.4.5(2) SSACT are not required in public corridors in Mental Health Areas that are freely accessed and occupied by Patients and where Patients are under the casual observation of Staff with Line of Sight from Staff work areas. In these corridors, provide SACT.

6.9.4.6 GWB Ceilings

6.9.4.6(1) Provide GWB ceilings as described in Appendix 3N [Safety and Risk Reduction Matrix].

6.9.4.6(2) In Secure Rooms,

6.9.4.6(2)(a) ceiling Design will prevent Patients from being able to hide items in the ceiling or tamper with fixtures, even if standing on the toilet fixture or other fixed Furniture;

6.9.4.6(2)(b) Ceiling fixtures will not be within reach of a Patient standing on toilet or other fixed Furniture; and

6.9.4.6(2)(c) Provide ceilings that comply with the requirements of the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

6.9.4.7 Access Panels

6.9.4.7(1) Where GWB ceilings are used, provide access panels to allow for mechanical and electrical servicing in the ceiling.

6.9.4.7(2) All access panels located on corridor walls in public and Patient accessible areas will be consistent in form, material, and detail with the rest of the adjacent corridor materials and finishes.

6.9.4.7(3) For the rooms and spaces described in Appendix 3A [Clinical Specifications and Functional Space Requirements] provide Vandal Resistant and Ligature Resistant access panels as required by Appendix 3N [Safety and Risk Reduction Matrix].

6.9.4.7(4) Project Co will provide Vandal Resistant and Ligature Resistant access panels in other areas such as corridors and other spaces not described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.9.4.8 Modular Ceiling Plates

6.9.4.8(1) For areas in MDRD, H1 - Generic Outpatient Clinics and Scopes and G2 - Scopes and Minor Procedures Zone, provide modular ceiling plates to meet the following requirements:

6.9.4.8(1)(a) Purpose built, dedicated modular ceiling plate panel above each workstation or packaging table;

6.9.4.8(1)(b) Each will be designed such that the cables and cords used do not impact circulation between workstations or span and drape between workstations; and

6.9.4.8(1)(c) Power and data above each workstation in the quantities described in this Schedule.

6.9.4.8(2) Modular ceiling plates will be stainless steel and sized to suit the T-bar grid panel size.

6.9.4.8(3) Provide medical gases located in modular ceiling plates, in the quantities described below:

6.9.4.8(3)(a) Two (2) Instrument Air & two (2) vacuum at each of the 16 workstations in O2.2.4 Workstation-MDRD;

6.9.4.8(3)(b) Two (2) Instrument Air outlets at each of the decontamination sinks in O2.1.4 Workroom-Decontamination;

6.9.4.8(3)(c) Two (2) Instrument Air & two (2) vacuum at each of the packaging tables in the satellite reprocessing areas in G2.8.3 Scope Disinfection and H1.3.2.11 Satellite Scope Reprocessing-Clean;

6.9.4.8(3)(d) Two (2) Instrument Air outlets at each of the sinks in G2.8.2 Scope Decontamination and H1.3.2.10 Satellite Scope Reprocessing-Soiled; and

6.9.4.8(3)(e) Refer to Appendix 2E [Equipment and Furniture] for any additional Equipment gas requirements.

6.9.4.9 Secure Room

6.9.4.9(1) Floor will have a gradual slope to a floor drain in order to facilitate cleaning while ensuring that the Patient can lie relatively flat.

6.9.4.9(2) Floor will be constructed to comply with the requirements of the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

6.9.4.9(3) Floor finish will be resistant to damage and composed of a material that provides cushioning to decrease the risk of injury to the Patient in the event of body slamming or falling onto the floor.

6.9.5 Painting and Protective Coatings

6.9.5.1 Comply with LEED requirements for Low Emitting Materials Paints and Coatings. In particular:

6.9.5.1(1) architectural paints, coatings and primers: low VOC.

6.9.5.1(2) anti-corrosive and anti-rust: low VOC.

6.9.5.1(3) clear wood finishes, floor coatings, stains and shellacs: low VOC.

6.9.5.2 Walls, doors and shelving

6.9.5.2(1) Use eggshell or semi-gloss for all walls, doors and painted shelving.

6.9.5.3 Door frames and metal doors

6.9.5.3(1) Use semi-gloss for all door frames and metal doors.

6.9.5.4 Wood finish doors

6.9.5.4(1) Use clear coat interior rub varnish for all wood finish doors.

6.9.5.5 Paint Grade Doors

6.9.5.5(1) Use semi-gloss for all paint grade doors.

6.9.5.6 Ceilings

6.9.5.6(1) Use eggshell paint for all ceilings.

6.9.5.7 Floors, concrete

6.9.5.7(1) Use a two-component (base component A, curing agent B).

6.9.5.7(2) Use a primer if part of coating system.

6.9.5.8 Floors, underground parking

6.9.5.8(1) Provide seamless fluid applied elastomeric traffic bearing membrane with surface aggregate in accordance with Section 6.7.9.2. Provide additional aggregate at high wear areas such as corners and breaking and acceleration points.

6.9.5.9 Paint Clinical Spaces with a semi-gloss finish.

6.9.5.10 Conform to all applicable standards, including the material and workmanship requirements of Master Painters Institute (MPI) Architectural Painting Specification Manual. Provide the MPI Accredited Quality Assurance Association's two (2) year guarantee or a 100% two (2) year maintenance bond in accordance with MPI Painting Manual requirements. Maintenance bond to warrant that painting work has been performed in accordance with MPI Manual requirements.

6.9.5.11 Use exterior paints of a quality designed to protect substrate materials from weather and climate conditions.

6.9.5.12 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.

6.9.5.13 Treat exterior masonry materials such as brick and concrete block with water-repellent coatings to prevent water ingress into or through the material.

6.9.5.14 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 by the Owner to be insufficient protection. Materials requiring a special protective coating include exterior and interior structural, galvanized, and miscellaneous steel.

6.9.5.15 Use interior paint materials of a quality to withstand regular or repeated cleaning with hospital-grade disinfectants as the function of the area dictates.

6.9.5.16 Paint handrails, doors, and frames with a contrasting colour from walls in consideration of the visually impaired.

6.9.5.17 Do not use materials containing lead and mercury.

6.9.5.18 Where 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. Coatings will comply and have been tested in accordance with ASTM D1308-Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

6.9.6 Vinyl Acrylic Wall Covering

6.9.6.1 Provide vinyl/acrylic wall covering that is high impact resistant, rigid sheet with nominal 2.0 mm thickness with chemical and stain resistance to ASTM D543 with colour-matched vinyl/acrylic trim for joint/transitions.

6.9.6.2 Furnish complete packaged system containing all primers and adhesive. Use non water-based and non-hazardous primer and adhesive materials.

6.9.6.3 Dry Erase Wall Covering

6.9.6.3(1) Provide as required throughout the Facility pigmented gloss vinyl wall covering presentation surfaces utilizing dry erase markers, 0.61 kg/sq.m, non-woven backing, at minimum in Meeting Rooms, Conference Rooms, Care Team Stations and other locations where Staff will reasonably be expecting to collaborate and benefit from this feature.

6.9.6.3(2) Provide trim and other accessories including: wall covering trim of anodized aluminum, low profile trim and tray/storage for writing utensils, plastic marker dispensers, dry erase markers (set of 4 colours), low odour, and eraser, magnets, clearer, towels.

6.9.6.4 Wall Coverings in Food Services Areas

6.9.6.4(1) Wall covering in the CFP will be comprised of extruded semi-rigid PVCu sheets that create a heat-formable hygienic wall system that reduces the growth of harmful bacteria and microorganisms. Provide welded seams to prevent water and mould penetration. When integrated with a coved flooring system, a seamless, impervious and water tight solution can be achieved.

6.9.6.4(2) Wall covering in Nutrition Centres will be comprised of extruded semi-rigid PVCu sheets that create a heat-formable hygienic wall

system that reduces the growth of harmful bacteria and microorganisms as for the CFP.

6.9.6.5 Padded Surfaces

6.9.6.5(1) Provide protective surface padding system for walls, doors and frames for use in all Secure Rooms in accordance with the Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms in Designated Mental Health Facilities under the B.C. Mental Health Act. Floors may be constructed with padded surfaces.

6.9.6.5(2) Door padding panels will be composed of a padded material system adhered to a 19 mm thick fire resistant plywood backing board. OSB is not permitted.

6.9.6.5(3) Provide openings in door padding for glazed observation openings and food slots.

6.9.6.5(4) Application of protective surface padding will be performed by an applicator with a minimum of 5 years' experience in the successful fabrication and installation of surface padding system.

6.9.7 Flooring

6.9.7.1 Basic Requirements

6.9.7.1(1) Use adhesive for resilient flooring that meets or exceeds the United States Environmental Protection Agency (EPA) Standards for acceptable VOC concentration and emission rates. Use water-soluble, low-odour flooring adhesive, of types recommended by flooring manufacturer.

6.9.7.1(2) Provide flooring and floor finishes to meet the infection control requirements set out in Section 5.11.

6.9.7.1(3) All preparation, materials, and workmanship will be in strict accordance with NFCA requirements and material manufacturer's written recommendations and detail requirements for conditions of work that apply, and guarantee / warranty periods noted herein. Comply with the NFCA Specification Standards Manual.

6.9.7.1(4) Any preparation, materials, and workmanship that do not meet NFCA requirements will be repaired or replaced in accordance with Quality Assurance requirements at no additional cost to the Owner.

6.9.7.1(5) Use heavy-duty materials for flooring on which wheeled, or service vehicle traffic is anticipated, and to which wear and damage may result.

6.9.7.1(6) Use permanent, heavy-duty integral materials for flooring in areas subject to moisture and heat over extended periods of time.

6.9.7.1(7) Use suitable flooring in Patient and Staff areas where cart traffic is expected or where cleaning on a regular basis is necessary.

6.9.7.1(8) Refer to Section 6.17.7.13 for Central Food Production flooring requirements.

6.9.7.2 Performance Requirements

6.9.7.2(1) All Work will be done under the Quality Assurance (QA) Program and will be reviewed in strict accordance with NFCA QA requirements by a qualified inspection agency assigned by the Provincial Floor Covering Trade Association having jurisdiction.

6.9.7.2(2) Vinyl Resilient Flooring

6.9.7.2(2)(a) Provide slip resistant homogeneous single layered, vinyl flooring to meet the following certification and classifications:

6.9.7.2.2.(a).1 Type I;
6.9.7.2.2.(a).2 Commercial: 34; and
6.9.7.2.2.(a).3 Industrial: 43.

6.9.7.2(2)(b) Choose products with exposed surface having anti-bacterial properties to prevent entry of gram-positive and gram-negative micro-organisms. Heat weld all seams. Provide a minimum 150 mm high integral cove base at all locations.

6.9.7.2(2)(c) Provide slip-resistant flooring with a minimum DCOF AcuTest of 0.42 on level surfaces and 0.8 on ramps.

6.9.7.2(2)(d) If linoleum sheet flooring is used, provide with a homogenous core of primarily natural materials, consisting of linseed oil, wood flour, and resin binders mixed and calendared onto a natural jute backing. Weld all seams. Provide a minimum 150 mm high integral cove base at all locations. Linoleum sheet flooring will only be used in areas as reviewed by the Owner.

6.9.7.2(2)(e) Do not use products that require a sealer or wax. Finish flooring with high speed buffing in accordance with manufacturer's specification.

6.9.7.2(2)(f) Heat weld all seam joints.

6.9.7.2(2)(g) Provide anti-reflective finish.

6.9.7.2(2)(h) In Critical Acoustic areas as identified in Appendix 3C [Acoustic and Noise Control Measures], ensure an Impact Sound Reduction of 6db when tested in accordance with ISO 717-2.e.

6.9.7.2(2)(i) Provide flooring that has a minimum wear layer thickness of 0.080" (2.0 mm) and meets ASTM F510 - Standard Test Method for Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method.

6.9.7.2(3) Rubber Resilient Flooring

6.9.7.2(3)(a) Provide 3.0 mm thick smooth homogeneous rubber flooring with vulcanized rubber compound and environmentally compatible colour pigments that are free of toxic heavy metals like lead, cadmium or mercury.

6.9.7.2(3)(b) Provide rubber flooring solid cushioned sheet or tile formulated with 100% virgin elastomers, reinforcing agents, soil-resisting agents, and migrating waxes compounded to create durability, routine cleaning characteristics, and slip resistance. Stud designs will have chamfered edges with a sharply-defined edge at the top to ensure higher slip resistance, routine cleaning, maintenance and low vibration.

6.9.7.2(3)(c) Rubber flooring will meet or exceed the following minimum technical requirements:

6.9.7.2.3.(c).1 Static Load Limit: ASTM F970, Residual compression of 0.003" with 800 lbs. achieved, ≤ 0.005" with 250 lbs. is required.

6.9.7.2.3.(c).2 Provide slip-resistant flooring with a minimum DCOF AcuTest of 0.42 on level surfaces and 0.8 on ramps;

6.9.7.2.3.(c).3 Flammability: ASTM E648; NFPA 253; NBSIR 75 950, 1.03 achieved, ≥ 0.45 watts/sq. cm for Class 1 is required.

6.9.7.2.3.(c).4 Smoke Density: ASTM E662; NFPA 258; NBS, 376 (flaming) and 256 (non-flaming) achieved, < 450 is required.

6.9.7.2.3.(c).5 Bacteria Resistance: ASTM E2180 and ASTM G21, resistant to bacteria, fungi, and micro-organism activity.

6.9.7.2.3.(c).6 Provide rubber flooring that is GREENGUARD Gold Certified for Low VOC Emissions, Blue Angel Certified and CA 01350 Compliant.

6.9.7.2.3.(c).7 Sound Absorption: ASTM E2179 Δ IIC 11, ISO 140 Δ Lw 8 dB.

6.9.7.2(3)(d) Acceptable Products include; Noraplan Sentica 3.0 mm sheet goods resilient floor covering manufactured by Nora systems, Inc. or acceptable alternative as reviewed by the Owner.

6.9.7.2(3)(e) Joints will be sealed with a water-tight polyurethane-based adhesive.

6.9.7.2(4) Wet Rooms

6.9.7.2(4)(a) Use non-skid, slip-resistant solid sheet flooring for all wet areas.

6.9.7.2(4)(b) Non-skid, slip resistant homogeneous single layered, rubber flooring to meet the following certification and classifications:

6.9.7.2.4.(b).1 Type I;

6.9.7.2.4.(b).2 Commercial: 34; and

6.9.7.2.4.(b).3 Industrial: 43.

6.9.7.2(4)(c) Non-skid slip resistance to meet ASTM D2047: Dry – 0.88 and Wet -1.03;

6.9.7.2(4)(d) Hot weld all joint seams;

6.9.7.2(4)(e) Floor substrate will slope to drain with no puddling of surface water;

6.9.7.2(4)(f) Provide integral wall base;

6.9.7.2(4)(g) Use solvent-based, low-odour flooring adhesive, of types recommended by flooring manufacturer;

6.9.7.2(4)(h) Hot weld new flooring to existing floor product;

6.9.7.2(4)(i) Finish flooring in accordance with manufacturer’s specification. Do not apply sealer or wax;

6.9.7.2(4)(j) Wet rooms requiring non-skid, slip-resistant solid sheet flooring include:

- 6.9.7.2.4.(j).1 All rooms and spaces requiring a floor drain;
- 6.9.7.2.4.(j).2 All rooms and spaces requiring utility / process sinks as described in Appendix 3J [Sinks Matrix];
- 6.9.7.2.4.(j).3 All rooms with showers, emergency shower or an eyewash;
- 6.9.7.2.4.(j).4 Washrooms and ensuite washrooms;
- 6.9.7.2.4.(j).5 EMS Holding Bay;
- 6.9.7.2.4.(j).6 Hold-Central Equipment;
- 6.9.7.2.4.(j).7 Mop Wash and Drying
- 6.9.7.2.4.(j).8 Soiled Utility;
- 6.9.7.2.4.(j).9 Soiled holding rooms;
- 6.9.7.2.4.(j).10 Laundry rooms and areas;
- 6.9.7.2.4.(j).11 Housekeeping Closets;
- 6.9.7.2.4.(j).12 Washroom/Shower;
- 6.9.7.2.4.(j).13 Specimen handling areas such as;
  - (j).13.1 G1.4.3 Specimen Holding
  - (j).13.2 J4.2.1 Specimen Receive/Sort/Verification
  - (j).13.3 J4.6.1 Specimen Receiving and Verification Area
  - (j).13.4 J4.10.7 Wet Specimen Processing
  - (j).13.5 J4.10.15 Store-Wet Specimens
  - (j).13.6 J6.5 Specimen Processing Room
  - (j).13.7 J6.8 Store-Wet Specimens
- 6.9.7.2.4.(j).14 Secure Rooms;
- 6.9.7.2.4.(j).15 Anteroom-Secure; and
- 6.9.7.2.4.(j).16 Accessible washrooms.

6.9.7.2(4)(k) Floor will slope to drain without any puddles.

6.9.7.2(5) Stair Covering

6.9.7.2(5)(a) Use one-piece treads and sheet risers with carborundum strip, or acceptable alternative as reviewed by the Owner.

6.9.7.2(5)(b) In all stairs provide tactile warning strips and stair nosings to assist the visually impaired.

6.9.7.3 Anti-Fatigue Flooring

6.9.7.3(1) Provide anti-fatigue flooring in areas where Staff are standing at workstations for prolonged periods, including at minimum, areas such as the MDRD, Main Pharmacy and Main Laboratory.

6.9.7.3(2) Provide anti-fatigue flooring will consist of the following minimum requirements:

- 6.9.7.3.2.(a).1 25 mm thick interlocking tiles which are secured and able to withstand repeated cleaning with hospital grade disinfectant;
- 6.9.7.3.2.(a).2 Size: custom fit to space;
- 6.9.7.3.2.(a).3 Composition: SBR/EPDM/NBR Rubber Polymer;
- 6.9.7.3.2.(a).4 Provide drain-through feature; and
- 6.9.7.3.2.(a).5 Finish / Textures: factory poly coat and slip resistant texture.

6.9.7.4 Sports Flooring

6.9.7.4(1) Rubber Athletic Flooring

6.9.7.4(1)(a) Provide rubber athletic flooring in Rehab Gym-Cardiovascular and Rehab Gym-Strength Training

6.9.7.4(1)(b) Will be in conformance to

- 6.9.7.4.1.(b).1 ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension;
- 6.9.7.4.1.(b).2 ASTM D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine;
- 6.9.7.4.1.(b).3 ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness);
- 6.9.7.4.1.(b).4 ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader);
- 6.9.7.4.1.(b).5 ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source;
- 6.9.7.4.1.(b).6 ASTM F386: Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces;
- 6.9.7.4.1.(b).7 ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- 6.9.7.4.1.(b).8 ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring;
- 6.9.7.4.1.(b).9 ASTM F970: Standard Test Method for Static Load Limit; and
- 6.9.7.4.1.(b).10 ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

6.9.7.4(1)(c) Manufacturer must be certified ISO 9001.

6.9.7.4(1)(d) Product must have undergone a vulcanization process, with a base of natural and synthetic rubbers, stabilizing agents and pigmentation. Factory lamination is not accepted.

6.9.7.4.1.(d).1 Exceed coefficient of friction standards for athletic performance. Provide a coefficient of friction (COF) no less than 0.6 for level surfaces and 0.8 for incline surfaces in accordance with ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces;

6.9.7.4.1.(d).2 Thickness: 8 mm;

6.9.7.4.1.(d).3 2 mm homogeneous wear layer;

6.9.7.4.1.(d).4 Surface texture: smooth;

6.9.7.4.1.(d).5 Greenguard Gold certified;

6.9.7.4.1.(d).6 Excellent fungal, bacterial and microbial resistance; and

6.9.7.4.1.(d).7 Easily maintained and cleaned as per manufacturer's specifications.

6.9.7.4(1)(e) Install underlayment for increased thermal insulation and sound absorption and decreases potential moisture problems.

6.9.7.4(1)(f) Project Co will prepare the subfloor surface with a depression to suit manufacturer's specifications. Top of resilient athletic flooring will be level with adjacent floor finish.

6.9.7.4(1)(g) Flooring will be warranted to be free from manufacturing defects for one (1) year from date of shipment, and ten (10) years against excessive wear under normal usage.

6.9.7.4(1)(h) Acceptable product: Mondo Advanced or acceptable alternative as reviewed by the Owner.

6.9.7.4(2) Sprung Hardwood Floor

6.9.7.4(2)(a) Provide sprung hardwood flooring in Rehab Gym-Physiotherapy, Rehab Gym-Group Exercise, and Mobility Gym.

6.9.7.4(2)(b) Flooring to be hard maple flooring on one layer of 19 mm sheathing plywood, or anchored. Bio Channel steel encased plywood sleeper, on polyethylene membrane, on concrete floor slab.

6.9.7.4(2)(c) Hard maple flooring: 19.8 mm thick x 57 mm wide continuous strip SL, tongue and groove edges, No. 2 and better grade to MFMA-FJ grading rules.

6.9.7.4(2)(d) Cushion system: Will be Bio-Channel Classic as manufactured by Robbins Sports or acceptable equivalent.

6.9.7.4(2)(e) Vented base: 75 x 100 mm, molded rubber, with ventilation holes.

6.9.7.4(2)(f) Membrane: 0.15 mm polyethylene film, to CGSB 70-GP-1A, Type 2.

6.9.7.4(2)(g) Finish: Clear moisture-cure two-part polyurethane to CGSB 1-GP-180 M, Type 1, MPI gloss level 6; MPI #31.

6.9.7.4(2)(h) Moisture cured urethane coated Spenkel M37-A6X-42 OAE. Minimum 4 coats, sanded between coats. Provide the Owner access to view between each coat.

6.9.7.4(2)(i) Provide MPI QAA two (2) year guarantee or maintenance bond.

6.9.7.4(2)(j) Provide written guarantee that wood flooring system is guaranteed against faulty material and workmanship for two (2) years after Service Commencement.

6.9.7.4(2)(k) Provide painted games lines. Epoxy game line marking to MPI 6.5F, MPI #77.

6.9.7.4(2)(l) Sprung wood flooring will be cushioned with neoprene foam cushion.

6.9.7.4(2)(m) Acceptable sprung wood flooring manufacturers include Harlequin, Robin Luluna Maplewood sprung floors or approved equivalent.

6.9.7.5 Seamless Quartz Epoxy Flooring

6.9.7.5(1) 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.

6.9.7.5(2) Provide integral wall base.

6.9.7.5(3) Provide a coefficient of friction (COF) no less than 0.6 for level surfaces and 0.8 for incline surfaces in accordance with ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces.

6.9.7.6 Safety Flooring

6.9.7.6(1) Safety flooring in Nutrition Centres, Dining Room Serveries, Complete Nourishment Centres and Nourishment Rooms will be slip-resistant homogeneous single-layered, vinyl aggregate sheet flooring to meet the required criteria for the Central Food Production flooring set out in Section 6.17.7.13.

6.9.7.7 Carpets and Carpet Tiles

6.9.7.7(1) Use of carpets and carpet tile requires review by the Owner and will only be considered in areas such as:

6.9.7.7(1)(a) single and multi-occupancy offices;

6.9.7.7(1)(b) open office and administrative areas;

6.9.7.7(1)(c) conference and meeting rooms;

6.9.7.7(1)(d) other similar administrative areas; and

6.9.7.7(1)(e) Media Services Studios.

6.9.7.7(2) Provide secure wall base.

6.9.7.8 Concrete Stain

6.9.7.8(1) Contractors used to install/apply concrete stains will have minimum 10 years' verified experience in the installation of concrete floor treatment finishes.

6.9.7.8(2) Moisture: Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer prior to applying.

6.9.7.8(3) The use of flocked flooring is permitted, except in wet rooms.

6.9.7.9 Static-Resistant Flooring

6.9.7.9(1) Water-based self-leveling epoxy electro-static dissipative coating.

6.9.7.9(2) Bond coat/prime coat and maintenance sealer: as required by manufacture of static dissipative coating.

6.9.7.9(3) Coating system thickness: minimum of 14 mils.

6.9.7.9(4) Provide a flooring system that meets or exceeds the listed minimum physical property requirements when tested according to the following standards:

6.9.7.9(4)(a) Electrical transmission properties (Point-to-point and point-to-ground resistance): ANSI/ESD STM 7.1 Static Dissipative: 1E6-1E9 ohms;

6.9.7.9(4)(b) Microbial-resistant ASTM G 21 Passes, Rating 1;

6.9.7.9(4)(c) Flexibility 1/8” mandrel ASTM D 522 Passes;

6.9.7.9(4)(d) Adhesion resistance ASTM D 4060 5B;

6.9.7.9(4)(e) Impact resistance (Direct/Reverse 160/160 in-lbs.) ASTM D 2794 Passes;

6.9.7.9(4)(f) Abrasion resistance (CS-17 wheels, 1 kg, 1000 cycles) ASTM D 4060 40 mg; and

6.9.7.9(4)(g) Chemical resistance ASTM C 868, ASTM C 267, ASTM D 1308 As listed by manufacturer.

6.9.7.10 Stair Covering

6.9.7.10(1) Use one-piece treads and sheet risers with carborundum strip or acceptable alternative as reviewed by the Owner.

6.9.7.10(2) Use water-soluble, low-odour adhesive, of types recommended by product manufacturer.

6.9.7.10(3) Comply with all applicable standards, including the National Floor Covering Association (NFCA) Specification Standards Manual. US Federal Specification RR-T-650d.

6.9.7.10(4) Select flooring materials that are suitable for:

6.9.7.10(4)(a) ease of cleaning and maintenance;

6.9.7.10(4)(b) pedestrian and rolling traffic;

6.9.7.10(4)(c) the acoustic requirements of the space;

6.9.7.10(4)(d) infection prevention and control; and

6.9.7.10(4)(e) the aesthetics of the Facility.

6.9.8 Painting and Protective Coatings

6.9.8.1 All paint materials to be rated under the Environmental Notation System (NTS) with acceptable VOC ranges as listed in the MPI Approved Products List under E ranges

6.9.8.2 Use only materials having a minimum MPI 'Environmentally Friendly' E2 rating based on VOC (EPA Method 24) content levels.

6.9.8.3 Exposed conduit and services in the underground parking, and any electrical panelboards in Facility corridors.

6.9.8.3(1) Paint to match the adjoining surface for finished appearance.

6.9.8.4 Achieve a visually harmonious and aesthetically coordinated appearance across all areas of the Facility.

6.9.8.5 For specific requirements for paint finishes in Communications Rooms and multimedia rooms, refer to Section 7.9 Communications (Division 27) of this Schedule.

6.9.8.6 Vinyl Acrylic Wall Covering

6.9.8.6(1) If vinyl/acrylic wall covering is used, provide vinyl/acrylic high impact rigid sheet suede texture, minimum 0.060 mm thickness with chemical and stain resistance to ASTM D543 with colour-matched vinyl/acrylic trim for joint/transitions.

6.9.8.6(2) Furnish complete packaged system containing all primers and adhesive. Use water-based and non-hazardous primer and adhesive materials.

6.9.9 Solid Surface Wet Wall Panel System and Accessories

6.9.9.1 At all showers in the Facility, provide a wet wall panel system of solid polymer components that include; panels, inside corner trim and outside finish trim. Wall panels will be full width and height and extend to cover the shower spray zone with seams occurring only at the inside corners of the shower area.

6.9.9.2 At all Soiled Utility rooms in the Facility, provide a wet wall panel system on all walls extending 1.6 m AFF.

6.9.9.3 Panels will be formed from manufacturer's standard 6 mm thick sheet product.

6.9.9.4 Solid polymer will be a non-porous, homogeneous material maintaining the same composition throughout the part with a composition of polyester or acrylic polymer, aluminum trihydrate filler and pigment.

6.9.9.5 Provide matching inside corner trim and outside finish trim to conceal corner sealant and provide transition from shower to adjacent wall finishes.

6.9.9.6 Provide matching cast recessed shampoo and soap holder.

6.9.9.7 Provide mildew-resistant silicone sealant that is FDA compliant and 100% clear.

6.9.9.8 Manufacture will be Avonite acrylic solid surface as manufactured by Aristech Surfaces LLC or acceptable alternative as reviewed by the Owner. In some areas, such as Soiled Utility Rooms, the Owner may accept Altro Whitewock rigid sheet vinyl wall covering as manufactured by Altro USA Inc., subject to further review of locations and their specific application requirements.

6.9.9.9 Technical Requirements:

6.9.9.9(1) Minimum Thickness: 6 mm;

6.9.9.9(2) Barcol Hardness: 59, when tested in accordance with ASTM D258;

6.9.9.9(3) Elongation: 2.2%, when tested in accordance with ASTM D638;

6.9.9.9(4) Tensile strength: 3,800psi, when tested in accordance with ASTM D638;

6.9.9.9(5) Tensile Modulus: 11 x 105, when tested in accordance with ASTM D638;

6.9.9.9(6) Water Absorption after 24 hours: .07%, when tested in accordance with ASTM D570;

6.9.9.9(7) Charpy Impact (Foot Pounds/Inch): 1.5, when tested in accordance with ASTM D6110;

6.9.9.9(8) Impact Resistance 1/2 Pound: No Fracture, when tested in accordance with NEMA LD3-3.8;

6.9.9.9(9) Linear Thermal Expansion: 2.0 x 10-5, when tested in accordance with ASTM D696;

6.9.9.9(10) High Temperature Resistance: Slight Effect, when tested in accordance with NEMA LD3-3.6;

6.9.9.9(11) Boiling Water Resistance: No Effect, when tested in accordance with ISFA 2-01;

6.9.9.9(12) Stain Resistance: No Effect, when tested in accordance with NEMA LD3-3.4;

6.9.9.9(13) Weight per sq. ft., 6 mm thickness: 2.2 pounds.

6.9.9.10 Provide a wet wall panel system at all hand hygiene sinks, lavatory sinks, utility sinks, janitorial sinks, scrub stations sinks, as well as emergency showers and eyewash stations. Wet wall panel system will be provided behind all chemical dispensing systems in Housekeeping Closets.

6.10 Specialties (Division 10)

6.10.1 Magnetic Whiteboards

6.10.1.1 Provide and install magnetic whiteboards in rooms and spaces throughout the Facility including, at minimum, each of the following:

6.10.1.1(1) Conference rooms;

6.10.1.1(2) Meeting rooms;

6.10.1.1(3) Medication rooms;

6.10.1.1(4) Offices (private or shared);

6.10.1.1(5) Open work areas with multiple workstations;

6.10.1.1(6) Care Team Stations;

6.10.1.1(7) Lounges-Staff;

6.10.1.1(8) Patient Rooms;

6.10.1.1(9) Workrooms;

6.10.1.1(10) Control-Imaging rooms;

6.10.1.1(11) Assessment/Treatment rooms;

6.10.1.1(12) Group Therapy rooms;

6.10.1.1(13) Consult/Interview room;

6.10.1.1(14) Multipurpose Room-Large

6.10.1.1(15) Dining/Activity Areas;

6.10.1.1(16) Packaging and Assembly Areas;

6.10.1.1(17) Decontamination rooms;

6.10.1.1(18) Cart Exchange-Clean;

6.10.1.1(19) Cart Exchange-Soiled;

6.10.1.1(20) Corridors;

6.10.1.1(21) Clinical Skills Room(s)

6.10.1.1(22) Procedure rooms;

6.10.1.1(23) Operating Rooms; and

6.10.1.1(24) Interventional Suites.

6.10.1.2 Magnetic whiteboards will meet the following requirements:

6.10.1.2(1) Have surfaces designed for use with felt-type writing instruments as well as erasing with repeated cleaning with minimal effort;

6.10.1.2(2) Acrylic enameled steel, scratch and abrasion-resistant writing surface that resists ghosting or staining;

6.10.1.2(3) Continuous extruded aluminum frame, accessory holder tray with protective end caps, map rails and map hooks; and

6.10.1.2(4) Uses non-toxic, water based lamination adhesive.

6.10.1.3 In the locations listed above, provide magnetic whiteboards of the following sizes and quantities:

6.10.1.3(1) One (1) at 600 mm x 915 mm:

6.10.1.3(1)(a) in all medication rooms, Patient rooms and Exam/Treatment Bays, including those 25 nsm and larger; and

6.10.1.3(1)(b) in all other rooms or spaces equal to or less than 10 NSM.

6.10.1.3(2) One (1) at 1.22 m x 1.83 m in all rooms or spaces greater than 10 NSM but less than 25 NSM, except as required by 6.10.1.3(1)(a); and

6.10.1.3(3) Two (2) at 1.22 m x 2.4 m each in all rooms or spaces equal to or greater than 25 NSM, except as required by Section 6.10.1.3(1)(a).

6.10.2 Compartment and Cubicles

6.10.2.1 Design and construct compartments and cubicles to meet the following requirements:

6.10.2.1(1) For compartment/cubicle doors, use material matching the partitions and include permanent, purpose-made hardware. Design doors and hardware to provide barrier-free access.

6.10.2.1(2) Provide a mirror in all change compartments.

6.10.2.1(3) Curtain tracks in these spaces that are accessible to Patients will comply with the requirements of shower curtain tracks as indicated in this Schedule.

6.10.3 Coat Hooks, Hangers and Brackets

6.10.3.1 Provide coat hooks in all the following room locations:

6.10.3.1(1) Washrooms;

6.10.3.1(2) Offices;

6.10.3.1(3) Conference Rooms and Meeting Rooms;

6.10.3.1(4) Workrooms;

6.10.3.1(5) Workstations;

6.10.3.1(6) Locker Rooms;

6.10.3.1(7) Change Rooms and cubicles;

6.10.3.1(8) O11.3 Store-Ceiling Lift and Transfer Sling

6.10.3.1(9) Lounges; and

6.10.3.1(10) Throughout the following components:

6.10.3.1(10)(a) J1 - Main Pharmacy

6.10.3.1(10)(b) J2 - Specialty Pharmacy

6.10.3.1(10)(c) J3 - Clinical Nutrition

6.10.3.1(10)(d) J4 - Main Laboratories

6.10.3.1(10)(e) J5 - Outpatient Lab

6.10.3.1(10)(f) J6 - Morgue and Autopsy

6.10.3.2 Provide a single coat hook where the areas listed above are equal to or less than 10 NSM in Appendix 3A [Clinical Specifications and Functional Space Requirements]. For all other instances, provide a hook strip with multiple hooks along a single strip. Provide hooks equal to the anticipated number of occupants expected in the room at one time.

6.10.3.3 Coat hooks and hook strips: back plate will be 2 mm, type 304, satin-finish stainless steel.

6.10.3.4 Coat hooks or hook strips applied to doors will not be accepted.

6.10.3.5 Provide Ligature Resistant stainless steel hooks that snap down for safety if excessively loaded complete with Tamper Resistant mounting fasteners throughout the Facility with the exception of Staff only areas.

6.10.3.6 Provide hangers within each Patient Room (excluding Mental Health Areas) to support Patient walkers and other mobility aids.

6.10.3.7 Provide two (2) laser goggles/eye protection hooks outside all Operating Rooms and Interventional Suites. Exact location as determined with the Owner based on the Design.

6.10.3.8 Provide mop and broom brackets with a minimum of five (5) holding positions in each Housekeeping Closet.

6.10.3.9 Provide coat hooks equal to the number of expected occupants in the room, as well as multiple wall-mounted hooks for all other miscellaneous items such as slings and exercise mats in the O11.3 Transfer Sling Room and gym spaces.

6.10.4 Toilet Partitions

6.10.4.1 Galvannealed sheet metal will conform to ASTM A653 with minimum ZF001 (A01) zinc coating. Finish in polyester, baked enamel or powder coating.

6.10.4.2 For stainless steel, use Type 304 conforming to ASTM A240 with No. 4 finish.

6.10.4.3 For plastic laminate, use Grade 10/HGS GP50 scuff-resistant, high pressure laminate, conforming to NEMA LD-3.

6.10.4.4 Avoid use of particleboard core partitions.

6.10.4.5 For fibre-reinforced plastic (fibreglass), use a moisture resistant grade.

6.10.4.6 Incorporate Ligature Resistant design features to the maximum extent possible in publicly accessible washrooms.

6.10.5 Washroom and Change Cubicle Partitions

6.10.5.1 Provide embossed stainless steel compartments and cubicles including toilet partitions, change cubicles and other compartments and cubicles requiring privacy and security. Where multiple showers are grouped such as D6.1.2 Shower, Staff they will be separated with wall assemblies, not cubicle partitions. Urinals will have side panels on both sides unless adjacent to wall. Walls adjacent to urinals and toilets will be covered with wet wall panel system. All washroom urinal and change room partitions are to be made with full-height channels at all mounting locations. Privacy channels will be provided to eliminate gaps between all panels and doors.

6.10.5.2 Provide exposed surfaces that are permanent, water-resistant, corrosion-proof, and readily cleaned and maintained. Provide anti-graffiti coatings as required.

6.10.5.3 Secure partitions and stanchions from the ceiling structure in a manner to resist lateral loading, seismic forces and impact.

6.10.5.4 For compartment/cubicle doors, use material matching the partitions and include permanent, purpose-made hardware. Design doors and hardware to provide barrier-free access.

6.10.5.5 For stainless steel, use Type 304 conforming to ASTM A240 embossed finish.

6.10.5.6 Plastic laminate is not acceptable.

6.10.5.7 Particleboard core partitions are not acceptable.

6.10.5.8 Fibre-reinforced plastic (fibreglass) is not acceptable.

6.10.5.9 Galvannealed sheet metal is not acceptable.

6.10.5.10 Where not adjacent to showers, change cubicle partitions will comply with the above requirements for toilet partitions.

6.10.5.11 Incorporate Ligature Resistant design features to the maximum extent possible in publicly accessible washrooms and change areas.

6.10.6 Typical Room Accessories

6.10.6.1 Project Co will provide the following:

6.10.6.1(1) a recessed toiletry shelf having a two-shelf design and minimum dimensions of approximately (H x D x W) 460 mm x 110 mm x 300 mm wherever required by Appendix 3L [Millwork and Modular Casework Matrix], for personal belongings (e.g. purse, handbag, toiletries);

6.10.6.1(2) a solid acrylic surface shelf for personal belongings (e.g. purse, handbag, toiletries) in all Staff locker areas and Staff washrooms;

6.10.6.1(3) shoe, racks or cubbies in all Staff locker or change areas, the quantity of which will correspond equally to the number of lockers or Staff indicated in Appendix 3A [Clinical Specifications and Functional Space Requirements];

6.10.6.1(4) stainless steel coat rod and shelf in the Coat Closet and similar garment storage spaces;

6.10.6.1(5) Shoe racks, open stainless steel coat rod and shelf in all Staff locker areas;

6.10.6.1(6) benches and seating (chairs), coat hooks, and shelf for personal belongings in all Patient and Staff locker or change rooms/cubicles; and

6.10.6.1(7) benches and/or seating, coat hooks, and shelf for personal belongings in Staff shower areas.

6.10.7 Corner Guards and Wall Protection, Handrails, Chair rails and Bed Bumpers and Door Frame Protection

6.10.7.1 Corner Guards and Wall Protection

6.10.7.1(1) Provide corner guards and sheet wall protection throughout the Facility in any corridor, room or area where Patients, wheelchairs, stretchers, Equipment, and service vehicles including carts can reasonably cause damage to the wall, including all Patient Rooms. Sheet wall protection is not required along interdepartmental corridors within restricted Staff only administrative areas or within open workstation areas, offices, shared offices and meeting rooms where stretchers and carts are not anticipated.

6.10.7.1(2) Apply sheet wall protection to wall areas where the impact damage anticipated is of a larger area of wall than would be protected by bumper guards.

6.10.7.1(3) All corner guards in the Facility will be stainless steel unless otherwise noted.

6.10.7.1(4) Provide corner guards that are flush-mounted, one-piece 90-degree corner guards with 90 mm legs constructed of 16 gauge type 304 stainless steel with wing edges crimped for continuous tight fit against the wall surface.

6.10.7.1(5) Provide heavy duty corner guards in all Back of House service corridors consisting of 16 gauge stainless steel with 125 mm legs. Heavy duty corner guards will be provided at other locations where AGV, tow motors, carts, pallets and logistics traffic is expected.

6.10.7.1(6) Provide ‘U’ shape surface mounted end wall protectors at all such conditions.

6.10.7.1(7) All corner guards to be adhered with no visible fasteners. Secure wall and corner guards to reinforcing and backing in the walls; such backing to be sufficient to withstand expected impact loads.

6.10.7.1(8) Install minimum 19 mm X 19 mm stainless steel corner guards to Millwork corners exposed to mobile equipment movements including both sides of headwall.

6.10.7.1(9) For floor or wall-mounted sinks, the wet wall panel system will extend up to a minimum height of 1.60 m AFF and a minimum width of 600 mm on either side of the sink centreline, except in all Operating Rooms, Interventional Suites and Procedure Rooms; refer to Section 6.10.7.1(15)(a). For counter mounted or integral sinks, the wet wall panel system will extend up 600 mm above the top of counter or in the case of upper cabinets, to underside of cabinets above. The minimum width will be 600 mm on either side of the sink centreline or as required to protect the adjacent wall surfaces from water. For emergency showers and eyewash

stations, the wet wall panel system will extend full height of the wall and 200 mm beyond the curtain track or 600 mm beyond the spray area.

6.10.7.1(10) Secure wall protection to reinforcing and backing in the walls and ensure that such backing is sufficient to withstand expected impact loads.

6.10.7.1(11) Use sheet wall protection products that are high impact resistant, stain-resistant to pen marks, paint, and graffiti, and able to withstand hospital-grade repeated cleaning and disinfection. Use products containing antimicrobial additives to retard mildew and bacterial growth. Sheet wall protection will be a high impact wall covering with preformed rigid sheet and matching trims, internal and external corners, containing no PVC. Minimum thickness 1.02 mm with panel size 1.22 m x 2.44 m. Fiberglass reinforced plastic (FRP) is not acceptable. Provide welded or chemically bonded seams to form a seamless continuous covering.

6.10.7.1(12) Corner guards and wall protection height to be aligned horizontally at a minimum 1.35 m AFF unless otherwise noted. Provide corner guards at all hand hygiene sinks to align with the height of wet wall panel systems as required in Section 6.10.7.1(9).

6.10.7.1(13) The following rooms or areas will have corner guards and wall protection to a minimum height of 1.6 m AFF:

- 6.10.7.1(13)(a) All Store rooms or spaces, unless noted otherwise;
- 6.10.7.1(13)(b) Store – Clean supply;
- 6.10.7.1(13)(c) Housekeeping Closet;
- 6.10.7.1(13)(d) All Equipment storage rooms;
- 6.10.7.1(13)(e) Soiled Utility rooms, except that wall protection is not required where wet wall panel systems are provided in accordance with Section 6.9.9.2;
- 6.10.7.1(13)(f) All alcoves unless otherwise noted; and
- 6.10.7.1(13)(g) Control – Imaging.

6.10.7.1(14) The following rooms or areas, at minimum, will have corner guards and wall protection to a minimum height of approximately 2.1 m AFF to align with the top of the door frame:

6.10.7.1(14)(a) A1 - Emergency Department

6.10.7.1.14.(a).1 Exam/Treatment Room-Resuscitation.

6.10.7.1(14)(b) E2 - Maternity Centre

6.10.7.1.14.(b).1 Procedure Room-Airborne Isolation-Hybrid; and

6.10.7.1.14.(b).2 Procedure Room.

6.10.7.1(14)(c) G - Surgical and Interventional Services

6.10.7.1.14.(c).1 Back of House corridor circulation for Interventional Suites (for transport of specialized supplies);

6.10.7.1.14.(c).2 All Workrooms;

6.10.7.1.14.(c).3 All rooms where clean supplies are stored; and

6.10.7.1.14.(c).4 All laboratory or Lab-Frozen Section areas;.

6.10.7.1(14)(d) J - Clinical Support Services throughout the following Components with the exception of administration areas;

6.10.7.1.14.(d).1 J1 - Main Pharmacy;

6.10.7.1.14.(d).2 J2 - Specialty Pharmacy;

6.10.7.1.14.(d).3 J4 - Main Laboratories; and

6.10.7.1.14.(d).4 J6 - Morgue and Autopsy.

6.10.7.1(14)(e) O - Operational Support throughout the following Components with the exception of administration areas;

6.10.7.1.14.(e).1 O1 - Biomedical Engineering;

6.10.7.1.14.(e).2 O2 – MDRD;

6.10.7.1.14.(e).3 O3 - Central Food Production;

6.10.7.1.14.(e).4 O4 - FMO Operations;

6.10.7.1.14.(e).5 O5 - Logistics Centre;

6.10.7.1.14.(e).6 O7 - Equipment Depot;

6.10.7.1.14.(e).7 O8 - Environmental Services; and

6.10.7.1.14.(e).8 O10 - Waste Management.

6.10.7.1(14)(f) Back of House areas for commercial and retail spaces.

6.10.7.1(15) The following rooms or areas, at minimum, will have full height, floor to ceiling, corner guards and wall protection:

6.10.7.1(15)(a) All Operating Rooms, Interventional Suites and Procedure Rooms, including at any sinks within these rooms.

6.10.7.1(15)(b) A1 - Emergency Department;

6.10.7.1.15.(b).1 Decontamination Room.

6.10.7.1(15)(c) G - Surgical and Interventional Services;

6.10.7.1.15.(c).1 All areas where Equipment or supplies stored;

6.10.7.1.15.(c).2 All alcoves;
6.10.7.1.15.(c).3 Utility-Bronch Scope Rinse;
6.10.7.1.15.(c).4 Scope Decontamination;
6.10.7.1.15.(c).5 Scope Disinfection;
6.10.7.1.15.(c).6 Store-Clean Scope-Endo;
6.10.7.1.15.(c).7 Store-Clean Scope-Bronch;
6.10.7.1.15.(c).8 Sterile Core; and
6.10.7.1.15.(c).9 Specimen Holding.

6.10.7.2 Handrails

6.10.7.2(1) Provide handrails on both sides of all corridors for support. All handrails to extend across adjacent sidelights at corresponding mid-rails.

6.10.7.2(2) Provide materials and shapes appropriate for Patient support, with continuous uninterrupted supports.

6.10.7.2(3) Provide handrails that meet the needs of the visually impaired and comply with Elder-Friendly principles, including:

6.10.7.2(3)(a) Handrails will be of a colour that contrasts with the floor and wall for ease of location and use;

6.10.7.2(3)(b) Provide a tactile signal, such as a notch, 100 mm from the endpoint or interruption of handrails, or have the rail curve and connect back to the wall;

6.10.7.2(3)(c) Handrails will be 40 to 45 mm in diameter with a non-slip texture;

6.10.7.2(3)(d) Curve the end of handrails down to 680 mm for easier detection by visually impaired adults using cane technique;

6.10.7.2(3)(e) Continue handrails through and around landings;

6.10.7.2(3)(f) Allow a minimum clearance of 1.47 m to 1.83 m between handrails to allow two wheelchairs to pass; and

6.10.7.2(3)(g) In public-use elevators, provide handrails on both sides of the cabin at a height between 800 mm and 1 m.

6.10.7.2(4) Provide handrails for all walkways, including those having a gradient of 5 percent or less.

6.10.7.2(5) All handrails will be able to withstand an applied force of 2 kN.

6.10.7.2(6) Provide handrails which are Ligature Resistant throughout the Facility, except for Staff only Back of House areas.

6.10.7.2(7) Provide handrails in Clinical Spaces as required by the Owner including for GANs testing in the Exam Room-VNG.

6.10.7.3 Chair rails and Bed Bumpers

6.10.7.3(1) Chair rails will be provided throughout the Facility in all offices, conference rooms, meeting rooms, collaboration rooms, lounges, workstations, administrative areas and all other locations where chairs would otherwise reasonably cause damage to the wall. Width to be 260 mm; top of rail to be 980 mm AFF.

6.10.7.3(2) Bed bumper (bed locators) to be provided in rooms where movable gurneys, beds or stretchers are to be used and all other locations where gurneys, beds or stretchers would otherwise reasonably cause damage to the wall.

6.10.7.3(3) Bed bumper will be minimum 1.22 m wide X 900 mm high mounted 150 mm AFF made of phenolic core with plastic laminate finish coordinated with other finishes within the spaces such as Millwork.

6.10.7.3(4) Finish of the bed bumper will withstand hospital-grade repeated cleaning and disinfection.

6.10.7.3(5) Coordinate height and fit with gurney or stretcher model and all associated Equipment. Coordinate bed bumper design with sheet wall protection system utilized for the Facility.

6.10.7.4 Door Edge and Door Frame Protection

6.10.7.4(1) Protect door edges and door frames in Clinical Spaces from damage such as impact caused by the regular movement of stretchers and other wheeled vehicles.

6.10.7.4(2) Provide full height door edge protection in high use areas. Height of all door, edge and frame protection will be of an adequate height to fully protect the door, edge and frame from damage.

6.10.7.4(3) Protect elevator frames from damage due to bed and cart movement.

6.10.7.4(4) Door protection including edge guards, kick plates, mop plates, armour plates and stretcher plates will be stainless steel and provided accordingly.

6.10.7.4(5) Provide kick plates for any doors with a self-closing device.

6.10.7.4(6) Door protection will be minimum height of 1.35 m above the finished floor.

6.10.7.4(7) For the door and frame protection types listed in Appendix 3M [Door Requirements Matrix], provide the following:

6.10.7.4(7)(a) Type 1 - Low

6.10.7.4.7.(a).1 1 Ea. Kickplate 80A 10” x door width less 2” 630 GS for single door.

6.10.7.4.7.(a).2 2 Ea. Kickplate 80A 10” x door width less 1.5” 630 GS for double doors.

6.10.7.4(7)(b) Type 2- High

6.10.7.4.7.(b).1 Single door -protection to 34” AFF

(b).1.1 1 Ea. Armor plate 80A x door width less 2” 630 GS

(b).1.2 2 Ea. Door Edge Guards GSH butted type to suit door 630 GS

(b).1.3 2 Ea. Door Frame Guards GSH 50N 630 GS

6.10.7.4.7.(b).2 Double door protection to 34” AFF

6.10.7.4.7.(b).3 2 Ea. Armor plate 80A x door width less 1.5”” 630 GS

6.10.7.4.7.(b).4 2 Ea. Door Edge Guards GSH butted type to suit door 630 GS

6.10.7.4.7.(b).5 2 Ea. Door Frame Guards GSH 50N 630 GS

6.10.7.5 Horizontal Surfaces

6.10.7.5(1) Provide a solid polymer fabricated surface to protect the ledge continuously along all horizontal GWB surfaces, pony walls, window sills, or similar. Sub-surface material will be plywood; no particle board will be permitted.

6.10.8 Metal Lockers

6.10.8.1 Where lockers are described for Staff use only in Appendix 3A [Clinical Specifications and Functional Space Requirements], provide full size, ‘Z’ or half size, and purse size metal lockers to meet the following requirements. For all other lockers within the Facility, provide solid phenolic lockers.

6.10.8.1(1) For sheet metal, use galvanized and cold-rolled steel conforming to ASTM – A366: Specifications for steel, carbon, cold-rolled sheet of commercial quality;

6.10.8.1(2) Finish steel surfaces with silver-based antimicrobial treated powder coating;

6.10.8.1(3) Lockers will include a provision for locking with padlock, and complete with number plates, and hanging hooks; and

6.10.8.1(4) Provide a sloped top at all locker locations.

6.10.8.2 Basis of Design will be Lincora Canada Inc., 50 Series “Nova” Lockers all Welded, or equal as reviewed by the Owner.

6.10.9 Solid Phenolic Lockers

6.10.9.1 General Requirements

6.10.9.1(1) Provide full size, ‘Z’ or half size, and purse size solid phenolic lockers in the quantities and locations listed in Appendix 3A [Clinical Specifications and Functional Space Requirements];

6.10.9.1(2) For each locker, include number plates, hanging hooks, and a keyless mechanical combination cam lock with a key override – no wires, battery, nor card required;

6.10.9.1(3) Locker number sequencing to be as determined with the Owner.

6.10.9.1(4) Provide seismic restraints in accordance with the VBBL for all lockers;

6.10.9.1(5) Provide a sloped top at all locker locations; and

6.10.9.1(6) Each individual locker will include door pull handles, and a keyless mechanical combination cam lock with a key override – no wires, battery nor card required.

6.10.9.2 Materials Requirements

6.10.9.2(1) Locked core or panel material will meet fire resistance per ASTM E84 Class A fire rating;

6.10.9.2(2) Door material will be 13 mm thick solid phenolic composite material with rounded edges;

6.10.9.2(3) Doors will be attached to the hinge with through-bolting;

6.10.9.2(4) Locker bodies will have eased edges to remove sharpness, be machine polished and free from tooling imperfections and include;

6.10.9.2(4)(a) Tops, bottoms, and intermediate shelves consisting of 13 mm solid phenolic composite material with ventilation holes;

6.10.9.2(4)(b) Locker backs consisting of 6 mm solid composite material; and

6.10.9.2(4)(c) Locker sides consisting of 10 mm thick solid phenolic composite material.

6.10.9.3 Hardware Requirements

6.10.9.3(1) Hinges will be 304-grade stainless steel. Provide minimum three (3) for full height doors and two (2) for multi-tier units; and

6.10.9.3(2) Interior hooks will be stainless steel.

6.10.9.4 Ventilation Requirements

6.10.9.4(1) Interior Vent: Provide six (6) minimum 10 mm diameter ventilation holes on tops, bottoms, and intermediate shelves;

6.10.9.5 Provide three (3) 10 mm diameter ventilation holes on “Z” type intermediary shelves; and

6.10.9.5(1) Door Vent: Provide minimum of 20 squares inches opening of front ventilation for full tier lockers. For other styles, provide front ventilation 1.43 square inches per lineal foot of door perimeter.

6.10.9.6 Locker Size Requirements

6.10.9.6(1) Full Size with 1 Tier

6.10.9.6(1)(a) 1.83 m H x 305 mm W x 381 mm D

6.10.9.6(2) ‘Z’ with 2 Tier

6.10.9.6(2)(a) 1.067 m (1.83 m Overall) H x 305 mm W x 381 mm D

6.10.9.6(3) Purse or Multi-Tier

6.10.9.6(3)(a) 349 mm H x 305 mm W x 381 mm D

6.10.10 Storage Shelving Systems

6.10.10.1 Provide storage systems for materials in designated storage areas.

6.10.10.2 Shelves will be adjustable and suitable for various storage requirements.

6.10.10.3 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.

6.10.10.4 Provide storage shelving systems in accordance with the applicable requirements of the Fraser Health Recommendations for the Ergonomic Design of Storage, Shelving, and Racks.

6.10.10.5 Shelves will be cleanable with Owner approved detergents and disinfectants.

6.10.11 Washroom Accessories

6.10.11.1 Provide washroom accessories in all washrooms. Provide and install the type, size, and number of washroom accessories as determined with the Owner. All accessories will be compatible with Owner provided consumable supplies.

6.10.11.2 Washroom accessories and installation will be in conformance with VBBL requirements for Persons with Disabilities.

6.10.11.3 Provide fold-down infant change tables and fold-down adult change tables in the locations described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.10.11.3(1) Fold-down infant change tables will include:

6.10.11.3(1)(a) Safety straps to hold infant securely;

6.10.11.3(1)(b) Antimicrobial finish able to withstand repeated cleaning with hospital grade disinfectant;

6.10.11.3(1)(c) Minimum closed dimensions of 890 mm L x 560 mm H x 100 mm W with minimum open width of 58 cm;

6.10.11.3(1)(d) High-density polyethylene construction with stainless steel veneer front; and

6.10.11.3(1)(e) Integral compartment for disposable, biodegradable liners 330 mm x 460 mm.

6.10.11.3(2) Fold-down adult change tables will include:

6.10.11.3(2)(a) Wall-mounted installation;

6.10.11.3(2)(b) Removable mattress with adjustable head/back support;

6.10.11.3(2)(c) Minimum weight Capacity of 200 kg (440 lbs);

6.10.11.3(2)(d) Minimum width of 785 mm (31″) with height adjustment from 300 mm to 985 mm AFF;

6.10.11.3(2)(e) Aluminum frame;

6.10.11.3(2)(f) Pneumatic counter balance; and

6.10.11.3(2)(g) Removable durable 3-piece polyurethane foam mattress;

6.10.11.4 Provide washroom accessories in Mental Health Areas that comply with New York State Office of Mental Health, Patient Safety Standards – Materials and Systems Guidelines.

6.10.11.5 Unless otherwise noted, do not use recessed dispensers (such as those for paper towels, soap and waste receptacle).

6.10.11.6 Unless otherwise noted, use commercial and hospital grade accessories free from imperfections in manufacture and finish.

6.10.11.7 In all washrooms, use fasteners and fittings that are Tamper Resistant.

6.10.11.8 Public washrooms will be provided with the following accessories:

6.10.11.8(1) soap dispenser;

6.10.11.8(2) double stainless steel toilet paper dispenser;

6.10.11.8(3) paper towel dispenser;

6.10.11.8(4) paper towel / garbage disposal;

6.10.11.8(5) mirror;

6.10.11.8(6) grab bar accessible to Persons with Disabilities, with integral tactile grip finish;

6.10.11.8(7) coat hook;

6.10.11.8(8) sanitary napkin dispensers;

6.10.11.8(9) sanitary napkin disposals; and

6.10.11.8(10) solid polymer surface utility shelf.

6.10.11.9 Patient washrooms will be provided with the following accessories:

6.10.11.9(1) soap dispenser;

6.10.11.9(2) double stainless steel toilet paper dispenser;

6.10.11.9(3) paper towel dispenser;

6.10.11.9(4) paper towel / garbage disposal;

6.10.11.9(5) mirror;

6.10.11.9(6) grab bar accessible to Persons with Disabilities, with integral tactile grip finish;

6.10.11.9(7) coat hook;

6.10.11.9(8) shelf above or near the sink; and

6.10.11.9(9) solid polymer surface shower shelf.

6.10.11.10 Patient washrooms in Mental Health Areas and public washrooms within the Emergency Department will be provided with the following accessories:

6.10.11.10(1) Soap dispenser Ligature Resistant;

6.10.11.10(2) Ligature Resistant, wall-mounted paper towel waste bin;

6.10.11.10(3) Vandal Resistant mirrors that are unbreakable and securely fasten to the wall and do not distort the viewer's reflection, glass is not acceptable. Angled mirror as required;

6.10.11.10(4) Ligature Resistant grab bar with integral weep holes, wall-mounted on one side to allow Staff assist from the other side;

6.10.11.10(5) Ligature Resistant coat hook;

6.10.11.10(6) Vandal Resistant shelf above sink; and

6.10.11.10(7) Ligature Resistant toilet paper dispenser.

6.10.11.11 Shower rooms or showers in washrooms within Mental Health Areas will include the following accessories:

6.10.11.11(1) Ligature Resistant shower curtain and breakaway track or breakaway rod;

6.10.11.11(2) Ligature Resistant grab bar with integral weep holes;

6.10.11.11(3) a recessed combination shampoo and soap holder approximately 200 mm x 380 mm as part of a complete solid surface wet wall panel system; and

6.10.11.11(4) Ligature Resistant and Vandal Resistant shower fixtures and accessories.

6.10.11.11(4)(a) Provide a lockable handheld shower head for staff use in accessible and bariatric washrooms in Mental Health Areas.

6.10.11.12 Staff Showers and Change rooms will include the following accessories:

6.10.11.12(1) shower curtain track or rod as appropriate;

6.10.11.12(2) grab bars (with integral tactile grip finish);

6.10.11.12(3) mirrors with counter;

6.10.11.12(4) shower curtain; and

6.10.11.12(5) utility shelf.

6.10.11.13 Selection of Washroom accessories for Staff Washrooms, Staff Change rooms, and Public Washrooms will be from the Owner's approved list of Washroom accessories in further consultation with the Owner during the process described in Schedule 2 [Design and Construction Protocols].

6.10.11.14 Provide infant change tables in all Washroom-Public areas.

6.10.12 Operable Partitions

6.10.12.1 Provide operable partitions and suspension system in rooms described as dividable in Appendix 3A [Clinical Specifications and Functional Space Requirements] such as conference rooms and multipurpose rooms.

6.10.12.2 Operable partitions will be electrically operated with continuously hinged panels.

6.10.12.3 Panel faces will be laminated to substrate to meet STC and acoustical performance requirements of Appendix 3C [Acoustic and Noise Control Measures].

6.10.12.4 Frames will be minimum 16 gauge (1.42 mm) painted steel with integral factory applied aluminum vertical edge and face protection.

6.10.12.5 Vertical sound seals will be of tongue and groove configuration, ensure panel-to-panel alignment and prevent sound leaks between panels.

6.10.12.6 All panels will have bottom retractable seals that provide a minimum of 51 mm (2") floor clearance during movement of the partition, including all panels adjacent to any pass door(s).

6.10.12.7 Retractable bottom floor seal to exert downward seal force when activated. Floating or rigid seals that maintain contact with the floor during partition movement will not be acceptable.

6.10.12.8 Motor will automatically extend/retract the bottom seals.

6.10.12.9 Suspension System Requirements

6.10.12.9(1) Track design will provide precise alignment at the trolley running surfaces and provide integral support for adjoining ceiling, soffit, or plenum sound barrier. Track will be connected to the structural support.

6.10.12.9(2) Factory assembled power units will be ULC listed and include motor, electronic torque limiter, two key control stations wired in series, emergency release, and all necessary equipment for electric operation.

6.10.12.9(3) Roller chain drive will attach to carrier of lead panel. Limit switches will be provided to prevent over-travel.

6.10.12.10 Safety Requirements:

6.10.12.10(1) Low profile hinges will be of steel and project no more than 6 mm beyond panel faces. Panels to have a minimum of three hinges.

6.10.12.10(2) Panel will be supported by a single carrier allowing the panels to stack freely without the use of rub rails near the pocket.

6.10.12.10(3) Partition will be operated by two (2) control stations wired in series and located on opposite sides and ends of the partition.

6.10.12.10(4) The key stations will be designed for Staff only operation of the partition system.

6.10.12.11 Finishes

6.10.12.11(1) Face finish will be provided and include;

6.10.12.11(1)(a) Factory applied reinforced vinyl fabric with woven backing, wood veneer, or high pressure laminate.

6.10.12.12 Operational Requirements

6.10.12.12(1) Partitions will be key switch controlled, requiring constant contact to activate the motor. As a safety precaution, two key switches are required to activate the partition. Switches to be mounted on both sides of partition to provide operators a clear view of the partition path to prevent injury.

6.10.12.12(2) Motor drive will automatically seal the partition in the opening.

6.10.13 Mail Slots

6.10.13.1 Provide mail slots that are a minimum of 25 mm wide, 350 mm high and 400 mm deep, in locations identified in the Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.10.14 Privacy Curtains, Shower Curtains, Tracks and IV Tracks

6.10.14.1 Provide privacy curtains in all areas and spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.10.14.2 In addition, provide privacy curtains in Clinical Spaces with the following door types as described in Appendix 3M [Door Requirements Matrix];

6.10.14.2(1) Type G;

6.10.14.2(2) Type H;

6.10.14.2(3) Type J; and

6.10.14.2(4) Type F2.

6.10.14.3 Provide a hookless curtain system and tracks at all privacy curtain locations.

6.10.14.4 Provide attachments and cover escutcheons which are continuously sealed with silicone sealant in all wet areas.

6.10.14.5 In addition to those privacy curtains described in Appendix 3A [Clinical Specifications and Functional Space Requirements], provide 35% additional privacy curtains for the Facility (i.e.135%) for the Owner's use.

6.10.14.6 Curtain textiles will comply with all Owner requirements and CAN/CBSB-4.162 M, Hospital Textiles - Flammability Performance Requirements.

6.10.14.7 Provide open mesh along the top of all curtains as required for sprinkler protection.

6.10.14.8 Provide curtain rod extenders or other devices as required to ensure that the ceiling lift systems will not interfere with curtains or be obstructed by curtains.

6.10.14.9 Provide IV tracks in locations where medications are expected to be prepared such as Medication Rooms and Clean Supply Rooms.

6.10.14.10 For IV tracks, use extruded aluminum, anodized finish and entirely enclosed except for slot in bottom. Provide IV carriers consisting of plated steel block supported from four nonconductive nylon ball-bearing wheels and equipped with 180-degree twist lock with nylon washer.

6.10.14.11 All tracks will be structurally supported. Attach the track assembly to the ceiling with solid wood blocking or sheet metal blocking, attached with pan head screws through the acoustic ceiling tile and into the blocking. For GWB ceilings, attach with toggle bolt assemblies through the GWB. Attaching to acoustic tile T-bar ceiling is not acceptable.

6.10.14.12 Metal grommets on textiles are not acceptable.

6.10.14.13 Provide shower curtains at all shower locations.

6.10.14.14 Shower curtain tracks in Patient accessible showers will meet the following requirements:

6.10.14.14(1) Be specially designed as Ligature-Resistant with tracks recessed into the ceiling surface;

6.10.14.14(2) Tracks will consist of one-piece extruded aluminum spanning from end point to end point and secured in place with Tamper Resistant fasteners; and

6.10.14.14(3) Tracks are not permitted to "break-away".

6.10.14.15 Provide curtain textile, height of curtains, colour, fasteners and tracks, as required.

6.11 Equipment (Division 11)

6.11.1 This section will be read in conjunction with Appendix 2E [Equipment and Furniture].

6.11.2 Equipment Supports

6.11.2.1 Provide supports for Equipment outlined in Appendix 2E [Equipment and Furniture] with proper backing and structural reinforcing as required.

6.11.2.2 Provide support as recommended by manufacturer for all ceiling and wall-mounted equipment in all Gyms;

6.11.3 Ceiling Lifts

6.11.3.1 Provide x-y gantry and single-track ceiling lift systems for the Facility at locations described in the Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.11.3.2 Provide complete ceiling lift systems including all structural supports, ceiling lift rails, tracks, anchors, backing and electrical power. Refer to Appendix 2E [Equipment and Furniture] for Owner-supplied components of the ceiling lift system.

6.11.3.3 Ceiling lifts will be recessed in the ceiling (e.g. recessed fixed track) to be Ligature Resistant and prevent dust collection for infection prevention and control. All fixed tracks will be recessed and flush with the adjacent ceiling surface.

6.11.3.4 Provide ceiling lift systems that do not contain proprietary features or components which would limit the Owner's ability and flexibility to maintain and upgrade.

6.11.3.5 Ceiling lift system will be fully compatible with lift motors selected by Owner, without use of adapters.

6.11.3.6 Provide structural steel components, custom washroom doors and door frames as required to suit ceiling lift coverage into the washroom.

6.11.3.7 Coordinate x-y gantry ceiling lift system with other systems including equipment, privacy curtains, lights and sprinklers.

6.11.3.8 Ceiling-mounted equipment such as booms, televisions/infotainment, lights and ceiling lifts will be coordinated in the structural Design.

6.11.3.9 Coordinate the electrical system components of the x-y gantry ceiling lift system with all clinical and housekeeping activities in the Patient room or bay to allow for easy service access.

6.11.3.10 The ceiling lift system will electrically charge at any location along the support track. Provide the ability to disconnect the electrical power safely at the connect point, without Staff having to travel to an electrical panel.

6.11.3.11 The ceiling lift system tracks will not obstruct, partially or completely, over-bed ceiling-mounted light fixtures or any cameras.

6.11.3.12 Provide access to ceiling lift system components above the ceiling through such means as ceiling access panels for periodic inspection purposes. Access panels will provide space for the Owner to access the connection points of the ceiling lift system for verification, quality control and regular maintenance.

6.11.3.13 In Mental Health Areas, provide single-track recessed ceiling lift systems. Provide a locking Millwork cabinet for lift storage and charging where the track meets the intersection of the wall and ceiling in order to conceal and protect the lift from the Patient when not in use. Design the system to be Ligature Resistant and Vandal Resistant.

6.11.3.14 Load Bearing Requirements

6.11.3.14(1) Provide ceiling lift systems to meet the following load bearing requirements:

6.11.3.14(1)(a) Load bearing capacity of 295 kg (650 lbs) load-tested to 150%; and

6.11.3.14(1)(b) For all bariatric rooms, provide a ceiling lift system with a minimum load bearing capacity of 500 kg (1100 lbs), load-tested to 150%.

6.11.3.15 Coverage Requirements

6.11.3.15(1) Provide x-y gantry ceiling lift with complex bed coverage for the entire room including tubs in Patient Room-SRMC, space or bay to allow for in-bed or in-stretcher positioning, lateral transfers, and seated transfers.

6.11.3.15(2) Provide a recessed, fixed single-track ceiling lift in all ensuite Patient washrooms connecting with the x-y gantry ceiling lift system and extending to provide coverage over the toilet.

6.11.3.15(3) Provide x-y gantry ceiling lift with multi-bed coverage or multi-stretcher coverage in locations as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] such as in Rehab gymnasiums.

6.11.3.15(4) Where ceiling lift coverage is required for spaces with floor-to-ceiling walls, such as the Infusion Treatment Bay-Stretcher, provide a single track in each bay.

6.11.3.15(5) Provide x-y gantry ceiling lift with complex ceiling coverage in locations as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] such as in Operating Rooms.

6.11.3.15(6) Final ceiling lift coverage requirements will be as determined with the Owner based on the specific functional requirements. The safety of the ceiling lift systems, particularly in the design of the transition from x-y gantries to single-track, is to be prioritized in Project Co component selections and the Design.

6.11.3.16 Shop-Bed/Stretcher/Ceiling Lift and Shop-AGV Requirements

6.11.3.16(1) Provide x-y gantry ceiling lift system for complete room coverage in the Shop-Bed/Stretcher/Ceiling Lift and the Shop-AGV.

6.11.3.16(2) Ceiling lift system will have a minimum load bearing capacity of 500 kg (1100 lbs), load-tested to 150%.

6.11.3.16(3) Project Co will be responsible for the installation and certification of the ceiling lift system which will be Owner provided; refer to Appendix 2E [Equipment List].

6.11.4 Headwalls

6.11.4.1 All headwalls are the responsibility of Project Co and will meet the functional requirements of the Owner and the requirements set out in Appendix 3O [Electrical IM/IT Matrix].

6.11.4.2 Project Co will provide headwalls at those locations where headwall outlets are indicated in Appendix 3K [Medical Gas Matrix] and Appendix 3O [Electrical IM/IT Matrix].

6.11.4.3 Headwalls will be designed so that raising/lowering of the bed or stretchers will not catch/interfere the headwall or adjacent equipment and cause damage to either one.

6.11.4.4 If a prefabricated headwall is used, Project Co will have the manufacturer's representative present in person at all meetings required under the Agreement. If used, prefabricated headwalls will be provided by the following manufacturers or acceptable alternative as reviewed by the Owner: Class 1, Amico, BeaconMedaes, and Hillrom.

6.11.4.5 At all headwalls, provide a multiple rails system or acceptable alternative as reviewed by the Owner for the installation of headwall accessories and the storage of a small quantity of medical surgical supplies for ease of access for direct Patient care.

6.11.4.6 Provide all rails, accessories, and backing required for mounting monitors, baskets and other equipment as required. Project Co to consult with the Owner for determining rails and accessories.

6.11.4.7 Headwalls in Component C Inpatient Care and Component E Maternity Centre will include;

6.11.4.7(1) Non-institutional and modern Design elements including finishes and colours that are coordinated with the interior design concept;

6.11.4.7(2) Services outlets, lighting and lighting controls as required per Appendix 3K [Medical Gas Matrix] and Appendix 3O [Electrical IM/IT Matrix].

6.11.4.7(3) Wood-grain plastic laminate to all exposed surfaces or has wood-look components in prefabricated system;

6.11.4.7(4) Opportunity for artwork above the bed head;

6.11.4.7(5) For Patient Rooms in Component C Inpatient Care, in addition to the requirements in Appendix 3L [Millwork and Modular Casework Matrix], provide a minimum 600 mm x 600 mm counter with drawers including recessed pull for flowers and personal belongings at the non-nursing side of the bed.

6.11.4.7(6) Reveals and joints that align and are coordinated with other features in the room such as; bed bumpers and sheet wall protection; and

6.11.4.7(7) Area for clean supply storage and computer charting workstation for Staff.

6.11.4.8 Provide a counter in the SRMC Patient room with upper and lower cupboards adjacent to the infant headwall, for storage of consumable medical supplies, refer to Appendix 3L [Millwork and Modular Casework Matrix].

6.11.4.9 Provide storage at the nursing side for fetal monitor and non-nursing side for consumable medical supplies, refer to Appendix 3L [Millwork and Modular Casework Matrix].

6.11.4.10 Headwalls and Medical Gas Outlets in Mental Health Areas will;

6.11.4.10(1) be specifically designed for behavioural health environment and prohibit Patient access to devices such as electrical receptacles, medical gas outlets, and nurse call equipment;

6.11.4.10(2) feature a protective cover to absorb high impact forces without breaking or permanently deforming and include an image that is digitally printed on the inside to create a more calming, less clinical, environment; and

6.11.4.10(3) be shaped to prevent ligature points with Tamper Resistant fasteners and fittings;

6.11.5 Weight Racks

6.11.5.1 Project Co will provide manufactured rack systems as required to support dumbbells, weights and other accessories in all gym spaces, all storage rooms, and rehab areas,

6.11.6 Safe Boxes

6.11.6.1 Provide a safe box in the locations indicated in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.11.6.2 Provide a safe box at all wardrobe locations, refer to Appendix 3L [Millwork and Modular Casework Matrix].

6.11.6.3 Safe boxes will be integrated and securely fastened to the Millwork piece they are required to be placed in.

6.11.6.4 Provide Millwork or Modular Casework to conceal all safe boxes from public view.

6.11.6.5 Safe boxes will have the following features:

6.11.6.5(1) LED display;

6.11.6.5(2) 3 to 6-digit PIN code options;

6.11.6.5(3) Mechanical key override – single key for all safe boxes;

6.11.6.5(4) On hold time after 4 wrong consecutive attempts;

6.11.6.5(5) Anti-drill rotating bolts;

6.11.6.5(6) Battery powered;

6.11.6.5(7) Power status display on screen;

6.11.6.5(8) ADA compliant keyboard;

6.11.6.5(9) “Code to close” technology;

6.11.6.5(10) Approximate external dimensions: 190 mm in height, 430 mm in width, and 460 mm in depth; and

6.11.6.5(11) Approximate volume: 38 lt.

6.11.7 Fall Protection and Window Washing Access

6.11.7.1 Provide fall protection and window washing access in accordance with Part 11 of WSBC guidelines.

6.11.7.2 Provide a complete system with safety tie-back, life line anchors, horizontal life line system and associated equipment for the Owner’s 24/7 safe building maintenance operations including window-washing.

6.11.7.3 Provide roof anchors with sufficient capacity to support the use of a window washing platform suspended from the roof level. Window washing by a worker suspended by a vertical lifeline from a roof anchor is not permissible.

6.11.8 Fully Integrated Modular Diffuser System

6.11.8.1 Project Co may provide a fully integrated modular diffuser system for Operating Rooms and Interventional Suites. The system will include:

6.11.8.1(1) Air supply from a single large diffuser system of modular construction consisting of a continuous ceiling grid with an aluminum air frame HEPA filter grid channel;

6.11.8.1(2) An integrated LED lighting system;

6.11.8.1(3) Integrated boom mounts;

6.11.8.1(4) Guillotine style, room side adjustable dampers; and

6.11.8.1(5) Laminar air diffusers.

6.11.8.2 Basic Requirements

6.11.8.2(1) The fully integrated modular diffuser system will be required to completely seal off the interstitial ceiling space from the room.

6.11.8.2(2) The diffuser system will include a steel air delivery duct that is an integrated part of the ceiling system. The steel duct is required to pressurize the system for distribution through each individual supply air opening in the ceiling.

6.11.8.2(3) The steel duct will have a powder coating to ensure all exterior and interior surfaces are protected.

6.11.8.2(4) The ceiling system will accept equipment boom loads directly as part of an engineered system. The Integrated Modular Diffuser System supplier will provide shop drawings signed and sealed by a Professional Engineer Registered in the Province of British Columbia. Project Co's Structural Engineer-of-Record will provide signed and sealed drawings for anchorage to building structure including seismic restraint.

6.11.8.3 Acceptable manufacturers include AirFrame as manufactured by SLD Technologies, Inc. or acceptable alternative as reviewed by the Owner.

6.11.8.4 Performance Requirements

6.11.8.4(1) The fully integrated modular diffuser system will utilize an LED lighted grid and powder-coated steel HEPA filtered air frame.

6.11.8.4(2) HEPA filters, diffusers, guillotine style balancing dampers and blank pans will be capable of being loaded from the bottom of the system directly into the grid opening.

6.11.8.4(3) All lighting components will be accessible from the room side.

6.11.8.4(4) The system will incorporate a hinged damper/diffuser assembly capable of being independently opened for repeated cleaning as well as access for HEPA filter installation. The system will utilize a damper/diffuser assembly that is room side adjustable.

6.11.8.4(5) The damper/diffuser assembly will incorporate Tamper Resistant fasteners for access to the guillotine style damper adjustment mechanism.

6.11.8.4(6) Systems that utilize balancing dampers located upstream of the HEPA are not permitted.

6.11.8.4(7) Systems that utilize balancing dampers that are not room side adjustable are not permitted.

6.11.8.4(8) Grid members will be formed together into modules. Grid will be caulked with an appropriate sealant as necessary.

6.11.8.4(9) The ceiling support grid will be structurally designed so as to remain dimensional stability.

6.11.8.4(10) The lighted grid system will have integrated LED lighting within the grid channel.

6.11.8.4(11) Light fixtures that block the airflow within the supply air, such as recessed light troffers, are not permitted.

6.11.8.4(12) All lighting components will be pre-installed. Systems that require field installation of lighting components are not permitted. Lighting circuits will utilize quick connect fittings for module to module connection.

6.11.8.4(13) The complete lighting system consisting of LED assemblies, drivers, wireway, lenses, and wiring will be an integral part of the lighted grid. The LED lighted grid will be CSA approved (or equivalent) and so identified;

6.11.8.4(13)(a) The drivers will be housed within the grid channel or remote mounted, and in either case, provided with access in accordance with Section 7.8.13.1(4). Drivers will be CSA approved (or equivalent) and so identified.

6.11.8.4(13)(b) Wiring within the grid for the lighting circuit will be contained within and protected by the grid system. The system will have the ability to handle circuits from two different power branches (UPS and vital). The system will have the ability to handle line voltage and low voltage control wiring circuits. The light lens will sit flush with the bottom of the air frame grid channel. Light lens covers will be clear acrylic or polycarbonate ribbed diffusers that snap flush to the grid channel without external fasteners;

6.11.8.4(13)(c) LED lighting components will be able to easily snap into the grid without the use of rivets, nuts, bolts or other hardware fasteners;

6.11.8.4(13)(d) In addition to the room lighting requirements in other sections, the system will use Indigo-Clean™ LED technology with indigo disinfection mode. Indigo disinfection mode is a high power 405nm indigo LED array for continuous environmental disinfection.

6.11.8.4(14) The HEPA filtered air frame system will incorporate air passages on all sides to jet air underneath the lighted grid so as to wash the area below the lights of particles. The top duct, steel structures and air frame channels will be protected with a powder-coat finish. All hardware will be stainless steel.

6.11.8.4(15) The lighted grid system will be capable of attaching clips for suspending ceiling lifts, equipment supports, and other components as required.

6.11.8.4(16) Solid blank filler panels will be constructed of powder coated steel or aluminum with welded corners, an upward facing trough and designed to affect an airtight seal in the channel grid. The finish of the panel will match the ceiling grid finish.

6.11.8.5 Air Supply Integrated to Ceiling Grid

6.11.8.5(1) Provide an air delivery duct attached to the ceiling grid as an integral part of the ceiling grid diffuser system. Modules will be supplied completely pre-assembled with the lighting grid, HEPA filtered air frame and duct as one piece.

6.11.8.5(2) Modules will be welded or rivet style construction using steel roof panels welded to HSS framing or steel side panels. System will be sized so as to meet structural load requirements. Holes will be provided at the perimeter of the module roof for suspension. The entire ceiling grid module will be coated with a baked-on powder coating.

6.11.8.5(3) Units will be manufactured to dimensional tolerance of +/- 1/8" on width and length and diagonal dimensions or squareness of +/- 1/8".

6.11.8.5(4) The HSS framed modules will be capable of accepting equipment boom loads directly as part of an engineered structural system.

6.11.9 Cart Washing Machine

6.11.9.1(1) Project Co to provide two (2) manually loaded Cart Wash units to be located near the loading dock. Upon washing and drying, the carts are returned to the Logistics Centre for use.

6.11.9.1(2) Basic Requirements for each Cart Wash unit:

6.11.9.1(2)(a) The machine casing, tanks and cladding will be made from 1.4301 grade (type 304) stainless steel.

6.11.9.1(2)(b) The machine's chambers will have double walls with intermediate insulation. The cavity is 40 mm wide in the region of the chambers.

6.11.9.1(2)(c) Single chamber system.

6.11.9.1(2)(d) Stainless steel heating coils.

6.11.9.1(2)(e) The Cart Wash unit control is via a programmable logic controller.

6.11.9.1(2)(f) Noise level will be 75 db or less.

6.11.9.1(3) Performance Criteria

6.11.9.1(3)(a) The Cart Wash unit will spray the cart from all sides. Wash temperatures will be 60–65 deg. C, and a fresh water rinse temperature of 85 deg. C.

6.11.9.1(3)(b) The Cart Wash unit will include a drying phase using heated fresh air.

6.11.9.1(3)(c) Stainless steel heating coils.

6.11.9.1(4) Acceptable manufacturer includes Meiko Maschinenbau GmbH and Co. KG, Model WS125 or acceptable alternative as reviewed by the Owner.

6.11.10 Roller Conveyor

6.11.10.1 Provide a heavy-duty, manual roller conveyor in J4.1 Central Receiving.

6.11.10.2 Loading capacity and configuration of the conveyor will be as determined with the Owner.

6.11.10.3 Conveyor will have 63.5 mm dia. Galvanized steel rollers in powder coated 10 ga. steel frames.

6.11.10.4 Acceptable manufacturers include Norpak, or an acceptable alternative as reviewed by the Owner.

6.11.11 Waste Disposal Unit

6.11.11.1 Project Co will provide a heavy-duty, stainless steel, 1HP Waste Disposal unit, complete with on/off switch, water solenoid, and vacuum breaker to be used with Morgue and Autopsy sinks as described in Appendix 3J [Sinks Matrix] and Appendix 2E [Equipment List].

6.11.11.2 Project Co will be responsible for coordinating and providing all mechanical and electrical services required by the Waste Disposal Unit.

6.11.11.3 The Waste Disposal unit and the associated laboratory sink will be obtained from one (1) source by a single manufacturer.

6.11.11.4 The Mopec BL800 is an acceptable product or an acceptable alternative as reviewed by the Owner.

6.11.12 Wheelchair Washer/Disinfector

6.11.12.1 Project Co will provide a heavy duty, stainless steel Wheelchair Washer/Disinfector in Environmental Services as described in Appendix 2E [Equipment List], and will include the following minimum features:

6.11.12.1(1) 3HP motor/stainless steel pump;

6.11.12.1(2) Digital temperature display;

6.11.12.1(3) Lighted wash chamber;

6.11.12.1(4) Disinfectant application spray wand;

6.11.12.1(5) Backflow prevention devices/system;

6.11.12.1(6) Disinfectant mixing station;

6.11.12.1(7) Air dry blower;

6.11.12.1(8) Equipment wash rack;

6.11.12.1(9) Loading ramp set;

6.11.12.1(10) Fill and drain hose set;

6.11.12.2 Project Co will be responsible for coordinating and providing all mechanical and electrical services required by the Wheelchair Washer/Disinfector.

6.11.12.3 The AQ-3500 by Aqua Phase is an acceptable product or an acceptable alternative as reviewed by the Owner.

6.11.13 Walk-in Refrigerators and Cold Rooms

6.11.13.1 Provide walk-in refrigerators and cold rooms with insulated walls and ceiling panels, complete with all refrigeration systems, piping, fittings and controls to render the refrigerators and cold rooms complete and fully operational. Remote condensing units will be water cooled and 100% redundant.

6.11.13.2 Provide a laboratory/medical grade walk-in cold room in J6.6 Store-Cadaver, as set out in Section 6.11.14.

6.11.13.3 Provide laboratory/medical grade walk-in refrigerators meeting the following requirements for each of the rooms listed below, in conjunction with the requirements set out in Appendix 3A [Clinical Specifications and Functional Space Requirements] and as reviewed with the Owner:

6.11.13.3(1) J1.2.4 Store-Medication Supplies

6.11.13.3(1)(a) Operating temperature range of 3 to 6 °C;

6.11.13.3(1)(b) Minimum clear interior dimensions of 2.5 m (L) x 1.85 m (W) x 2.5 m (H); and

6.11.13.3(1)(c) Dual condenser unit for redundancy;

6.11.13.3(2) J4.3.5 Store-Walk-in Refrigerator

6.11.13.3(2)(a) Operating temperature range of 2 to 8°C;

6.11.13.3(2)(b) Minimum clear interior dimensions of 4.88 m (L) x 3.048 m (W) x 3.048 m (H);

6.11.13.3(2)(c) Dual condenser unit for redundancy; and

6.11.13.3(2)(d) Dual display glass door with a minimum of 16 stainless steel shelves for quick entry access to products. Include a door on the side for entrance with trolley.

6.11.13.3(3) J4.6.2 Store-Blood Products

6.11.13.3(3)(a) Operating temperature range of 1 to 6°C;

6.11.13.3(3)(b) Minimum clear interior dimensions of 2.743 m (L) x 3.658 m (W) x 3.048 m (H);

6.11.13.3(3)(c) Dual condenser unit for redundancy; and

6.11.13.3(3)(d) Dual display glass door with a minimum of 16 stainless steel shelves for quick entry access to products. Include a door on the side for entrance with trolley.

6.11.13.3(4) J4.7.4 Store-Walk-in Refrigerator

6.11.13.3(4)(a) Operating temperature range of 2 to 8°C;

6.11.13.3(4)(b) Dual condenser unit for redundancy; and

6.11.13.3(4)(c) Dual display glass door with a minimum of 6 stainless steel shelves for quick entry access to products. Include a door on the side for entrance with trolley.

6.11.13.4 All laboratory/medical grade walk-in cold rooms and refrigerators will be designed to provide temperature stability and include a calibrated thermometer to monitor internal temperature and a temperature display mounted on the outside of the unit. Provide data loggers for each unit designed to interact through wireless communications for temperature monitoring, alarms and notifications.

6.11.13.4(1) Data logging via wired communication will also be accommodated for all stand-alone laboratory/medical grade refrigerators and freezers, as required for the Equipment listed in Appendix 2E [Equipment and Furniture],

6.11.13.5 The refrigerator and freezer walk-ins and refrigeration systems will be equipped with a sophisticated alarm system. The alarm system will monitor internal temperatures and compressor pressures to ensure that all systems are maintained within the specified temperature and pressure ranges. In the event that either a temperature or pressure goes outside the specified range the alarm system will go into an audio and visual alarm state. The cold rooms and freezers will be equipped with a local audible and visual hi/low temperature alarm as well as connected to the BMS for signaling faults.

6.11.13.6 Evaporator coils inside each cooler or freezer will be equipped with the latest digital monitoring device capable of alerting the monitoring station of any malfunction.

6.11.13.7 All temperature controlled rooms will be constructed of rigid pre-fabricated, walk-in type ULC-listed, CSA- and NSF-approved wall and ceiling panels with insulation between exterior and interior metal skins, meeting the requirements of the latest ASHRAE 90.1, current VBBL and BC Fire Code.

6.11.13.8 The unexposed exterior top of ceiling will be 0.6 mm steel unfinished. The exposed interior and exterior wall and ceiling panels will be 1.0 mm Colour coat

PVC plastisol steel finish. Stainless steel sheet will be to ASTM A167, type 302/304 with No. 4 finish.

6.11.13.9 All insulated wall and ceiling panels, refrigeration lines, suspended HVAC and light fixtures will be installed in accordance with the VBBL.

6.11.13.10 Provide floor depressions to accommodate in-slab insulation below all equipment such as cold storage rooms, walk-in refrigerators and freezers and to ensure a level access both into and out of the units.

6.11.14 Store-Cadaver

6.11.14.1 Provide a secure laboratory/medical grade cold room to serve as J6.6 Store-Cadaver with odour-handling systems as required in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.11.14.1(1) The Store-Cadaver will have an operating temperature of 2ºC.

6.11.14.1(2) The unexposed exterior top of ceiling will be 0.6 mm steel unfinished. The exposed interior and exterior wall and ceiling panels will be stainless steel finish. Stainless steel sheet will be to ASTM A167, type 302/304 with No. 4 finish.

6.11.14.1(3) Refer to Section 6.11.13 Walk-in Refrigerators and Cold Rooms for additional information and requirements.

6.11.14.1(4) Provide sufficient manoeuvring space for cadaver lift.

6.11.14.1(5) Provide wall bumpers, corner guards and door protection.

6.11.14.2 Provide cadaver storage racks with the following requirements:

6.11.14.2(1) Capacity for twenty-four (24) regular and six (6) bariatric cadavers.

6.11.14.2(2) Rack construction will be:

6.11.14.2(2)(a) Vertical supports: heavy gauge, 38mm square tubing, type 304 polished stainless steel;

6.11.14.2(2)(b) Horizontal supports: 14-gauge type 304 stainless steel;

6.11.14.2(2)(c) Roller Frames: formed from 14-gauge type 304 stainless steel, #4 finish; zinc plated steel roller bearings; full length anti-tilt guides, and type 304 stainless steel tray latch/stop;

6.11.14.2(2)(d) Formed stainless steel with rubber bumper rear stop; and

6.11.14.2(2)(e) Type 304 stainless steel, adjustable flanged feet.

6.11.14.2(3) Body trays will be as follows:

6.11.14.2(3)(a) Constructed from one piece welded construction 18 gauge stainless steel, type 304 with #4 finish. Complete with 25 mm rolled edge construction with two hand slots on each end of the tray. Approximate weight capacity will be 175 kg;

6.11.14.2(3)(b) Provide drain hole with plug for washing; and

6.11.14.2(3)(c) Dimensions:

6.11.14.2.3.(c).1 Regular: 584 mm x 1.96 m x 70 mm

6.11.14.2.3.(c).2 Bariatric: 686 mm x 1.96 m x 70 mm.

6.11.14.3 Acceptable manufacturer will be Mopec JC023 and JC027 or an acceptable alternative as reviewed by the Owner.

6.11.14.4 Configuration of the cadaver storage area will be coordinated with the Owner-supplied equipment outlined in Appendix 2E [Equipment and Furniture], including the Cadaver Lift.

6.12 Furniture, Clinical Systems Furniture and Systems Furniture (Division 12)

6.12.1 Basic Requirements

6.12.1.1 This section is to be read in conjunction with Appendix 3A [Clinical Specifications and Functional Space Requirements], Appendix 3L [Millwork and Modular Casework Matrix] and Appendix 2E [Equipment and Furniture].

6.12.1.2 Provide Furniture, Clinical Systems Furniture and Systems Furniture and accessories as required to support the programs and functions described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and to support the operation of the Facility. Refer to Appendix 2E [Equipment and Furniture] for Owner supplied items.

6.12.1.3 Project Co will retain a licensed interior designer to assist in the selection and coordination of all Furniture, Clinical Systems Furniture and Systems Furniture; refer to Section 5.12.1.1(1).

6.12.1.4 Provide all grommets, mounting brackets, height adjustability, storage, work surfaces, charting counters and Care Team Stations to meet the needs of each department.

6.12.1.5 Provide locks and keyboard trays and all items required to support the programs and functions described in this Schedule.

6.12.1.6 Provide power and data in accordance with the manufacturer's specifications and requirements. Refer to Section 7.8 Electrical (Division 26) and Section 7.9 Communications (Division 27) for additional requirements.

6.12.1.7 Project Co will be responsible to coordinate all elements of a room's design, architectural, electrical and IM/IT, with the Owner supplied items listed in Appendix 2E [Equipment and Furniture]. This includes pathways, junction boxes, receptacles and the specific routing of electrical and data cabling to and through the wire ways;

6.12.1.8 Casework and Clinical Systems Furniture will be coordinated with equipment and Furniture that will be provided by the Owner, as described in Appendix 2E [Equipment List].

6.12.2 Performance Requirements

6.12.2.1 All Furniture, Clinical Systems Furniture and Systems Furniture supplied by Project Co will:

6.12.2.1(1) Be ergonomically designed and functional for multiple work heights, including sitting, stool-height sitting and standing;

6.12.2.1(2) Be height adjustable where described as required in Appendix 3L [Millwork and Modular Casework Matrix];

6.12.2.1(3) Have sealed surfaces and be covered in upholstery material that is inert and will not support microbial growth and is cleanable with hospital-grade disinfectant;

6.12.2.1(4) Be cleanable and able to withstand frequent cleaning and routine hospital disinfection;

6.12.2.1(5) If upholstered, be of a material that is impermeable and non-shedding when located in Patient accessible areas and any area where Staff goes after providing direct Patient care (including Care Team Station, Staff Lounge, conference rooms and office within Patient Care Areas). Polyurethane fabrics are preferred, if they meet the requirements of the application;

6.12.2.1(6) Be provided with locks to secure all cabinets and drawers whether in a locked room or not; and

6.12.2.1(7) Be provided with valance lighting underneath all upper cabinets including above workstations, work surfaces or countertops.

6.12.2.2 Additional requirements for any Project Co provided Furniture, Modular Casework, Clinical Systems Furniture and Systems Furniture include the following:

6.12.2.2(1) Flexibility

6.12.2.2(1)(a) Provide products that enable flexibility and:

6.12.2.2.1.(a).1 Allow for individualization;

6.12.2.2.1.(a).2 Possess the ability to be used in different applications or flex easily for future use; and

6.12.2.2.1.(a).3 Use non-handed solutions that work in multiple configurations, wherever possible.

6.12.2.2(2) Durability

6.12.2.2(2)(a) Provide products engineered for high traffic use, where required.

6.12.2.2(3) Construction

6.12.2.2(3)(a) Products with replaceable components are preferred.

6.12.2.2(3)(b) Wood will be avoided in Clinical Spaces and conference rooms. Where utilized, wood pieces will be constructed of:

6.12.2.2.3.(b).1 Solid wood frames of kiln dried wood for added strength and long term durability;

6.12.2.2.3.(b).2 A frame capable of supporting varying weights and body types and offering ease and reassurance to both Patients and Staff; and

6.12.2.2.3.(b).3 Plastic laminates may be used in place of real wood when a wood-look is desired.

6.12.2.2(4) Seating

6.12.2.2(4)(a) Seating will consist of steel tube and spring-seat construction.

6.12.2.2(4)(b) Provide seating with wall-saver legs or a wall-saver back design.

6.12.2.2(4)(c) Provide seating with arms that include polyurethane arm caps, upholstered arm caps will not be acceptable.

6.12.2.2(5) Tables

6.12.2.2(5)(a) Provide solid surface horizontal table surfaces.

6.12.2.2(5)(b) Front edges will feature a profile for user comfort and be of durable material composition and construction.

6.12.2.2(6) Workstations and Desks

6.12.2.2(6)(a) When installed, two adjoining end panels of work surfaces will be leveled so work surfaces sit at the same height.

6.12.2.2(7) Filing / Storage

6.12.2.2(7)(a) Filing will be provided for letter filing, unless specified otherwise. In order to maximize filing capacity, files will be set up for side-to-side filing.

6.12.2.2(7)(b) During installation, the conversion parts of the files will be left in the file to allow for front-to-back / side-to-side conversion at a later time.

6.12.2.2(7)(c) At a minimum, two-drawer files will include a counter-balance package as recommended by the product manufacturer.

6.12.2.2(7)(d) Lockable storage will be keyed as per the Facility keying system. Keying schedule to be determined with the Owner.

6.12.2.2(7)(e) Filing of Patient charts at Care Team Stations to meet the needs of each department.

6.12.2.2(8) Cleaning and Ease of Maintenance

6.12.2.2(8)(a) The size, shape, and design will allow easy access for cleaning.

6.12.2.2(8)(b) Materials, upholstery, and finishes will be capable of withstanding institutional grade detergents, cleaners, and disinfectants with no effect on the appearance, integrity, or life of the product.

6.12.2.2(8)(c) Selection will be based on the understanding of the principles of decontamination and maintenance requirements (able to withstand multiple applications of diluted disinfectants over time).

6.12.2.2(8)(d) Project Co will request that manufacturers provide detailed cleaning and disinfection guidelines prior to purchase along with a thorough listing of which cleaning products will be used on their products.

6.12.2.2(8)(e) Project Co will review instructions to ensure they are clear and cleanable with Owner-approved detergents and disinfectants.

6.12.2.2(8)(f) Other upholstered soft furnishings will have the following characteristics:

- 6.12.2.2.8.(f).1 Be seamless where possible or have double stitched seams located on the non-contact areas of the Furniture or sealed;
- 6.12.2.2.8.(f).2 Limited pleating;
- 6.12.2.2.8.(f).3 Upholstered Furniture in Clinical Spaces will be covered with fabrics that are fluid-resistant, non-porous and will withstand cleaning with hospital grade disinfectants;
- 6.12.2.2.8.(f).4 Seating will have removable seat cushions for cleaning between the seat and back for lounge seating applications;
- 6.12.2.2.8.(f).5 Seating will have removable upholstery covers for both the seat and back, if applicable; and
- 6.12.2.2.8.(f).6 Have high-destiny foam cores with a moisture barrier and resistance to mold.

6.12.2.2(8)(g) Upholstery will:

- 6.12.2.2.8.(g).1 be impermeable to water and quick-drying;
- 6.12.2.2.8.(g).2 be antimicrobial, and/or have anti-microbial inhibitor technology;
- 6.12.2.2.8.(g).3 have an abrasion rating for high-use areas (with a minimum of 100,000 DR (ASTM D4157-02 Wyzenbeek Test Method);
- 6.12.2.2.8.(g).4 have a high-rating for colour-fastness, exceeding 40 hours (AATCC Method 16A);
- 6.12.2.2.8.(g).5 be stain-resistant;
- 6.12.2.2.8.(g).6 be latex-free;
- 6.12.2.2.8.(g).7 have low volatile organic compounds;
- 6.12.2.2.8.(g).8 contain no heavy metals; and
- 6.12.2.2.8.(g).9 have no halogenated flame retardant materials or perfluorinated chemicals (PFCS).

6.12.2.2(9) Comfort, Efficiency, and Safety

6.12.2.2(9)(a) Seating will have the stability to assist the Patient or visitor in entering and exiting the chair.

6.12.2.2(9)(b) All items of Furniture (including tables) will be stable and will not move or tip over when touched by a person requiring support.

6.12.2.2(10) Furniture will not constitute a hazard for persons who have visual limitations and will be usable by Persons with Disabilities.

6.12.2.2(11) Back support will be provided on seating pieces, through the use of a high or mid back, to provide adequate back support to various populations.

6.12.2.3 Furniture

6.12.2.3(1) Furniture means loose or unattached items that can be rearranged to suit various activities and includes:

6.12.2.3(1)(a) Coffee tables and side tables;

6.12.2.3(1)(b) Unattached seating (such as chairs and stools); and

6.12.2.3(1)(c) Office desks.

6.12.2.3(2) Refer to Appendix 2E [Equipment and Furniture] for Owner provided Furniture to be incorporated into the Design and coordinated by Project Co.

6.12.2.4 Clinical Systems Furniture

6.12.2.4(1) Clinical Systems Furniture means factory-produced component system designed to be replaceable, reconfigurable, and interchangeable, and designed for specific use in health care facilities including Mental Health Areas.

6.12.2.4(2) The Owner will consider Clinical Systems Furniture in lieu of Millwork and Modular Casework solutions provided it meets the functional requirements of Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.12.2.4(3) Clinical Systems Furniture will include all accessories, storage, cabinetry, upper and lower shelving, and counters necessary to meet the functional requirements.

6.12.2.4(4) Staff workstations in Clinical Spaces are areas in particular where the Owner will consider Clinical Systems Furniture in lieu of Millwork and Modular Casework solutions and include;

6.12.2.4(4)(a) Alcove-Touchdown/Charting;

6.12.2.4(4)(b) Care Team Stations;

6.12.2.4(4)(c) Registration/Triage; and

6.12.2.4(4)(d) Control-Imaging.

6.12.2.4(5) Clinical Systems Furniture will be capable of being easily rearranged to change the configuration or to include additional modules and accessories.

6.12.2.5 Systems Furniture

6.12.2.5(1) Systems Furniture means a composition of factory-produced panels, work surfaces and shelves produced by a single manufacturer that are reconfigurable and interchangeable.

6.12.2.5(2) Systems Furniture is designed for administrative or educational use and includes accessories and attachments that complete its functionality.

6.12.2.5(3) The Owner will consider Systems Furniture in lieu of Millwork and Modular Casework solutions provided it meets the functional requirements of Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.12.2.5(4) Systems Furniture will include all accessories, storage, cabinetry, upper and lower shelving, and counters necessary to meet the functional requirements.

6.12.2.5(5) Staff workstations are areas in particular where the Owner will consider Systems Furniture in lieu of Millwork and Modular Casework solutions and include;

6.12.2.5(5)(a) Office workstations;

6.12.2.5(5)(b) Touchdown workstations;

6.12.2.5(5)(c) Registration cubicles;

6.12.2.5(5)(d) Reception desks; and

6.12.2.5(5)(e) Information desks.

6.12.2.5(6) Provide low height, moveable walls in waiting areas or similar areas to subdivide the space.

6.12.2.5(7) Study Carrel Requirements

6.12.2.5(7)(a) Provide modular, pod style, Systems Furniture study carrels designed for single users to provide quiet for focused activities.

6.12.2.5(7)(b) Provide upholstered surrounds and integral seating.

6.12.2.5(7)(c) Provide plastic laminate work surface with PVC edge banding.

6.12.2.5(7)(d) Provide clean anodized aluminum legs.

6.12.2.5(7)(e) Provide integrated power and data outlets at each carrel.

6.12.2.6 Lecture Theater Seating and Lecterns

6.12.2.6(1) Provide Co will provide lecture theatre seating in the following areas and quantities as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 2E [Equipment and Furniture].

6.12.2.6(1)(a) Conference-VC Lecture Theatre-Large

6.12.2.6(1)(b) Conference-VC Lecture Theatre-Small

6.12.2.6(2) Seating in the Conference-VC Lecture Theatre-Small will conform to the UBC FoM standards and guidelines listed in this Schedule.

6.12.2.6(3) Seating in the Conference-VC Lecture Theatre-Large will be as required to meet the Owner's functional requirements.

6.12.2.6(4) Lecture theatre seating will be tiered and designed for straight or radius row configurations.

6.12.2.6(5) Lecture theatre seating will include:

6.12.2.6(5)(a) Arm rests and tablet arms;

6.12.2.6(5)(b) Wire Management;

6.12.2.6(5)(c) Row letters and seat numbers;

6.12.2.6(5)(d) Aisle lights; and

6.12.2.6(5)(e) Cup holders.

6.12.2.6(6) Project Co will provide lecterns for presenters in the Conference-VC Lecture Theatre-Large and Conference-VC Lecture Theatre-Small.

6.12.2.6(7) Refer to Multimedia Room Requirements section of this Schedule for additional requirements.

6.12.2.7 Command Centre/EOC Requirements

6.12.2.7(1) Project Co will provide height adjustable workstations to accommodate desktop displays and computers, refer to Section 3.20.1.5.

6.12.2.7(2) Refer to Appendix 3L [Millwork and Modular Casework Matrix] for minimum category and counter length requirements.

6.12.2.8 MDRD, Pharmacy, Biomedical Engineering, and FMO Area quantities

6.12.2.8(1) Project Co will provide Clinical Systems Furniture as required to meet the functional requirements described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.12.2.8(2) Where required for Biomedical Engineering and FMO areas as described in Appendix 3A [Clinical Specifications and Functional Space Requirements], all workstations and storage solutions will be designed and intended for biomedical use and manufactured by Lista, Rousseau Metal Inc. or an acceptable alternative as reviewed by the Owner.

6.12.2.9 Laboratory Requirements

6.12.2.9(1) General Approach

6.12.2.9(1)(a) Project Co will provide laboratory casework:

6.12.2.9.1.(a).1 appropriate for the specific and specialized functions to be performed by Staff using the casework;

6.12.2.9.1.(a).2 providing end users with an ergonomic working environment that is suited to their specific needs, including with height-adjustable work surfaces where required;

6.12.2.9.1.(a).3 having structural rigidity and chemical resistivity to withstand the service conditions to which they are exposed; and

6.12.2.9.1.(a).4 complying with Public Health Agency of Canada Guidelines for Biosafety Containment Level 2 (CL2) Laboratories.

6.12.2.9(1)(b) All casework will be Modular Casework and consistent throughout the Facility.

6.12.2.9(1)(c) All epoxy resin material workbench tops will be chemical resistant and allow for decontamination of CL2 laboratory surfaces.

6.12.2.9(1)(d) Provide all laboratory workbenches with cabinets for a minimum 50% of the length of the benches.

6.12.2.9(1)(e) Laboratory workbench systems will hide and organize instrument tubing, electrical and/or data cables.

6.12.2.9(1)(f) Laboratory Modular Casework will be versatile and accommodate a flexible and adaptable fit (reconfiguration) within the overall design.

6.12.2.9(1)(g) Laboratory Modular Casework will be freestanding where possible to accommodate open laboratory spaces and allow for easy reconfiguration and movement within the laboratory space.

6.12.2.9(1)(h) Laboratory Modular Casework will meet the standards identified in Recommended Practices for Laboratory Grade Casework - SEFA 8-2010 guidelines for laboratory furniture, casework, shelving and tables testing. Construction and finishes will be tested in accordance with SEFA 8 procedures.

6.12.2.9(1)(i) Project Co will retain a laboratory design and equipment specialist consultant who will attend in person and lead all laboratory casework user consultation meetings.

6.12.2.9(2) Project Co will provide adaptable, modular leg frame and cantilevered laboratory Clinical Systems Furniture and Modular Casework as required to meet the functional requirements described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.12.2.9(3) Provide laboratory Clinical Systems Furniture and Modular Casework, including;

6.12.2.9(3)(a) All stainless steel cabinets;

6.12.2.9(3)(b) Integral sinks;

6.12.2.9(3)(c) Leg frame laboratory system;

6.12.2.9(3)(d) Cantilevered laboratory system;

6.12.2.9(3)(e) Supporting structures such as island cores, wall cores, island panels;

6.12.2.9(3)(f) Cabinet hardware;

6.12.2.9(3)(g) Metal cabinets including doors, shelves and drawers;

6.12.2.9(3)(h) Glassware drying base cabinets;

6.12.2.9(3)(i) Service cover panels;

6.12.2.9(3)(j) Dust cover tops;

6.12.2.9(3)(k) Laboratory air; refer to Section 7.4.4.14;

6.12.2.9(3)(l) Drain peg boards; and

6.12.2.9(3)(m) Countertops and backsplashes.

6.12.2.9(4) Project Co will provide all required touchdown-workstations, workstations and workbenches in the quantities described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.12.2.9(5) Project Co will provide laboratory Clinical Systems Furniture and Modular Casework from a single manufacture specializing in producing these systems with minimum five (5) years documented experience in the manufacturing of the specified systems.

6.12.2.9(6) Installers will have minimum five (5) years documented experience and ten (10) successful installations of equal or larger size and requirements.

6.12.2.9(7) Design Requirements

6.12.2.9(7)(a) Provide vibration-free work surfaces for microscopes and other equipment as required, refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 2E [Equipment and Furniture].

6.12.2.9(7)(b) Provide height adjustable work surfaces adjustable from 762 mm to 915 mm AFF.

6.12.2.9.7.(b).1 Sized appropriately to accommodate all Equipment (refer to Appendix 2E [Equipment and Furniture]) and the functional requirements as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.12.2.9(7)(c) Provide professional balance tables for ergonomic and efficient weighing in the Balance Room to meet the specific requirements the Owner and Equipment, refer to Appendix 2E [Equipment and Furniture].

6.12.2.9(7)(d) Provide suspended and floor mounted cabinets which are interchangeable and can be easily moved from workstation to workstation.

6.12.2.9(7)(e) Provide suspended base cabinets which can be relocated while fully loaded and installed in any position between table leg frames.

6.12.2.9(7)(f) Provide independently supported work surfaces, under counter cabinets, and overhead storage components.

6.12.2.9(7)(g) Provide leg frames, work surface supports and horizontal structural base frame which are fully welded construction.

6.12.2.9(7)(h) Support cores will be equipped with access ports that allow integration of cabling, conduit and piping within the vertical support structure.

6.12.2.9(7)(i) Provide slotted vertical standards to mount a wide variety of shelving materials.

6.12.2.9(8) Provide laboratory work surfaces and counter tops meeting the following requirements:

6.12.2.9(8)(a) Solid epoxy resin with the following properties:

- 6.12.2.9.8.(a).1 Non-porous;
- 6.12.2.9.8.(a).2 Monolithic;
- 6.12.2.9.8.(a).3 Resistant to corrosive effect of laboratory chemicals;
- 6.12.2.9.8.(a).4 Self-extinguishing;
- 6.12.2.9.8.(a).5 Heat Resistant;
- 6.12.2.9.8.(a).6 Smooth, no-glare surface and
- 6.12.2.9.8.(a).7 Seamless joining.

6.12.2.9(8)(b) Stainless steel sheet with the following properties:

- 6.12.2.9.8.(b).1 Compliant with ASTM A 167-96, Type 304 or 316, with #4 finish;
- 6.12.2.9.8.(b).2 Finished marine edge to countertop; and
- 6.12.2.9.8.(b).3 Straight lengths, one-piece with minimum seams. All joints welded and finished to match top.

6.12.2.9(9) Provide metal cabinets fabricated to meet the following requirements:

6.12.2.9(9)(a) Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Except where otherwise specified, integrally frame and weld cabinet bodies to form dirt and vermin-resistant enclosures. Reinforce base cabinets for sink support at all sink locations.

Maintain uniform clearance around door and drawer fronts of 1.5 to 2.4 mm (1/16 to 3/32 inch).

6.12.2.9(9)(b) Flush Doors: Outer pan and inner pans that nest into box formation, with full-height channel reinforcements at centre of door. Fill doors with non-combustible, sound-deadening material.

6.12.2.9(9)(c) Drawers: Provide fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom will be fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal.

6.12.2.9(9)(d) Tables: Provide welded tubing legs minimum 50 mm square with channel stretchers. Weld or bolt stretchers to less and cross-stretchers, and bolt legs to table aprons. Provide leveling device welded to bottom of each leg.

6.12.2.9(9)(e) Provide filler and closure panels to close spaces between cabinets and walls, ceilings, and equipment. Fabricate from same material and with same finish as cabinets and with hemmed or flanged edges.

6.12.2.9(9)(f) Provide shelves made from stainless steel sheet, not less than 1.21 mm nominal thickness, with No. 4 satin finish. Provide integral stiffening brackets, formed by folding up ends 19 mm and welding to upturned front and back edges. After fabricating, grind welds smooth and polish to produce uniform, directionally textured finish with no evidence of welds and free of cross scratches.

6.12.2.9(9)(g) Metal cabinets will be stainless Steel No. 4 brushed finish.

6.12.2.9(9)(h) Provide chemical-resistant finish to comply with AAMA 2605. Provide laboratory casework manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 0.05 mm (2 mils).

6.12.2.9(9)(i) Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test will be no more than four Level 3 conditions.

6.12.2.9(9)(j) Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty cabinet hardware.

6.12.2.9(9)(k) Provide locks for metal cabinets as follows;

6.12.2.9.(k).1 Cam or half-mortise type, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, E07111, or E07021.

6.12.2.9(9)(l) Provide a minimum number of keys per lock and master keys as required by the Owner. Provide locks on all drawers and doors. Keying of locks will be as required by the Owner.

6.12.2.9(9)(m) Provide countertops and sinks fabricated to meet the following requirements:

6.12.2.9.(m).1 Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 25 mm.

6.12.2.9.(m).2 Provide sink sizes to meet functional requirements as determined with the Owner.

6.12.2.9.(m).3 Provide sinks and troughs made from stainless steel sheet, not less than 1.52 mm nominal thickness. Fabricate with inside corners rounded and coved to at least 25 mm radius. Slope sink bottoms to outlet. Provide double-wall construction for sink partitions with top edge rounded to at least 12.7 mm diameter. Provide continuous butt-welded joints.

6.12.2.9.(m).4 Provide cup sinks of stainless-steel with stainless-steel strainers and integral tailpieces.

6.12.2.9.(m).5 Provide stainless steel troughs that are sloped to drains not less than 10 mm/m. Except where troughs empty into sinks, provide outlets with strainers and tailpieces.

6.12.3 Window Coverings

6.12.3.1 Basic Requirements

6.12.3.1(1) Project Co will provide window coverings:

6.12.3.1(1)(a) On all exterior windows for privacy, sun and heat control, that are easy to clean and do not support or provide a surface that encourages spread of infectious disease (e.g. do not become electrostatically charged);

6.12.3.1(1)(b) On all interior windows where privacy is a concern as determined with the Owner; and

6.12.3.1(1)(c) In multimedia rooms and all other rooms where video conferencing is required.

6.12.3.1(2) Window coverings will allow control of exterior light entering the room during daylight hours and provide privacy during daylight and non-daylight hours.

6.12.3.1(3) Use window coverings manufactured from materials and mechanisms that minimize cleaning and maintenance operations and maximize infection prevention and control, refer to Section 5.11 for additional requirements.

6.12.3.1(4) Window covering controls will be Ligature Resistant type with no loops or chains in Clinical Spaces. Where window treatments controls are difficult to reach, motor operated blinds will be provided.

6.12.3.1(5) Manual roller shade chain drive window shade in non-clinical use spaces will meet the following requirements:

6.12.3.1(5)(a) Tension activated lifting mechanism with multi-layer concentric constant tension;

6.12.3.1(5)(b) Lifting mechanism with a memory tension lock;

6.12.3.1(5)(c) Shades will not require re-tensioning after removal for cleaning; and

6.12.3.1(5)(d) Internally free-floating mechanism along grooved non-corrosive shaft, and reversible for future alterations and maintenance by the Owner.

6.12.3.1(6) Provide laser blocking blinds in ORs and other spaces where lasers would be in use, as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.12.3.2 Roller Shades

6.12.3.2(1) Project Co will provide roller shades at all exterior windows, or acceptable alternative as reviewed with the Owner.

6.12.3.2(2) Provide a factory assembled shade unit consisting of fabric, shade roller tube, hem bar, removable extruded aluminum fascia, mounting brackets, end caps, and drive assembly and miscellaneous hardware.

6.12.3.2(3) Provide roller shades consisting of PVC shading fabric, vinyl-coated polyester or fibreglass yarn that:

6.12.3.2(3)(a) is 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, monolithic and not divided into more than one sheet per window panel;

6.12.3.2(3)(b) Conforms to CAN/CBSB-4.162 M, Hospital Textiles - Flammability Performance Requirements; and

6.12.3.2(3)(c) Is tested in accordance with ASHRAE Standard 74073 for shading coefficient, fungal resistance in accordance with ASTM G21,

6.12.3.2(4) Roller shades systems in Patient rooms will be recessed into the ceiling to protect the roller blind when not in use, keep it clear when windows are cleaned, and protect the roller shade from dust collection.

6.12.3.2(5) Coordinate size and finish of roller shade valence to account for all access and maintenance requirements of roller shade box assembly.

6.12.3.3 Blackout Blinds

6.12.3.3(1) Project Co will provide blackout blinds in windows and doors in the following locations:

6.12.3.3(1)(a) On-call rooms;

6.12.3.3(1)(b) NICU Patient rooms;

6.12.3.3(1)(c) Ante-natal/post-section rooms;

6.12.3.3(1)(d) Lab Post-PCR rooms;

6.12.3.3(1)(e) All Nations Sacred Space;

6.12.3.3(1)(f) Conference Room designated for Yuwipi Ceremonies;

6.12.3.3(1)(g) Media Services photo and video studio;

6.12.3.3(1)(h) Reading room- PACS;

6.12.3.3(1)(i) Office RIS/PACS team;

6.12.3.3(1)(j) Office- Private/ PACS;

6.12.3.3(1)(k) Exam Room-ABR; and

6.12.3.3(1)(l) Exam Room-VNG.

6.12.3.3(2) Provide blackout blinds which meet the following requirements:

6.12.3.3(2)(a) Flammability per NFPA 701: Pass

6.12.3.3(2)(b) Fungal Resistance: No growth when tested per ASTM G21.

6.12.3.3(2)(c) Room-Darkening Channels: Extruded aluminum side and centre channels with brush pile edge seals, mounting base and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side jamb light control and sill light control.

6.12.3.3(2)(d) Openness factor equal to 0% to block all light or as otherwise determined with the Owner.

6.12.3.4 Integral Blinds (Venetian-Type Blinds between Glass)

6.12.3.4(1) Provide integral blinds in the following locations, at minimum:

6.12.3.4(1)(a) In door glazing as described in Appendix 3M [Door Requirements Matrix];

6.12.3.4(1)(b) In all interior windows where Line of Sight is required between Patient Rooms, including as described in Section 6.8.13.6(5) and Appendix 3A [Clinical Specifications and Functional Space Requirements];

6.12.3.4(1)(c) In all Alcove-Touchdown/Charting that have observation windows into associated Patient Rooms;

6.12.3.4(1)(d) In all exterior windows of Secure Rooms and of Patient Rooms in Mental Health Areas; and

6.12.3.4(1)(e) In the interior window to the Cadaver Preparation/Viewing Room.

6.12.3.4(2) Provide integral blinds with the widest blades available.

6.12.3.4(3) Integral blind will:

6.12.3.4(3)(a) consist of tempered aluminum alloy slats uniformly spaced and 100% interlaced between cross-ladders on at least one tape.

6.12.3.4(3)(b) use tapes with no special end rails required to attach the suspension members from the window opening to the blind.

6.12.3.4(3)(c) be laser ready in all locations where laser Equipment will be used; refer to Appendix 2E [Equipment and Furniture]. Laser ready means providing all required filter or barriers to reduce any transmitted laser radiation to levels below the applicable MPE (maximum permissible exposure) level.

6.12.3.4(3)(d) not allow air movement from any room to adjacent rooms. Openings in the glazing plane are not acceptable.

6.12.3.4(4) Integral blind glazing units will be a hermetically sealed consisting of glass panes on both sides of an airspace, fitted with integral interlocking louver blades. Provide 10-year warranty for glazing units with integral blinds.

6.12.3.4(5) Control of Integral Blinds

6.12.3.4(5)(a) Provide an operator specially constructed with a permanent magnet capable of moving the blind assembly from a closed position in one direction to a closed position in the opposite direction.

6.12.3.4(5)(b) Provide fully adjustable positioning allowing 180 degree rotation in a continuous cycle, allowing a full range of privacy position options.

6.12.3.4(5)(c) Chain, pull down cords or rod type controls will not be permitted.

6.12.3.4(5)(d) Operating Room or Interventional Suite controls will be located within the theatre.

6.12.3.4(5)(e) Controls for integral blinds in the Secure Rooms will be located in the Secure Room Anteroom.

6.12.3.4(5)(f) Controls for integral blinds providing views into Patient rooms will be located on the corridor side.

6.12.3.4(5)(g) All other control locations will be determined in consultation with the Owner to suit functional requirements based on the Design.

6.12.3.5 Wall-mounted Display/TV Housings

6.12.3.5(1) Where wall-mounted displays and TVs are required in Mental Health Areas:

6.12.3.5(1)(a) Provide a secure, transparent, Ligature Resistant, Tamper Resistant, and impact resistant housing sized to encapsulate the device. Final sizing and location of housings will be as determined with the Owner.

6.12.3.5(1)(b) Housing to consist of minimum 12 mm clear tempered laminated glass consisting of 3 mm clear tempered, 6 mm polycarbonate lexan and 3 mm clear tempered glass.

6.13 Special Construction (Division 13)

6.13.1 Radiation Shielding System

6.13.1.1 Provide radiation shielding system in walls, doors, floors, Millwork, Modular Casework, ceilings and windows as required and appropriate to protect Staff and Patients from x-ray, imaging digitizing, CT scanner, PET/CT-Future Expansion, radiology, and other rooms in the radiation protection shield.

6.13.1.2 Unless otherwise noted, provide a radiation shielding system where required by the Equipment listed in Appendix 2E [Equipment and Furniture] and:

6.13.1.2(1) The following rooms in Emergency Services:

6.13.1.2(1)(a) Exam/Treatment Room-Resuscitation;

6.13.1.2(1)(b) Imaging-CT;

6.13.1.2(1)(c) Control-Imaging; and

6.13.1.2(1)(d) Imaging-Digital Radiography.

6.13.1.2(2) The following rooms in Inpatient Care:

6.13.1.2(2)(a) Patient Room-Airborne Isolation-Lead Lined;

6.13.1.2(2)(b) Anteroom-Airborne Isolation-Lead Lined;

6.13.1.2(2)(c) Washroom/Shower-Inpatient Ensuite-Airborne Isolation-Lead Lined;

6.13.1.2(2)(d) Patient Room-Airborne Isolation-Hybrid-Lead Lined; and

6.13.1.2(2)(e) Washroom/Shower-Inpatient Ensuite-Airborne Isolation-Lead Lined.

6.13.1.2(3) The following rooms in Surgical and Interventional Services:

6.13.1.2(3)(a) Interventional Suite;

6.13.1.2(3)(b) Control-Imaging;

6.13.1.2(3)(c) Technical Room-Imaging;

6.13.1.2(3)(d) Technical Room-Imaging;

6.13.1.2(3)(e) Operating Room;

6.13.1.2(3)(f) Operating Room-Hybrid;

6.13.1.2(3)(g) Control-Imaging;

6.13.1.2(3)(h) Technical Room-Imaging;

6.13.1.2(3)(i) Procedure Room-General; and

6.13.1.2(3)(j) Procedure Room-ERCP/GI Endoscopy.

6.13.1.2(4) The following rooms in the Outpatient Care Centre:

6.13.1.2(4)(a) Imaging-Digital Radiography.

6.13.1.2(5) The following rooms in Medical Imaging:

6.13.1.2(5)(a) Imaging-Fluoroscopy Multi-Purpose Room (MPR);

6.13.1.2(5)(b) Control-Imaging;

6.13.1.2(5)(c) Imaging-Digital Radiography;

6.13.1.2(5)(d) Imaging-CT;

6.13.1.2(5)(e) Control-Imaging;

6.13.1.2(5)(f) Technical Room-Imaging;

6.13.1.2(5)(g) Technical Room-Imaging;

6.13.1.2(5)(h) Waiting-Hot;

6.13.1.2(5)(i) Change Cubicle-Patient-Hot;

6.13.1.2(5)(j) Prep/Recovery/Injection Room;

6.13.1.2(5)(k) Patient Uptake/Injection Room;

6.13.1.2(5)(l) Imaging-Nuclear Medicine;

6.13.1.2(5)(m) Imaging-Nuclear Medicine-Large (including Imaging-PET/CT-Future Expansion);

6.13.1.2(5)(n) Control-Imaging;

6.13.1.2(5)(o) Technical Room-Imaging;

6.13.1.2(5)(p) Exam Room-Stress Test-Nuclear;

6.13.1.2(5)(q) Hot Lab;

6.13.1.2(5)(r) Cell labelling lab;

6.13.1.2(5)(s) Radiopharmaceutical Compounding Lab;

6.13.1.2(5)(t) Low Level Lab;

6.13.1.2(5)(u) Anteroom;

6.13.1.2(5)(v) Mo/TC Generator;

6.13.1.2(5)(w) Store-NM Hot;

6.13.1.2(5)(x) Washroom-Patient-Hot;

6.13.1.2(5)(y) Imaging-Bone Densitometry;

6.13.1.2(5)(z) Soiled Utility; and

6.13.1.2(5)(aa) Workroom-Biomedical Engineering.

6.13.1.2(6) The following rooms in Operational Support:

6.13.1.2(6)(a) Store-NM Radioactive Waste.

6.13.1.3 Provide lead sheet of appropriate weight and thickness into wall and door assemblies and leaded glass manufactured for radiation shielding purposes into window assemblies.

6.13.1.4 Provide radiation shielded doors that meet or exceed;

6.13.1.4(1) American National Standards Institute/ National Woodworkers Manufacturers Association (ANSI/NWMA) Industry Standard for wood doors, NCRP Report No. 147 and NCRP Report #49; and

6.13.1.5 Fabricate radiation-shielded doors using a single layer of sheet lead with wood core laminated on each side of the lead. Bond cores using poured lead dowels at edges. Other option is to fabricate doors with two layers of sheet lead, one at each side of central core with veneer cover each side. For double shielded doors, a shielded astragal is required.

6.13.1.6 Fabricate radiation-shielded door frames with lead-lining. Ensure that proper overlap of lead shielding is provided at all interfaces with radiation shielded doors.

6.13.1.7 Provide lead glass or lead louvers occurring in radiation shielded doors that is equivalent rated to sheet lead in doors, meet or exceed Federal Specification DD-G-451.

6.13.1.8 For cassette transfer cabinets, provide radiation shielding that meets or exceeds MIL-C-3673 (DM). CR cassette storage is required to be protected from scatter radiation to reduce baseline ‘radioactive fog’ and to meet requirements as specified in Safety Code 35 and NCRP.

6.13.1.9 Provide sheet lead that meets or exceeds the Federal Specification QQL-201F Chemical Analysis, Grade C.

6.13.1.10 Radiation shielding system will comply with Diagnostic Accreditation Program, WSBC, and applicable Health Canada Safety Code (e.g. 35 and 36). X-ray radiation safety measures will ensure that Staff and public receive < 1 mSv/yr from medical radiation.

6.13.1.11 Project Co will provide a full quality control, inspection, and testing program for all installations and provide verification reports assuring compliance to all requirements.

6.13.1.12 All radiation shielding systems will be designed and installed under the supervision of an independent physicist certified by the CCPM in diagnostic radiological physics engaged by Project Co.

6.13.1.13 Maintain a full record of lead installation on site including written reports and complete photo documentation of entire installation.

6.13.1.14 For sheet lead applied directly to partition steel studs, provide a continuous and complete protective shield that forms an unbroken barrier around the room.

6.13.1.15 Lead-laminated GWB is not acceptable.

6.13.1.16 Modular Radiation Shielding Barriers

6.13.1.16(1) In the following locations, provide full body modular radiation shielding barriers as required and appropriate to protect Staff from radiation Equipment described in Appendix 2E [Equipment List]:

6.13.1.16(1)(a) A1.2.1 Exam/Treatment Room-Resuscitation at each stretcher bay excluding the future bay;

6.13.1.16(1)(b) A1.9.7 Imaging-Digital Radiography;

6.13.1.16(1)(c) H2.4.2.4 Imaging-Digital Radiography; and

6.13.1.16(1)(d) I2.1.7 Imaging-Digital Radiography.

6.13.1.16(2) All modular radiation shielding barriers will be minimum 2.14 m high and provided with view panels using distortion free safety lead glass.

6.13.1.16(3) Provide scratch resistant safety lead glass with compatible lead equivalencies, providing radiation shielding, high light transmission that will not discolour due to radiation or cleaning chemicals.

6.13.2 Radio Frequency Shielding

6.13.2.1 Provide a RF and magnetic shield system for the MRI Component of the Facility including any areas noted as having RF Shielding required in Appendix 3A [Clinical Specifications and Functional Space Requirements].

6.13.2.2 Coordinate the following in the Design of the RF and magnetic shield system:

6.13.2.2(1) Electrical connections to the RF-Filters;

6.13.2.2(2) HVAC system to and from the wave guide type RF air vents; and

6.13.2.2(3) Piping to and from the RF penetrations.

6.13.2.3 Use of the following dissimilar metals in the RF and magnetic shield system will not be permitted:

6.13.2.3(1) Dissimilar metals that exhibit an anodic voltage differential greater than 0.25 V;

6.13.2.3(2) Copper or aluminum in direct contract with concrete;

6.13.2.3(3) Zinc plated framing members in direct contract with copper; and

6.13.2.3(4) Copper plated steel or brass framing in direct contract with galvanized steel.

6.13.2.4 Performance Requirements;

6.13.2.4(1) Provide a RF and magnetic shield system which creates and enclosure to contain RF and/or EMI to ensure proper performance of the MRI equipment.

6.13.2.4(2) The RF and magnetic shield system will meet the performance criteria of the MRI Equipment as set out in Appendix 2E [Equipment and Furniture], including attenuation of:

6.13.2.4(2)(a) Magnetic field;

6.13.2.4(2)(b) Electric field;

6.13.2.4(2)(c) Plane Wave; and

6.13.2.4(2)(d) Sound.

6.13.2.5 Flooring Requirements

6.13.2.5(1) Provide fully seam soldered, copper sheeting floor underlayment covered with self leveling cement grout.

6.13.2.5(2) All wiring trenches and raceways will be lined with copper and made electrically continuous with the floor panels.

6.13.2.6 Ceiling Requirements

6.13.2.6(1) Provide RF panels consisting of rigid composition board laminated on both sides, one with copper and one aluminum.

6.13.2.7 Door and Window Requirements

6.13.2.7(1) Provide door and door frame assemblies which maintain the RF shield integrity by means of a continuous RF door seal around the perimeter of the door.

6.13.2.7(2) Provide windows that are minimum 5 mm thick tempered glass both sides, hermitically sealed, with anodized aluminum trim and include a double layer stainless steel RF screen material exceeding the performance of the RF shield in which it's installed.

6.13.2.7(3) Provide RF window screens consisting of 304 stainless steel wire cloth and placed at an angle to prevent the Maury Effect and reflections.

6.13.2.7(4) Provide Safe IV port will be installed in RF shielded MRI doors to provide safe and easy passage of intravenous lines into the MRI room, without compromising the RF shield and allows infusion pumps and other medical equipment to remain outside the MRI room while remaining fully connected with the Patient.

6.13.2.8 Finish Requirements:

6.13.2.8(1) Provide interior finishes consisting of non-ferrous materials.

6.14 Conveying Equipment (Division 14)

6.14.1 Elevators – General

6.14.1.1 Project Co will retain a vertical transportation consultant that is a professional engineering firm specializing in vertical transportation as part of the Project team. The vertical transportation consultant will provide Design and Construction services for the duration of the Project. These services will include a comprehensive vertical transportation analysis for the purposes of determining the number, size and speed of the vertical transportation equipment to suit the requirements of the Facility.

6.14.1.2 The comprehensive vertical transportation study and analysis will determine the number, size and speed of the elevators. The requirements set out in a prescriptive manner herein are based on the Indicative Design and will be considered minimums.

6.14.1.3 Submit analysis conforming to performance requirements to demonstrate suitable Design for a contemporary hospital facility of this nature. Submit analysis report to the Owner for review, with report clearly defining all assumptions and basis of analysis.

6.14.1.4 Elevator service in the Facility is evaluated based on demands placed on the system during a typical five-minute heavy two-way traffic period, i.e., considerable traffic is being handled in both the up and down directions, with passenger and vehicles entering and exiting the cars at various floors throughout the elevator round trip.

6.14.1.5 Elevator analysis, to provide service excellence in health care facilities, is predicated on the projected peak population, of visitors, Patients, and Staff counts, in the Facility and the projected vehicle traffic.

6.14.1.6 Handling Capacity

6.14.1.6(1) The vertical transportation of hospital Staff will be 50% via the Patient Transfer/Staff Service Elevators and 50% via the Public Passenger Elevators.

6.14.1.6(2) Public Passenger Elevators will have a handling capacity of at least 12% of the public population and 12% of the Staff population utilizing the Public Passenger Elevators, for a peak 5-minute period.

6.14.1.6(3) Patient Transfer/Staff Service Elevators will have a handling capacity of at least 4% of total number of beds and 12% of total Staff and Patient population utilizing the Patient Transfer/Staff Service Elevators for a peak 5-minute period.

6.14.1.6(4) Handling capacity refers to the number of passengers that are transported by the elevator for a prescribed period of time.

6.14.1.7 Interval / Wait Time

6.14.1.7(1) Interval-based calculations will be used for the service elevators; the average interval for adequate service elevator service will be between 30 and 50 seconds.

6.14.1.7(2) Interval-based calculations will be used for the passenger elevators; the average interval for adequate passenger elevator service will be between 30 and 50 seconds.

6.14.1.7(3) The interval is defined as the average time between elevator departures from the ground floor. Wait time is defined as the average time from the passenger entering the lobby to call the elevator until the elevator arrives to answer the call.

6.14.1.8 Load factor: Passenger elevators will provide adequate service with a load factor below 40%. Patient Transfer/Staff Service Elevators will provide adequate service with a load factor below 40% or a minimum of one (1) bariatric bed inclusive of four Staff. Load factor refers to the number of passengers transported by each elevator during one trip expressed as a percentage of the maximum number of passengers permitted by CSA B44 – Safety Code for Elevators and Escalators.

6.14.1.9 Separation of traffic: provide distinct separation of traffic types, with dedicated Parking Passenger Elevators for parking levels, Public Passenger Elevators for public and Staff use, Patient Transfer/Staff Service Elevators for Patient traffic, and FM Service Elevators and MDRD Elevators for materials and logistics traffic.

6.14.1.10 Elevator locations: elevators will be located to provide separation of traffic types as well as to minimize walking distances.

6.14.1.11 Elevator grouping: grouping elevators rather than providing single units or small groupings at various locations gains the best elevator service. In consolidating elevator service, Project Co will take into account traffic congestion, security and walking distance.

6.14.1.12 Migration: when more than one elevator group is available, a person or vehicle's origin does not necessarily dictate which vertical transport element will be used. A certain percentage of the population will migrate to other areas of a building and may not use the same elevator throughout the day. Elevator design will accommodate a minimum migratory imbalance of 10%.

6.14.1.13 Scope of Work

6.14.1.13(1) Provide passenger and service elevators as required to satisfy the equipment and performance specifications as herein described.

6.14.1.13(2) Provide separate groups of elevators for:

6.14.1.13(2)(a) Urban Health and Integrated Mental Health and Substance Use (UH and IMHSU);

6.14.1.13(2)(b) Centre for Health Aging (C4HA);

6.14.1.13(2)(c) Public Passenger;

6.14.1.13(2)(d) Parking Passenger;

6.14.1.13(2)(e) Patient Transfer/Staff Service;

6.14.1.13(2)(f) Clean/Dirty MDRD;

6.14.1.13(2)(g) FM Service; and

6.14.1.13(2)(h) Energy Centre Freight.

6.14.1.13(3) Provide heavy duty equipment engineered and designed to provide long term reliable operation and performance based on the needs of the Facility.

6.14.1.13(4) Design and perform the elevator work in accordance with the LMFM Technical Guidelines – Division 14 Vertical Transportation in effect at the time of award.

6.14.1.13(5) Perform elevator work in accordance with the requirements of the most recently adopted edition of the applicable standards set out in Section 2.4.

6.14.1.13(6) Include all work required for registration, testing and licensing of elevators by jurisdictional authorities.

6.14.1.13(7) Unless otherwise indicated, all stainless steel finishes will be manufacturer's standard ASTM type 304, brushed #4 finish.

6.14.1.13(8) Provide wrap-around stainless steel door jamb protection up to 1.35 m above finish floor for all elevators.

6.14.1.13(9) Use Good Industry Practice taking into consideration infection prevention and efficient flow, while also addressing movement control requirements.

6.14.1.14 Quality Assurance

6.14.1.14(1) All systems will conform to the non-proprietary requirements of the LMFM Technical Guidelines, and components will have a demonstrated record of reliable performance, in similar applications, for a minimum of five years.

6.14.1.14(2) Provide equipment capable of maintaining the Owner's 24/7 operations with power fluctuations up to 10% of normal supply voltage and machine / controller / hoistway temperatures of 0–40°C.

6.14.1.15 Trademarks

6.14.1.15(1) Manufacturer / elevator contractor trademarks or logos will not be visible to the public.

6.14.1.16 Maintainability

6.14.1.16(1) Provide elevator equipment that will not restrict the ability to engage a competent elevator maintenance contractor other than the original manufacturer / installer for the provision of all maintenance, diagnostic, repair and replacement services. Where microprocessor-based control systems are supplied, provide on-board diagnostic tools and associated manuals containing all set-up parameters, code references and troubleshooting instructions required for routine maintenance, repairs, replacement, refurbishment and operating adjustment procedures.

6.14.1.16(2) Elevator equipment will not include any software, counters, timers, or other devices that will automatically shut down, alter, or otherwise affect normal equipment operation.

6.14.1.16(3) Where machine rooms require access above the last level served, provide stairs at a minimum width of 2.4 m; ladder access is not acceptable.

6.14.1.17 Non-proprietary

6.14.1.17(1) Non-proprietary will refer to all elevator systems and equipment meeting established standards for universal serviceability and maintainability. These standards will include the following elements:

6.14.1.17(1)(a) Parts and equipment can be purchased, installed and maintained by any elevator company;

6.14.1.17(1)(b) Repairs, upgrades, parts integration, replacement, diagnostic and programming information, tooling at sale or upon request, technical support and training where required to support the products will be readily available for not less than 25 years;

6.14.1.17(1)(c) Control systems will include diagnostic tool functions, either onboard or in a separate device provided that such maintenance, adjustment and troubleshooting device or system provides unrestricted access to all parameters, levels of adjustment, and provides alerts for necessary maintenance of the equipment;

6.14.1.17(1)(d) A proprietary tool will not be required for any reason. Any lost or damaged tool may be promptly replaced or repaired at reasonable market cost;

6.14.1.17(1)(e) Manuals, engineering drawings, circuit diagrams and prints will be provided with the equipment at time of delivery. All documentation will be available for replacement purchase, at reasonable cost, by any installing or maintaining elevator contractor or persons so designated by the Owner;

6.14.1.17(1)(f) Software or software keys will not expire;

6.14.1.17(1)(g) Software operation will not degrade, and all service updates to the original software will be provided by the control manufacturer free of charge to the Owner for not less than 25 years;

6.14.1.17(1)(h) The control manufacturer will provide direct support and diagnostic information to the Owner and their designated maintenance company. Factory and/or on-site training regarding installation, adjustment, maintenance and troubleshooting of the equipment will be available from the original equipment manufacturer to the designated maintenance company for not less than 25 years.

6.14.1.17(2) Include a standard 1-year parts and labour warranty of the elevator equipment from the date of Service Commencement. Refer to the Owner's Elevator Maintenance – Services Agreement.

6.14.1.17(3) Elevator sub-contractor will enter into separate contract for 1-year Elevator Maintenance – Service Agreement as outlined in the LMFM Elevator Contract Template. Costs associated with the 1-year elevator maintenance will be included in the base bid.

6.14.1.17(4) Elevators will be designed to ensure routine maintenance can be carried out only on floors that do not contain Clinical Spaces. Maintenance access to the hoistway for the MDRD elevators cannot be from sterile areas such as Sterile Core-Equipment/Supplies and Store-Sterile. Project Co will provide provisions such as space considerations for operations and design elements that allow for ease of install of an Infection Control air-isolated anteroom in front of the elevator doors.

6.14.2 Elevators – Types

6.14.2.1 UH and IMHSU Public Passenger Elevators

6.14.2.1(1) Provide, as a minimum, a group of two (2) passenger elevators dedicated to serve Patients, visitors and Staff of UH and IMHSU, at the speed specified herein, and additional elevators if required to meet the findings of a comprehensive vertical transportation analysis.

6.14.2.1(2) UH and IMHSU Public Passenger Elevators will have rated capacity of 2045 kg and minimum rated speed of 0.76 mps.

6.14.2.1(3) Provide entrances at each floor served, with nominal 1.22 m wide x 2.14 m high clear horizontal-sliding, two-speed side-opening doors finished in stainless steel.

6.14.2.1(4) Provide cab configuration to accommodate front openings only. Configuration using both front and rear openings can be confusing to the public and will be avoided. Car enclosure will have nominal clear inside dimensions of 1.73 m wide, 2.44 m deep and a minimum overall height of 2.75 m, with 2.6 m to underside of suspended ceiling.

6.14.2.1(5) Provide car enclosure with stainless steel door fronts and frames, one (1) car operating panel and durable finishes appropriate to the Facility.

6.14.2.2 C4HA Public Passenger Elevators

6.14.2.2(1) Provide, as a minimum, a group of two (2) C4HA Public Passenger Elevators at the speed specified herein, and additional elevators if required to meet the findings of a comprehensive vertical transportation analysis.

6.14.2.2(2) C4HA Public Passenger Elevators will have rated capacity of 2045 kg and minimum rated speed of 1.78 mps.

6.14.2.2(3) Provide entrances at each floor served, with nominal 1.22 m wide x 2.14 m high clear horizontal-sliding, two-speed side-opening doors finished in stainless steel.

6.14.2.2(4) Provide cab configuration to accommodate front openings only. Configuration using both front and rear openings can be confusing to the public and will be avoided. Car enclosure will have nominal clear inside dimensions of 1.73 m wide, 2.44 m deep and a minimum overall height of 2.75 m, with 2.6 m to underside of suspended ceiling.

6.14.2.2(5) Provide car enclosure with stainless steel door fronts and frames, one (1) car operating panel and durable finishes appropriate to the Facility.

6.14.2.3 Parking Passenger Elevators

6.14.2.3(1) Provide, as a minimum, four (4) Parking Passenger Elevators at the speed specified herein, and additional elevators if required to meet the findings of a comprehensive vertical transportation analysis.

6.14.2.3(2) Parking Passenger Elevators will serve all floor levels in the underground parking and the Main Lobby (L1). Configurations will have front openings only; using both front and rear openings can be confusing to the public and will not be used. All Wayfinding signage will be wall-mounted and include level descriptions.

6.14.2.3(3) The Parking Passenger Elevators will have minimum rated capacity of 1590 kg and minimum rated speed of 1.78 mps and be configured to ensure that the transfer of a stretcher in the prone position can be accommodated.

6.14.2.3(4) Provide car enclosure with minimum nominal clear inside finished panel-to-panel dimensions of 2.03 m wide, 1.65 m deep, and minimum overall height of 2.75 m, with 2.6 m clear height to underside of ceiling. With round handrails, cab width between handrails is approximately 1.9 m and depth from return panel to handrail of approximately 1.58 m.

6.14.2.3(5) Provide entrances at each floor served with nominal 1.07 m wide x 2.13 m high heavy-duty, horizontal-sliding doors configured as centre opening or single-speed side opening. Entrance frames and door panels will be finished in stainless steel.

6.14.2.3(6) Provide each car enclosure with stainless steel finish on the access wall elevation. Elevators will have centre-opening doors and be provided with two (2) car operating panels.

6.14.2.4 Patient Transfer/Staff Service Elevators

6.14.2.4(1) Provide, as a minimum, a total of eight (8) overhead traction type Patient Transfer/Staff Service Elevators at the speed specified herein, and additional elevators if required to meet the findings of a comprehensive vertical transportation analysis.

6.14.2.4(2) All eight (8) Patient Transfer/Staff Service Elevators will serve the following:

6.14.2.4(2)(a) all occupied floors that contain program spaces listed in Appendix 3A [Clinical Specifications and Functional Space Requirements];

6.14.2.4(2)(b) underground parking area for the hearse and two (2) ambulance stalls; and

6.14.2.4(2)(c) all levels and interstitial spaces containing major mechanical and electrical equipment.

6.14.2.4(3) Staff wishing to access the underground parking will use the dedicated Parking Passenger Elevators. Configurations using front and rear openings will be avoided.

6.14.2.4(4) Elevators will have rated capacity of 3629 kg and a minimum rated speed of 2.54 mps. Elevators will be engineered to accommodate Class C3 concentrated loads equivalent to 75% of the rated capacity.

6.14.2.4(5) Provide car enclosure with minimum nominal clear inside, finished panel to panel, dimensions of 2.13 m wide, 3.05 m deep, minimum overall height of 3.05 m, with 2.9 m to underside of suspended ceiling or lighting coves. Provide car enclosure with flat handrails and bumper rails.

6.14.2.4(6) Provide entrances at each floor served with nominal 1.83 m wide x 2.45 m high heavy-duty, horizontal-sliding, two-speed centre-opening doors. Entrance frames and door panels finished in stainless steel.

6.14.2.4(7) Provide car enclosure with stainless steel fronts, a minimum of two (2) car operating panels and durable finishes appropriate to the Facility. Provide nominal 100 mm wide stainless steel hand rail and 155 wide stainless-steel bumper rail, bar type, with turned back ends.

6.14.2.4(8) Configure Patient Transfer/Staff Service Elevators as conventional overhead traction machine type. Locate the machine room directly above the elevator hoistway. Machine room-less type elevators are not acceptable for the Patient Transfer/Staff Service Elevators. In addition to the entry/exit door for the machine room, a utility access opening with two side-by-side fire-rated doors will be included into the machine room design to facilitate the removal of machines and other machine room equipment from the Facility. Minimum size for such openings will be nominal 1.83 m wide x 2.03 m high. Alternatively, as reviewed by the Owner, Project Co may provide a machine room door sized to accommodate removal of the largest machine component, provided that the machine replacement can be demonstrated to the Owner's satisfaction.

6.14.2.5 Public Passenger Elevators

6.14.2.5(1) Provide, as a minimum, a total of twelve (12) elevator shafts. Ten (10) gearless overhead traction type Public Passenger Elevators will be installed for Service Commencement and two (2) remaining shafts will be for future elevators. Provide additional elevators if required to meet the findings of a comprehensive vertical transportation analysis. All elevators will serve the levels required by the Facility at the speed specified herein.

6.14.2.5(2) Public Passenger Elevators will have rated capacity of 1820 kg, minimum rated speed of 2.54 mps.

6.14.2.5(3) Provide entrances at each floor served, with nominal 1.22 m wide x 2.14 m high clear horizontal-sliding, high-speed, heavy-duty, single-speed centre-opening doors finished in stainless steel.

6.14.2.5(4) Provide cab configuration to accommodate front openings only. Configuration using both front and rear openings can be confusing to the public and will be avoided. Car enclosure will have nominal clear inside dimensions of 2.34 m wide, 1.65 m deep and a minimum overall height of 2.75 m, with 2.6 m to underside of suspended ceiling.

6.14.2.5(5) Provide car enclosure with stainless steel door fronts and frames, two (2) car operating panels and durable finishes appropriate to the Facility.

6.14.2.5(6) Configure Public Passenger Elevators as conventional gearless overhead traction machine type. Locate the machine room directly above the elevator hoistway. Machine room-less type elevators are not acceptable for the Public Passenger Elevators. In addition to the entry/exit door for the machine room, a utility access opening with two side by side fire rated doors will be included into the machine room design to facilitate the removal of machines and other machine room equipment from the Facility. Minimum size for such openings will be nominal 1.83 m wide x 2.03 m high.

6.14.2.5(7) Place elevator call buttons 1.2 m AFF. Call buttons will be at least 18 mm square with 16 mm high characters raised 1 mm in appropriate colour combinations, as set out in Section 5.13 Wayfinding and Signage.

6.14.2.5(8) Inside elevator cabs, provide floor designation buttons in contrasting colours with numbers at least 4 mm high and raised 1 mm, on both sides of the doors, located between 900 mm and 1.5 m AFF.

6.14.2.6 Clean and Dirty MDRD Elevators

6.14.2.6(1) As a minimum, provide six (6) dedicated MDRD elevators at the speed specified herein, and additional elevators if required to meet the findings of a comprehensive vertical transportation analysis demonstrating elevator level of service.

6.14.2.6(2) The MDRD elevator groups will be configured to function as simplex groups, duplex groups or a mixture of both types with selective collective operation and door openings into common clean and common dirty lobbies at all levels served, to provide operational redundancy. The MDRD elevators will be configured to arrive at designated floors, hold doors open until cart is removed and the car call is registered.

6.14.2.6(3) Elevators from the same group are permitted to operate in a common hoistway, although the clean and dirty elevator groups will be in completely isolated hoistways from each other and any other elevators, and not share any common space.

6.14.2.6(4) Refer to Section 7.5.9 Ventilation Requirements for elevator shaft pressurization in sterile spaces.

6.14.2.6(5) Clean and Dirty MDRD Elevators will be dedicated and serve all levels required by the Facility. Front and rear openings may be permitted for these elevators as determined with the Owner.

6.14.2.6(6) Clean and Dirty MDRD Elevators will have a minimum rated capacity of 2272 kg. A minimum rated speed of 0.76 mps will be utilized for MDRD Elevators that require no more than two (2) elevator stops, and a minimum rated speed of 1.02 mps will be utilized for the MDRD Elevators that require three (3) or more elevator stops.

6.14.2.6(7) Car enclosure will have minimum nominal clear inside dimensions of 1.98 m wide, 2.44 m deep and a minimum overall height of 2.75 m, with 2.6 m clear to underside of ceiling.

6.14.2.6(8) Provide entrances at each floor served with nominal 1.22 m wide x 2.14 m high heavy-duty, horizontally-sliding, two-speed side-opening doors and finished in stainless steel.

6.14.2.6(9) Cab interior finishes will match MDRD department walls, stainless steel panel ceiling with recessed LED illumination, handrails and bumpers on all non-access walls; surfaces will be smooth and durable to withstand the repeated cleaning and disinfection that is required in these elevators.

6.14.2.6(10) Elevators with a single opening are to be provided with one (1) car operating panel while elevators with front and rear openings are to be provided with two (2) car operating panels.

6.14.2.6(11) Provide remote arrival indicators at all floors, with LED lights and volume adjustable electronic chime or tone to provide visual and audible indicator to notify Staff that the elevator car has arrived.

6.14.2.6(12) In conformance with the latest version of the LMFM Technical Guidelines – Division 14 Vertical Transportation, ensure that pit floors and interior wall surfaces for the height of the respective Clean and Dirty MDRD Elevator hoistways are treated with a white high-gloss, anti-microbial, durable paint.

6.14.2.6(13) Refer to the MDRD Elevator Inputs and Cart Assumptions Matrix below:

MDRD ELEVATOR INPUTS AND CART ASSUMPTIONS MATRIX		
Assumptions		**Notes** (metric dimensions nominal)
Case cart dimensions	-	1149 mm W x 711 mm D x 1003 mm (45 ¼”W x 28”D x 39 ½”H)
Lakeside cart dimensions	-	1054 mm W x 559 mm D x 972 mm H (41 ½”W x 22”D x 38 ¼”H)
Equipment cart dimensions	-	1054 mm W x 559 mm D x 972 mm H (41 ½”W x 22”D x 38 ¼”H)
Wire cart dimensions	-	1829 mm W x 610 mm D x 2007 mm H (72”W x 24”D x 79”H)
Planned clean trips occur between 11pm to 6am	-	This is the shift where MDRD will build, move, and stage clean/stocked case carts (Outside of ORs). This is done for the planned OR slate on the following day.
All clean trips between O2 MDRD and G2 Scopes are unscheduled	-	Dependent on booking of cases and accommodating emergency same-day cases. MDRD is subject to last minute clinical changes.
All soiled trips are unscheduled	-	Dependent on end-time of cases and if cases were planned/unplanned
Peak clean trips/hour = 68 carts	-	48 large case carts to G1.3 Operating Rooms 4 large case carts to E2.3 C-Section 4 lakeside carts to G1.2 Interventional Suites 10 lakeside carts to G2 Scopes 2 lakeside carts from G2 Scopes
Peak soiled trips/hour = 43 carts	-	26 case carts from G1.3 Operating Rooms 3 case carts from E2.3 C-Section 12 lakeside carts to G1.2 Interventional Suites 2 lakeside carts from G2 Scopes

Subcomponent Name	**Number of Suites**	**Abbreviation**
G1.3 - Operating and Interventional Suites - Operating Rooms	16	G1.3 Operating Rooms
E2.3 - C-Section and Procedures	2	E2.3 C-Section

Subcomponent Name	Number of Suites	Abbreviation
G1.2 - Operating and Interventional Suites - Interventional Suites	9	G1.2 Interventional Suites
G2 - Scopes and Minor Procedures Zone	10	G2 Scopes
O2 - MDRD	-	O2 MDRD

Matrix				
Out from O2 MDRD via Clean MDRD Elevators	**Case Carts**	**Lakeside Carts**	**Wire Carts for Speciality Needs**	**Equipment Carts**
G1.3 Operating Rooms	86 planned 22 unplanned	16 planned 10 unplanned	4 planned 10 unplanned	4 planned 4 unplanned
E2.3 C-Section	3 planned	3 planned	2 planned	2 planned
G1.2 Interventional Suites	22 planned 10 unplanned	4 planned 4 unplanned	2 planned 2 unplanned	4 planned 2 unplanned
G2 Scopes	4 planned 4 unplanned	30 planned 50 unplanned	6 unplanned	2 unplanned
Required # of carts per trip	4 large case carts	2-4 lakeside carts + 2-4 Staff	2 large wire carts + 2 Staff	2 equipment carts + 2 Staff
G1.3 Operating Rooms and E2.3 C-Section via Dirty MDRD Elevators to O2 MDRD	**Case Carts**	**Lakeside Carts**	**Wire Carts for Speciality Needs**	**Equipment Carts**
Out	88	22	22	22
Schedule	Varied	Varied	Varied	Varied
Required # of carts per trip	3 large case carts + 1-2 Staff	3 lakeside carts + 1-3 Staff	2 large wire carts + 2 Staff	1 equipment cart + 1 Staff
G1.2 Interventional Suites via Dirty MDRD Elevators to O2 MDRD	**Case Carts**	**Lakeside Carts**	**Wire Carts for Speciality Needs**	**Equipment Carts**
Out	22	6	6	6
Schedule	Varied	Varied	Varied	Varied
Required # of carts per trip	3 large case carts + 2 Staff	3 lakeside carts + 1-3 Staff	2 large wire carts + 1 Staff	1 equipment cart + 1 Staff
G2 Scopes via Dirty MDRD Elevators to O2 MDRD	**Case Carts**	**Lakeside Carts**	**Wire Carts for Speciality Needs**	**Equipment Carts**
Out	4	32	N/A	8
Schedule	Varied	Varied	N/A	Varied
Required # of carts per trip	2+1 Staff	3 lakeside carts + 1-2 Staff	N/A	1 equipment cart + 1 Staff
G2 Scopes via Clean MDRD Elevators (for sterilization)	**Case Carts**	**Lakeside Carts**	**Wire Carts for Speciality Needs**	**Equipment Carts**
Out	20	90	N/A	6
Schedule (must be sent to MDRD within 1 hour of reprocessing)	Varied	Varied	N/A	Varied
Required # of carts per trip	2 large case carts	2 lakeside carts + 1-2 Staff	N/A	1 equipment cart + 1 Staff

6.14.2.7 FM Service Elevators

6.14.2.7(1) As a minimum, provide five (5) dedicated FM Service Elevators for the transportation of AGVs at the speed specified herein, and additional elevators if required to meet the findings of a comprehensive vertical transportation analysis, including the AGV system performance requirements.

6.14.2.7(2) The FM Service Elevator groups will be configured to function minimally as 2-car group selective collective operation with door openings into common lobbies at all levels served, to provide operational redundancy.

6.14.2.7(3) FM Service Elevators will be dedicated and serve all levels that require AGV service by the Facility.

6.14.2.7(4) FM Service Elevators will have rated capacity of 2045 kg, minimum rated speed of 2.54 mps. FM Service Elevators will be engineered to accommodate Class C3 concentrated loads equivalent to 50% of the rated capacity.

6.14.2.7(5) Car enclosure will have minimum nominal clear inside dimensions of 1.73 m wide, 2.44 m deep and a minimum overall height of 2.75 m, with 2.6 m clear to underside of ceiling. The cabs will be provided with flat handrails and bumper rails.

6.14.2.7(6) Provide entrances at each floor served with nominal 1.220 m wide x 2.14 m high, heavy duty, horizontally sliding, two-speed side opening doors and finished in stainless steel.

6.14.2.7(7) Provide each car enclosure with stainless steel finish on the access wall elevations. Elevators with a single opening are to be provided with one (1) car operating panel while elevators with front and rear openings are to be provided with two (2) car operating panels. Provide 100 mm high stainless steel hand rail and 155 mm high stainless steel foot / bumper rail, flat type, with turned back ends.

6.14.2.7(8) The AGV system will interface with the elevator control system automatically. Low voltage wires from the elevator controller will receive and send signals from the communication panel from the AGV system controller.

6.14.2.7(9) An elevator key switch will be provided at the lowest landing for the FM Service Elevator system to select between AGV operation, in which the AGV system directs the FM Service Elevators, or

normal operation, in which the elevator system directs the FM Service Elevators based on regular hall calls.

6.14.2.7(10) Wi-Fi connectivity will be achievable within the elevator hoistway and elevator cab interior to facilitate the AGV System functionality.

6.14.2.7(11) AGV system will connect from the communication panels to each individual elevator controller. Project Co will coordinate the elevator contractor and the AGV vendor such that the sequence and signaling software requirements are operational prior to implementation. The signaling requirements will include the following as a minimum:

6.14.2.7(11)(a) AGV system will signal to the FM Service Elevator controller:

6.14.2.7.11.(a).1 Floor requests for each elevator by floor;
6.14.2.7.11.(a).2 Open the door; and
6.14.2.7.11.(a).3 Close the door.

6.14.2.7(11)(b) The FM Service Elevator controller will signal to the AGV system controller:

6.14.2.7.11.(b).1 The mode of the elevator (normal operating mode, AGV mode, Fire Phase I or Phase II mode);
6.14.2.7.11.(b).2 Location of the elevator by floor;
6.14.2.7.11.(b).3 Signal when the elevator is in motion;
6.14.2.7.11.(b).4 Status of the door (Open or Closed);
6.14.2.7.11.(b).5 Elevator cab empty, or with AGV onboard;
6.14.2.7.11.(b).6 The emergency stop button is pushed in the elevator;
6.14.2.7.11.(b).7 Door obstruction; and
6.14.2.7.11.(b).8 Elevator malfunction or error.

6.14.2.7(12) A set of dry contacts with a rating of 24 VDC will be provided at the elevator controller and will require a signal that is active high and low.

6.14.2.7(13) The elevator phase I and phase II firefighters' emergency operation alarm modes will need to be coordinated with City requirements and the AGV system vendor.

6.14.2.8 Energy Centre Freight Elevator

6.14.2.8(1) As a minimum, provide one (1) overhead traction type freight elevator for the Energy Centre.

6.14.2.8(2) The Energy Centre Freight Elevator will serve all floor levels of the Energy Centre, including the roof level.

6.14.2.8(3) The Energy Centre Freight Elevator will have minimum rated capacity of 3630 kg, minimum rated speed of 1.02 mps. The elevator will be engineered to accommodate Class C3 concentrated loads equivalent to the rated capacity.

6.14.2.8(4) Provide car enclosure with minimum nominal clear inside, finished panel to panel, dimensions of 3.05 m wide, 3.53 m deep, minimum overall height of 2.44 m. With flat handrails and bumper rails. Final approved mock-up will confirm exact dimensions required.

6.14.2.8(5) Provide entrances at each floor served with nominal 3.05 m wide x 2.44 m high heavy-duty vertical bi-parting doors. Entrance frames and door panels finished in stainless steel.

6.14.2.8(6) Provide car enclosure with stainless steel fronts, a minimum of one (1) car operating panels and durable finishes appropriate to the Facility.

6.14.2.8(7) Configure the Energy Centre Freight Elevator as conventional overhead-geared or gearless-traction machine type with machine room located directly above the elevator hoistway. In addition to the entry/exit door for the machine room, a utility access opening with two side by side fire rated doors will be included into the machine room design to facilitate the removal of machines and other machine room equipment from the Facility. Minimum size for such openings will be nominal 1.83 m wide x 2.03 m high.

6.14.2.9 Traction Elevator Equipment

6.14.2.9(1) All equipment supplied will include a design and supply life of a minimum of 25 years.

6.14.2.9(2) Provide sound and vibration isolation pads such that there is no direct contact between the machine and the Facility structure.

6.14.2.9(3) Elevator machinery and switchgear will be adequately isolated from the Facility structure to prevent noise intrusion into occupied spaces that are not directly serviced by the elevators, i.e., all occupied spaces with the exception of elevator lobbies. Elevator noise in occupied spaces should be at least 10 dB less than the background noise levels.

6.14.2.9(4) Provide an emergency brake to stop the elevator if it overspeeds or if unintended motion is detected in accordance with CSA B44.

6.14.2.9(5) Provide a fully regenerative solid state AC motor drive complete with isolation transformers and filters to meet IEEE Standard 519.

6.14.2.9(6) Provide digital encoders to provide closed loop feedback to the controller on car speed and position.

6.14.2.9(7) All equipment provided will be non-proprietary such that it can be maintained by local qualified contractors, including the provision of unrestricted purchase and installation of the equipment, availability of spare parts, diagnostic tools, technical and engineering support, and all required documentation, drawings, parts lists, and manuals. Acceptable controller manufacturers are MCE 4000 or acceptable alternative as reviewed by the Owner. Project Co will provide details of the alternate controllers for review by the Owner. All manufacturers listed in Appendix 3S [Acceptable Manufacturers and Vendors List] are acceptable to provide details of their equipment for review by the Owner.

6.14.2.9(8) Provide a microprocessor-based controller consisting of relays, contactors, switches, capacitors, resistors, fuses, circuit breakers, overload relays, power supplies, circuit boards, static drive units, wiring terminal strips, and related components all enclosed in a cabinet with hinged door panels.

6.14.2.9(9) Equipment will be rated for high usage, based on 240 starts per hour.

6.14.2.9(10) Including for guarding of equipment consistent with requirements of CSA B44 and local standards and regulations.

6.14.2.10 Hydraulic Elevator Equipment

6.14.2.10(1) All equipment supplied will include a design and supply life of a minimum of 25 years.

6.14.2.10(2) Provide sound and vibration isolation pads such that there is no direct contact between the power unit and the structure.

6.14.2.10(3) All equipment provided will be non-proprietary such that it can be maintained by local qualified contractors, including the provision of unrestricted purchase and installation of the equipment, availability of spare parts, diagnostic tools, technical and engineering support, and all required documentation, drawings, parts lists, and manuals. Acceptable controller manufacturers are MCE 2000 or acceptable alternative as reviewed by the Owner. Project Co will provide details of the alternate controllers for review and approval by the Owner. All manufacturers listed in Appendix 3S [Acceptable Manufacturers and Vendors List] are acceptable to provide details of their equipment for review by the Owner.

6.14.2.10(4) Provide a microprocessor-based controller consisting of relays, contactors, switches, capacitors, resistors, fuses, circuit breakers, overload relays, power supplies, circuit boards, wiring terminal strips, and related components all enclosed in a cabinet with hinged door panels.

6.14.2.10(5) For hydraulic elevators not equipped with safeties, a pipe rupture down overspeed pit valve will be provided at the input to the cylinder(s), to stop the elevator in the event of an overspeed condition caused by a broken supply line or an abnormally high rate of flow from cylinder to tank.

6.14.2.10(6) Provide heat exchangers as follows:

6.14.2.10(6)(a) The heat exchanger will be sized to accommodate constant use of the elevator while maintaining a maximum oil temperature of 40°C.

6.14.2.10(6)(b) The heat exchanger will include a temperature-controlled pump and fan.

6.14.2.10(6)(c) The heat exchanger will be mounted outside of the machine room, unless site constraints require installation in the machine room.

6.14.2.11 Hoistway Equipment

6.14.2.11(1) Provide entrances consisting of heavy-duty commercial-grade doors, frames, sills, sight guards, door hangers, tracks, interlocks, door closers, gibs, and all other equipment required for a complete installation. Provide entrance doors and frames finished in brushed stainless steel.

6.14.2.11(2) Provide standard ‘T’-section steel guide rails for the car and counterweight. Install guide rails using brackets fastened to the Facility structure. Clamp the guide rails to the bracket with clips arranged to prevent any horizontal movement of the rail. Join the rail sections using steel backing plates.

6.14.2.11(3) For traction-type elevators, provide hoist ropes/belts of sufficient size and number to lift the load and ensure proper wearing qualities. Provide steel ropes consisting of at least six strands wound around a hemp core centre or polyurethane-coated belts with high-tensile-grade zinc-plated steel cords. Ensure that all the ropes for a particular elevator are from the same manufacturing run.

6.14.2.11(4) For traction-type elevators, provide a counterweight to counterbalance the elevator for smooth and economical operation

with cast iron or steel plate weights contained in a structural steel frame. Provide a counterweight equal to the weight of the elevator car plus between 45 and 50% of the rated capacity.

6.14.2.11(5) For hydraulic type elevators, provide jack and cylinder as follows:

6.14.2.11(5)(a) Hole-less single-stage and two-stage telescopic hydraulic elevators are acceptable. Holed hydraulic elevators and roped hydraulic elevators are not acceptable.

6.14.2.11(5)(b) Supply will include a complete twin jack unit consisting of cylinders, pistons, piston stop rings, guide bearings and packing, all designed to suit the service, the speed, and the rated capacity.

6.14.2.11(5)(c) Means will be provided to automatically maintain the synchronization between the twin jacks (e.g. lower elevators to bottom landing and synchronize jacks, once daily).

6.14.2.11(5)(d) Project Co will coordinate with the elevator contractor to assume responsibility for all hydraulic equipment, including the cylinders, under the terms of both the guaranteed and full service maintenance agreements.

6.14.2.11(5)(e) The pistons will be sized to suit the travel without requiring intermediate support.

6.14.2.11(5)(f) Supporting machine beams will be included as required.

6.14.2.11(5)(g) Hydraulic jacks will be installed plumb to within 0.8 mm over the length of the cylinder casing and will be parallel with the guiderails to within 1.6 mm over the length of the fully extended pistons.

6.14.2.11(6) Provide for the car, and counterweight, spring mounted roller guides located at the top and the bottom of the car, and counterweight frame if applicable.

6.14.2.11(7) Provide fascias from each hall sill to the entrance header below. Include express zones. Extend the fascias into the pit and the overhead. Alternatively provide a CSA B44-certified car door interlock if fascias are not provided.

6.14.2.11(8) Provide sound-isolated car platform.

6.14.2.11(9) Provide a car frame constructed of steel channels and a platform constructed of steel channels with a metal sub-floor. Isolate the frame and platform from one another so that there is no metal-to-metal contact in order to prevent the transmission of noise and vibration. Mount the elevator cab shell on the platform in alignment with the hoistway entrances. Isolate the cab from the car frame and platform.

6.14.2.11(10) Details of vibration isolation will show the method of isolation as well as isolation material proposed and will meet the requirements of Appendix 3C [Acoustic and Noise Control Measures]. It is the Elevator Contractor's responsibility to obtain the Elevator Vibration Isolation Guidance document and ensure compliance.

6.14.2.11(11) Paint all elevator pits up to the sill. Paint Clean and Dirty MDRD Elevator hoistways in their entirety.

6.14.2.12 Cab Equipment

6.14.2.12(1) Provide a heavy-duty closed-loop door operator to open and close the car and hoistway doors simultaneously. For all elevators provide the Unitec model ABA6940CD folding door restrictor or acceptable alternative as reviewed by the Owner. Project Co will provide details of the alternate equipment for review and approval by the Owner. All manufacturers listed in Appendix 3S [Acceptable Manufacturers and Vendors List] are acceptable to provide details of their equipment for review by the Owner.

6.14.2.12(2) Provide an infra-red multiple beam door protective device, Panachrome 3d door detector, that protects the full width and up to 1.83 m from the floor of the door opening.

6.14.2.12(3) Provide Trespa panels or an acceptable alternative as reviewed by the Owner. that are consistent with other Facility components, or as specified elsewhere.

6.14.2.12(4) Elevators will be equipped with a durable rubber flooring surface suitable for health care facilities, including a minimum thickness of 3 mm. Products will be slip-resistant, resilient flooring with antimicrobial properties and installed without joints. Flooring installation will permit the complete flooring to be removed independently of other elevator components.

6.14.2.12(5) For each elevator with centre-opening doors, or elevators with front and rear entrance arrangements, provide two (2) car operating panels. Otherwise, provide one car operating panel per elevator.

6.14.2.12(6) Include, as part of the car equipment, the following:

6.14.2.12(6)(a) Stainless steel car fronts, including doors, return panels, transom panels;

6.14.2.12(6)(b) For Public Passenger Elevators, including those for C4HA and UH and MHSU, provide ceiling, lighting and durable cab interior finishes consistent with the requirements of the LMFM Technical Guidelines. Provide cylindrical-type stainless steel handrails 38–50 mm in diameter that are easily grasped. All Public Passenger Elevators will have Ligature Resistant and Tamper Resistant finishes, including handrails;

6.14.2.12(6)(c) For all FM Service and Patient Transfer/Staff Service Elevators, provide ceilings and indirect LED cab interior lighting consistent with the LMFM Technical Guidelines. Include raised panels with 5WL textured stainless steel cladding on all non-access walls. Provide a 120 V duplex receptacle in all cabs. Provide flat-type 6 mm thick solid stainless steel hand (100 mm) and bumper (155 mm) rails with turned back ends;

6.14.2.12(6)(d) For all Clean and Dirty MDRD Elevators, provide ceilings and cab interior lighting consistent with the LMFM Technical Guidelines.

6.14.2.12(6)(e) For Parking Passenger Elevators, provide ceiling, lighting and durable cab interior finishes consistent with requirements of the LMFM Technical Guidelines. Provide cylindrical-type stainless steel handrails (38 – 50 mm in diameter) that are easily grasped;

6.14.2.12(6)(f) Car operating panel(s) will accommodate MAD touch-to-go 21W touchscreens, door hold-open buttons and all other features required for conformance with applicable codes and accessibility standards for Persons with Disabilities. Where it is demonstrated that 21 W touchscreens cannot be accommodated in specific applications, the largest possible touchscreen will be used;

6.14.2.12(6)(g) In each car operating panel provide a digital display screen, minimum 305 mm diagonal, programmable on site to display messages and special events as required by the Facility. Display screens will also show current elevator location and direction of

travel. Display screen will be capable of displaying emergency messages such as medical emergency, fire recall and Patient wandering, as required by the Facility;

6.14.2.12(6)(h) Voice synthesizer with automatic verbal announcement of each floor;

6.14.2.12(6)(i) Hands-free MWP-150 emergency two-way voice intercommunication / telephone system;

6.14.2.12(6)(j) Emergency battery-powered lighting;

6.14.2.12(6)(k) Two-speed ventilation fan complete with HEPA air filtration system to ensure that air distributed through the elevator cabs has first passed through a filter. Filter will be configured to permit access and replacement from inside the elevator cab by non-elevator personnel, yet not be visible at other times;

6.14.2.12(6)(l) Firefighters' emergency operation panel;

6.14.2.12(6)(m) Service cabinet and switches;

6.14.2.12(6)(n) Provision for Wi-Fi access point installation within each elevator cab; and

6.14.2.12(6)(o) Other features required for normal operation.

6.14.2.12(7) Do not install any certificates or licences in the cab. Arrange and pay for a variance from the Owner, if required.

6.14.2.12(8) Provide one set of cab protective pads for each group of elevators that cover all walls and the cab front return panel along with pad hooks. Provide pad hooks in all elevators.

6.14.2.13 Hall Signals and Equipment

6.14.2.13(1) Provide hoistway access switches located in the entrance frame or in the hall door sight guard at the top and bottom landing for each elevator regardless of the car speed or floor-to-floor height for safe access to the car top and pit areas.

6.14.2.13(2) Provide hoistway doors on all levels with standard landing door unlocking devices.

6.14.2.13(3) For elevator groups with three (3) cars or more, provide a minimum of two hall stations on each level, centrally located between the elevator entrances.

6.14.2.13(4) For single car or two (2)-car elevator groups, provide one riser of hall stations, locating the fixtures between adjacent elevators in two (2)-car groups.

6.14.2.13(5) Provide in each hall station illuminating up and down oversized push buttons (at terminal floors, provide only one button) located with their centreline 1.07 m ± 25 mm above the floor

6.14.2.13(6) Hall call buttons to be selected from manufacturer top of line or third party series. All car and hall call button illuminations to be LED type with oversized button style and stainless steel finish.

6.14.2.13(7) For each elevator, provide a combined digital, dot matrix or segmented, hall position indicator, with a minimum 50 mm high display, and hall lanterns with dual stroke electronic tones and adjustable volume control at all levels served centred above the respective entrance. Hall lanterns will be designed to allow 180-degree viewing of direction indicators.

6.14.2.13(8) For each group of elevators, provide a properly labelled fire recall keyswitch and keybox in one hall station at the main lobby level (L1). Activation of the keyswitch will initiate phase one of firefighters' operation.

6.14.2.13(9) For each group of elevators, provide an emergency power selection switch and LED indicator, labelled "Elevator Emergency Power", in a separate emergency feature hall fixture at the main floor. Indicator will illuminate when elevators are operating on generator power.

6.14.2.13(10) For each elevator group, with the exception of the Parking Passenger Elevators and MDRD Elevators, provide one three position key switch in the hall station at each level served. Key switch will be designated as "MEO" and positions identified as "CANCEL", "OFF" and "CALL". Turning key to the "CALL" position will initiate stage 1 of "MEO" and illuminate an LED to confirm that demand is registered. Key switch will be supplemented with a card reader device to initiate stage 1 of "MEO".

6.14.2.13(11) For the MDRD Elevators, provide each elevator with a remote combination type fixture containing a directional arrow, position indicator and electronic arrival chime (complete with adjustable volume control). Fixture faceplate will be finished in stainless steel and configured as either a surface or flush mounted fixture to suit the mounting location. Display characters for the directional arrow and position indicator will have a minimum height of 60 mm. Provide hardware, conduit and conductors required to support the

remote mounting of each fixture allowing for these fixtures to be up to 25 metres from the associated elevator hoistway.

6.14.2.13(12) Provide elevator control panels within the Facility CACF and remote monitoring panel in the Energy Centre control room. Provide a lobby panel for the elevators including car position indicators, elevator lobby telephone handset and remote firefighter's emergency operation keyswitch and indicators, and any other elements required by the specification or governing codes and regulations.

6.14.2.13(13) Designated CACF is located in the Facility.

6.14.2.14 Electric Wiring

6.14.2.14(1) Provide copper wiring to connect the equipment.

6.14.2.14(2) Run all wire in metal conduit, duct or electrical metallic tubing.

6.14.2.14(3) Run travelling cable between car stations and the controller in the machine room, without use of mid-way junction boxes. All travelling cables will be round, as flat travelling cables are not permitted.

6.14.2.14(4) In addition to the wiring required for elevator operations, provide special wiring to support installation of two-way voice communication, wireless access points, card readers, security IP Video Surveillance camera, and video display screen within each car enclosure. If not used at the time of initial installation, label the unused special wires and provide a neat coil of at least five (5) feet of cable within an interface box mounted on side of each controller. The elevator contractor will ensure that wireless access points mounted in the elevator cabs will not interfere with the operation of the elevator. Provide additional Data Drops in the elevator machine room to provide network connectivity for these devices.

6.14.2.14(5) Provide at least 10% spare of each wire type in each travelling cable. In addition to these spares provide:

6.14.2.14(5)(a) Four (4) shielded pairs 20 AWG;

6.14.2.14(5)(b) Two (2) spare 14 AWG conductors; and

6.14.2.14(5)(c) Ten (10) spare 18 AWG conductors.

6.14.2.14(6) Provide adjacent each controller a separate junction box or boxes for non-elevator devices such as telephones, cameras, wireless access points, video display screens and security systems.

6.14.2.15 Accessory Systems

6.14.2.15(1) Provide a two-way voice communication system and integrate with elevator communication systems a hands-free, two-way voice communication system in each elevator, with a central CACF lobby rescue station and remote handset located in Facilities Management Office. Provide system that will permit two-way communication between any station location and each car enclosure, remote CACF, Facilities Management Office and control/machine room(s).

6.14.2.15(2) Stations inside each machine room will be configured to communicate with master stations, remote stations, other machine room stations and as a minimum with elevators with equipment contained inside the respective room. System features will include a CPC-1 Return to Dial Relay to allow the phone to immediately disconnect when the operator hangs up, permitting the cab occupants to place an additional call. All elevator phone wiring will be to FHA / BCCSS telecom standards.

6.14.2.16 Operational Features

6.14.2.16(1) For all elevators provide:

6.14.2.16(1)(a) Group supervisory, full selective collective operation;

6.14.2.16(1)(b) Independent service operation (green collar);

6.14.2.16(1)(c) Firefighters' emergency operation phase 1 and 2;

6.14.2.16(1)(d) Emergency power operation with automatic sequencing;

6.14.2.16(1)(e) Inspection operation; and

6.14.2.16(1)(f) Hoistway access operation.

6.14.2.16(2) For Parking Passenger Elevators and Patient Transfer/Staff Service Elevators, provide travelling cable wiring, interface and circuits, installation assistance for card reader security operation (card readers and security systems provided by others).

6.14.2.16(3) Provide "MEO" for all elevators with the exception of the Parking Passenger Elevators and MDRD Elevators. Provide stage 1 three position key switch and indicator in hall stations at each floor level and stage 2 key switch and indicator in each elevator car operating panel. Key switches in the hall stations and inside the

car will be supplemented with a card reader device for both stage 1 and stage 2 operation.

6.14.2.16(4) In addition to the MEO, provide for all elevators, with the exception of the Parking Passenger Elevators, FM Service Elevators and MDRD Elevators, a Priority Service Operation mode, including a priority call button and keyed switch with orange collar at each floor served. Activation of the priority button and keyed switch will select one elevator, remove it from group operation and, once it has completed all its current car calls, it will arrive at the floor where the priority call was initiated to give Staff access to an empty elevator. The priority call button access will be restricted by key switch or security card reader.

6.14.2.16(5) For all elevators, provide a personnel card reader inside each elevator cab. For Patient Transfer/Staff Service Elevators and MDRD Elevators, the personnel card will be swiped to activate the elevator to go to that floor. For Public Passenger Elevators, no personnel card swipe will be required during normal hours of operation other than to restrict access to mechanical or other non-public levels. After-hours access to any of the floors will require personnel card swipe to activate the elevator.

6.14.2.16(6) Provide restricted access to mechanical level. Both key and card swipe will be provided.

6.14.2.16(7) Key switches will be keyed and colour coded in accordance with requirements of LMFM Technical Guidelines or as otherwise directed.

6.14.2.16(8) For elevators providing access to Clinical Spaces, provide Patient wandering system operation, lock down elevator when activated.

6.14.2.16(9) Horizontal threshold gap between car and landing sills will be set between 19 and 25 mm to mitigate risk of wheeled equipment getting stuck between the sills.

6.14.2.17 Medical Emergency Operation features

6.14.2.17(1) Definitions

6.14.2.17(1)(a) MEO stage 1 operation occurs when an elevator is recalled directly to the level requested by Staff.

6.14.2.17(1)(b) MEO stage 2 operation occurs once stage 1 is complete and MEO has been initiated from inside the elevator, and the elevator travels non-stop to the designated stop.

6.14.2.17(2) With exception of the Parking Passenger Elevators and MDRD Elevators, MEO will be pre-wired and fully installed on all remaining elevators to provide priority access by medical emergency Staff. For the Parking Passenger Elevators, FM Service Elevators and MDRD Elevators, controller platforms will be configured to permit this feature to be activated.

6.14.2.17(3) MEO will be installed to enable medical Staff to provide the most rapid care possible in an emergency on as near to all elevators as possible to account for elevator use changing over time.

6.14.2.17(4) MEO stage 1 and 2 will be initiated by a key switch in all instances. The key should spring back so that they key is not left in the key switch. MEO keyswitch should have a blue collar and keys with blue covers. Key switches will be supplemented by card reader devices.

6.14.2.17(5) MEO Stage 1 will be initiated at all hall entrances.

6.14.2.17(6) During stage 1, an illuminating indicator will indicate that passengers will exit the cab at the floor at which MEO was initiated.

6.14.2.17(7) During stage 1 and 2, an illuminating indicator adjacent to the hall card reader will indicate when an elevator has been called for a MEO.

6.14.2.17(8) During stage 1 and 2, an illuminating indicator in the car will indicate that the elevator has been called for a MEO.

6.14.2.17(9) At a minimum, provide MEO call locations at all Care Team Stations, Operations Control Desks and Reception areas in Surgical and Interventional Services, Exam/Treatment Room-Resuscitation, Future Heliport vestibule, emergency rooms to initiate MEO for the convenience of emergency Staff.

6.14.2.17(9)(a) Other locations that potentially expedite MEO operation to ensure faster elevator response times may be required; and

6.14.2.17(9)(b) Design considerations will be included to preclude false MEO initiations from these remote locations.

6.14.2.17(10) MEO operation will be terminated automatically after a pre-determined amount, field programmable between 0 and 60 seconds, of time following the elevator arriving at its designated stop.

6.14.2.17(11) If firefighter's emergency operation (FFEO) is initiated when MEO stage 2 is in effect, the elevator affected will not respond to the FFEO signal until MEO stage 2 has terminated.

6.14.2.17(12) MEO operation will be configured to suit the Owner's clinical needs.

6.14.2.18 Elevator Management System

6.14.2.18(1) Provide an interactive, network based EMS consistent with requirements of the LMFM Technical Guidelines. This single system will be interfaced with all elevators. Acceptable EMS manufacturers are MCE iControl or acceptable alternative as reviewed by the Owner. Project Co will provide details of the alternate EMS for review by the Owner. All manufacturers listed in Appendix 3S [Major Equipment Acceptable Manufacturers List] are approved to provide details of their equipment for review and acceptance by the Owner.

6.14.2.18(2) All elevators will be equipped with programmable inputs to accept signals from the Facility BMS to provide multiple functions including restricting the ability to put additional cabs on independent service, if one (1) cab in a group is already out of service.

6.14.2.18(3) Include two (2) Data Drops inside each elevator machine room and two (2) Data Drops in the final mounting location for both EMS terminals.

6.14.2.18(4) As part of EMS, provide two dedicated terminals including one in the Energy Centre control room. Final mounting location of the remaining terminal will be confirmed during the Design.

6.14.2.18(5) Provide complete training of EMS features to Staff and demonstrate operation of the system for all elevators and associated monitoring points.

6.14.2.18(6) Configure system to automatically trigger fault alarms at the EMS terminals when an elevator shuts down.

6.14.2.19 Cabinets and Spare Parts

6.14.2.19(1) Provide a metal cabinet located in each of the machine rooms. The cabinet will be capable of holding:

6.14.2.19(1)(a) Spare parts, including boards that need to be kept protected;

6.14.2.19(1)(b) Manuals; and

6.14.2.19(1)(c) Aerosols / lubes.

6.14.2.19(2) Provide spare parts for each elevator type as follows:

6.14.2.19(2)(a) One (1) duplicate of each board in the controller;

6.14.2.19(2)(b) One (1) complete safety edge or proximity edge;

6.14.2.19(2)(c) Four (4) Door hanger rollers;

6.14.2.19(2)(d) Four (4) Door Gibbs;

6.14.2.19(2)(e) Four (4) complete interlocks;

6.14.2.19(2)(f) One (1) hall push button assembly; and

6.14.2.19(2)(g) One (1) car push button assembly.

6.14.3 Execution

6.14.3.1 Performance

6.14.3.1(1) Levelling – Arrange that the car stops within 3 mm of the floor level. Ensure that levelling accuracy is not influenced by load inside the car with the same levelling accuracy achieved at no load and full load and any load in between.

6.14.3.1(2) Adjust the door equipment so that the noise level is less than 63 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.

6.14.3.1(3) Arrange the machine room equipment 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.

6.14.4 Dock Lift

6.14.4.1 Basic Requirements

6.14.4.1(1) The dock lift and systems will be designed to accommodate the requirements of the Facility in a manner that contributes to the overall efficiency and effectiveness of Facility operations.

6.14.4.1(2) The dock lift systems will be designed to ensure there is sufficient capacity to accommodate the wide range of user and functionality requirements, in a manner that satisfies expectations for safety, reliability, responsiveness, accessibility and operational efficiency.

6.14.4.1(3) Equipment provided will have a proven track record of at least five years field operation in Canada in similar environments and of similar configuration.

6.14.4.1(4) Durable equipment finishes will be provided.

6.14.4.1(5) Emergency power operation of dock lift will be provided.

6.14.4.1(6) Dock lift will be configured and positioned on site to accommodate easy movement of material carts. Requirements for transport of heavy equipment will be considered and accommodated.

6.14.4.1(7) Refer to Section 5.6.4 Loading Docks for additional information.

6.14.4.2 Performance Criteria for Dock Lift

6.14.4.2(1) Supply and install a group of one (1) exterior dock lift, with equipment and performance characteristics described in this Schedule. Provide all necessary components to make dock lift systems fully operational and functional. Components included will include the following:

6.14.4.2(1)(a) electrical power to power unit, hydraulic hoses linking power unit and lift, underground pathway in concrete or metal connecting dock lift to power unit in Facility, dock pit sized to accommodate flush bottom level, two (2) bollards of concrete filled steel, storm drain in pit base and any other equipment, fittings or systems required for a fully functioning dock lift.

6.14.4.2(2) Install dock lift with Direct Access to the loading dock in a paved at-grade receiving area.

6.14.4.2(3) 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 dock lift system.

6.14.4.2(4) 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.

6.14.4.3 Codes, Bylaws and Regulations

6.14.4.3(1) Provide equipment and perform work in accordance with the latest edition of any Safety Code for Dock Lifts and any other code that may govern the installation.

6.14.4.4 Wiring Diagrams and Manuals

6.14.4.4(1) Prior to Service Commencement, supply to the Owner three sets of manuals that include information itemized below.

6.14.4.5 Final shop drawings;

6.14.4.5(1) Description of special features such as independent service, emergency power operation and security operation;

6.14.4.5(2) Record wiring and schematic diagrams;

6.14.4.5(3) Schedule of recommended routine maintenance procedures;

6.14.4.5(4) Description of diagnostic procedures, including complete troubleshooting instructions.

6.14.4.6 Training

6.14.4.6(1) At completion of the job, provide a training session for the Owner consisting of a review of the documentation and operation of the equipment and features.

6.14.4.7 Trademarks

6.14.4.7(1) Arrange that no equipment visible to the public has any trademark, company name, or logo.

6.14.4.8 Operating Conditions

6.14.4.8(1) Provide equipment that will operate normally when the exterior temperature is between minus 40 and plus 35°C.

6.14.4.8(2) Provide equipment that will operate normally when the power supply is within 10%of its rated voltage.

6.14.4.9 Maintainability

6.14.4.9(1) Arrange the equipment such that there are no times, dates, trips, or other counters that would shut down the equipment or change its operation.

6.14.4.9(1)(a) Dock lift equipment provided under this specification will not contain proprietary features that limit the Owner’s ability to engage a registered maintenance contractor, other than the original manufacturer / installer, to provide routine maintenance services.

6.14.4.9(2) 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 Owner.

6.14.4.10 Equipment Summary

6.14.4.10(1) Provide the minimum performance and dimensional requirements. Final requirements to be adjusted to suit specific design:

6.14.4.10(1)(a) Pentalift HED 58 or equivalent equipment from Blue Giant or Serco Entrematic;

6.14.4.10(1)(b) 60" x 96" deck size;

6.14.4.10(1)(c) Remote 1 HP power unit located in Receiving Room;

6.14.4.10(1)(d) Maximum 30 second lift time;

6.14.4.10(1)(e) Capacity of 8000 lb;

6.14.4.10(1)(f) Bevelled toe guards;

6.14.4.10(1)(g) Removable guard rail with mid-level rail and kick plate;

6.14.4.10(1)(h) Plated access Chain

6.14.4.10(1)(i) Deck mounted push button – removable;

6.14.4.10(1)(j) Up travel limit switch;

6.14.4.10(1)(k) Hydraulic powered bridge;

6.14.4.10(1)(l) Toe sensor;

6.14.4.10(1)(m) Wall mounted push button;

6.14.4.10(1)(n) Two second warning bell;

6.14.4.10(1)(o) Manual lowering Valve;

6.14.4.10(1)(p) Swing-out night stop; and

6.14.4.10(1)(q) Hoistway, pit, as per manufacturer's specifications.

6.14.4.11 Hoistway / Pit Equipment

6.14.4.11(1) Provide structure and material consisting of reinforced concrete, guards, and all other equipment required for a complete installation.

6.14.4.11(2) Provide pit surface sloped to drain that is connected to site storm drainage system.

6.14.4.12 Electric Wiring

6.14.4.12(1) Provide copper conductors to connect the equipment.

6.14.4.12(2) Run the conductors in metal conduit, duct or electrical metallic tubing.

6.14.4.12(3) Provide travelling cable between dock lift and the power unit in the receiving room and the power unit and local electrical panel.

6.14.4.13 Operational Features

6.14.4.13(1) Provide independent service capability.

6.14.4.13(2) Provide emergency power operation of the dock lift such that dock lift is fed with emergency power and capable of operating in power outages.

6.14.4.14 Operating Performance

6.14.4.14(1) Levelling - Arrange that the lift stops within 3 mm of the floor level.

6.14.4.14(2) Operating time - Adjust the equipment so that the operating time is 30 seconds or less.

6.14.4.14(3) Arrange the power unit equipment so that the noise level with the dock in operation is less than 72 decibels.

6.14.5 Dock Leveler

6.14.5.1 Basic Requirements

6.14.5.1(1) The dock leveler system will be designed to accommodate the requirements / needs of the Facility in a manner that contributes to the overall efficiency and effectiveness of the Owner's 24/7 operations.

6.14.5.1(2) The dock leveler system will be designed to ensure there is sufficient capacity to accommodate the wide range of user and functionality requirements, in a manner that satisfies expectations for safety, reliability, responsiveness, accessibility and operational efficiency.

6.14.5.1(3) Equipment provided will have a proven track record of at least five years field operation in Canada in similar environments and of similar configuration.

6.14.5.1(4) Durable equipment finishes will be provided.

6.14.5.1(5) Emergency power operation of dock leveler will be provided.

6.14.5.1(6) Dock leveler will be configured and positioned on site to accommodate easy movement of delivery pallets and/or material carts. Requirements for transport of heavy equipment will be considered and accommodated.

6.14.5.2 Performance Criteria for Dock Leveler

6.14.5.2(1) Supply and install a group of one pre-formed pit-type dock leveler, with equipment and performance characteristics as generally described in this specification. Provide all necessary components to make dock leveler systems fully operational and functional, whether or not specifically referenced in this outline specification. Components will include the following: electrical power to power unit, hydraulic hoses linking power unit and leveler, dock pit sized to accommodate pit-type leveler (cast-in-place box type not acceptable), two site bollards of concrete filled steel, sloped bottom of pit base to drain water, and any other equipment, fittings or systems required for a fully functioning dock leveler.

6.14.5.2(2) Install dock levelers in the following paved receiving areas (as described in Section 5.6.4 Loading Dock):

6.14.5.2(2)(a) Clean loading dock: 5 levelers;

6.14.5.2(2)(b) Soiled loading dock: 1 leveler; and

6.14.5.2(2)(c) Medical gas bottle delivery loading dock: 1 leveler.

6.14.5.2(3) 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 dock leveler system.

6.14.5.3 Codes, Bylaws and Regulations

6.14.5.3(1) Provide equipment and perform work in accordance with the latest edition of any Safety Code for Dock Levelers and any other code that may govern the installation.

6.14.5.4 Wiring Diagrams and Manuals

6.14.5.4(1) Prior to Service Commencement, supply to the Owner, three sets of manuals that include information itemized below:

6.14.5.4(1)(a) Final shop drawings;

6.14.5.4(1)(b) Description of special features such as independent service, emergency power operation and security operation;

6.14.5.4(1)(c) Record wiring and schematic diagrams;

6.14.5.4(1)(d) Schedule of recommended routine maintenance procedures; and

6.14.5.4(1)(e) Description of diagnostic procedures, including complete troubleshooting instructions.

6.14.5.5 Training

6.14.5.5(1) At completion of the job, provide a training session for the Owner consisting of a review of the documentation and operation of the equipment and features.

6.14.5.6 Trademarks

6.14.5.6(1) Arrange that no equipment visible to the public has any trademark, company name, or logo.

6.14.5.7 Operating Conditions

6.14.5.7(1) Provide equipment that will operate normally when the exterior temperature is between minus 40 and plus 35°C.

6.14.5.7(2) Provide equipment that will operate normally when the power supply is within 10%of its rated voltage.

6.14.5.8 Maintainability

6.14.5.8(1) Arrange the equipment such that there are no times, dates, trips, or other counters that would shut down the equipment or change its operation.

6.14.5.8(2) Dock leveler equipment provided under this specification will not contain proprietary features that limit the Owner’s ability to engage a registered maintenance contractor, other than the original manufacturer / installer, to provide routine maintenance services.

6.14.5.8(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 Owner.

6.14.5.9 Equipment Summary

6.14.5.9(1) Provide the minimum performance and dimensional requirements. Final requirements to be adjusted to suit specific design:

6.14.5.9(1)(a) Pentalift, Blue Giant or Serco Entrematic;

6.14.5.9(1)(b) 60” x 96” deck size;

6.14.5.9(1)(c) Remote 1 HP power unit located in Receiving Room;

6.14.5.9(1)(d) Maximum 30 second lift time;

6.14.5.9(1)(e) Capacity of 30,000 lb;

6.14.5.9(1)(f) Bevelled toe guards;

6.14.5.9(1)(g) Removable guard rail with mid-level rail and kick plate;

6.14.5.9(1)(h) Plated access chain;

6.14.5.9(1)(i) Deck mounted push button – removable;

6.14.5.9(1)(j) Up travel limit switch

6.14.5.9(1)(k) Hydraulic powered bridge;

6.14.5.9(1)(l) Toe sensor;

6.14.5.9(1)(m) Wall mounted push button;

6.14.5.9(1)(n) Two second warning bell;

6.14.5.9(1)(o) Manual lowering valve;

6.14.5.9(1)(p) Swing-out night stop; and

6.14.5.9(1)(q) Pre-formed leveler pit, as per manufacturer’s specifications.

6.14.5.10 Pre-formed Pit

6.14.5.10(1) Provide structure and material consisting of reinforced concrete, guards, and all other equipment required for a complete installation.

6.14.5.10(2) Provide pit surface sloped toward exterior door, such that wash down water flows to site storm drainage system.

6.14.5.11 Electric Wiring

6.14.5.11(1) Provide copper conductors to connect the equipment.

6.14.5.11(2) Run the conductors in metal conduit, duct or electrical metallic tubing.

6.14.5.12 Operational Features

6.14.5.12(1) Provide independent service capability.

6.14.5.12(2) Provide emergency power operation of the dock leveler such that dock leveler is fed with emergency power and capable of operating in power outages.

6.14.5.13 Operating Performance

6.14.5.13(1) Levelling - Arrange that the leveler stops within 3 mm of the floor level.

6.14.5.13(2) Operating time - Adjust the equipment so that the operating time is 30 seconds or less.

6.14.5.13(3) Arrange the power unit equipment so that the noise level with the dock in operation is less than 72 decibels.

6.14.6 Equipment Lift

6.14.6.1 Provide an industrial grade, low headroom, ceiling-mounted manual trolley hoist from a reputable manufacturer, for the following areas:

6.14.6.1(1) J3.10 Biomedical Engineering;

6.14.6.1(2) O4.18 Shop-Mechanical;

6.14.6.1(3) O4.20 Shop-Electrical;

6.14.6.1(4) Elevator machine rooms; and

6.14.6.1(5) Energy Centre and mechanical spaces as described in this Schedule.

6.14.6.2 The ceiling hoist will comply with the latest edition of the following reference documents:

6.14.6.2(1) Certified CSA C22 No. 14 Industrial Control Equipment.

6.14.6.2(2) ASME B30.16 Overhead Underhung and Stationary Hoists.

6.14.6.2(3) ASME HST-2 Performance Standard for Hand Chain Manually Operated Chain Hoists.

6.14.6.3 Ceiling lift will be complete with a suitable steel beam track and any associated structural support fastened to Facility structure above, design and installed by the

manufacturer, complete with seismic design in compliance with the VBBL and other local codes.

6.14.6.4 The manual chain hoist will have a loading capacity of 2000 kg to a lifting height of 6.1 m above finished floor level.

6.14.6.5 The geared trolley will have integrated brake system with double enclosed brake cover.

6.14.6.6 Acceptable manufacturer will be Acklands Grainger model SHB020-20 or an acceptable alternative as reviewed by the Owner.

6.14.6.7 The trolley hoist will have a warranty for 2 years.

6.15 Pneumatic Tube System

6.15.1 The PTS will be designed to accommodate the requirements of the Facility in a manner that contributes to the overall efficiency and effectiveness of the Owner's 24/7 operations.

6.15.2 The placement of each of the pneumatic tube station will allow Convenient Access for Staff, have adequate counter space and storage for preparing and receiving material, and proper lighting for all times of day. Pneumatic tube stations are not permitted in public areas or to have public access.

6.15.3 Pneumatic tubing will never be installed directly above, in or through Communications Rooms or Electrical Rooms. This includes the adjoining walls and the floor and ceiling slab.

6.15.4 Project Co will provide a computerized PTS that interconnects and serves the departments as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] with automated secure on-demand transport of light materials and health care products.

6.15.5 The PTS will be a 150 mm diameter tube send/down receive system.

6.15.6 Project Co will be responsible for providing pneumatic tube stations in all locations noted in Appendix 3A [Clinical Specifications and Functional Space Requirements]. All pneumatic tube stations will be equipped with a control panel that includes a touch-screen display allowing carrier dispatch requests.

6.15.7 The PTS will be designed and constructed such that it can be expanded in the future to allow the Owner to install additional pneumatic tube stations, diverters and blowers with minimal disruption, and connect to pneumatic tube stations located within the Facility. Provide PTS connection points at all CSRC links including the below grade connection described in Section 4.4.2.2, such that the Owner can easily expand the Facility's PTS to serve the CSRC.

6.15.8 The location of the PTS head end will either be located within component O4 - FMO Operations or the Energy Centre as determined with the Owner.

6.15.9 The system will be capable of collecting a minimum of 30 days of historical traffic data to include source station address, destination station address, send request time, carrier dispatch time, carrier wait time (the time it takes for the carrier to leave the source station after the send button is pressed), carrier transit time and the time the carrier reached its destination station.

6.15.10 Provide ten (10) leak-resistant carriers for every new station with replicable rubbing bands and foam liners with a secure, lockable integral seal to transport fluid containers, including IV bags, blood products, bodily fluid samples, some small medical equipment and pharmaceutical products. Provide ten (10) tube cleaning devices / carriers for the Facility.

6.15.11 The PTS will be capable of slower delivery speed for gentle handling and soft delivery of sensitive items, such as blood products and glass containers, while increasing the speed of empty carriers. A receiving and management area is required to support the functional requirements and volumes in the Main Laboratories J4.1.4 Pneumatic Tube Station.

6.15.12 Provide a pneumatic tube station study that outlines the capacity, anticipated wait times, anticipated transit times, and anticipated daily transactions of the PTS. Pneumatic tube station will include speed and temperature evaluations and audits.

6.15.13 PTS control wiring will be run in conduit.

6.15.14 The PTS will:

6.15.14.1 Be a computer-controlled pneumatic tube materials distribution system with RFID technology for tracking and status updates, consisting of tubing, stations, transfer units, blower packages, carriers, and a control system;

6.15.14.2 Be integrated into the BMS with wireless mobile technology for demand maintenance;

6.15.14.3 Utilize Ethernet data communications between pneumatic tube stations and controllers;

6.15.14.4 Include all necessary transfer units, user stations and carriers through a strategically designed tubing network in a configuration that is optimized for overall PTS performance;

6.15.14.5 Have transaction times supported through a pre-installation virtual system simulation conducted by Project Co;

6.15.14.6 Allow the dispatching, routing and storage of carriers to be directed by a system control centre to provide automatic unattended transmission of carriers between two stations;

6.15.14.7 Have recessed type stations; no virtual stations will be allowed;

6.15.14.8 Have stations located to minimize Staff travel distance;

6.15.14.9 Include no more than ten (10) stations per zone;

6.15.14.10 Provide each zone with its own blower and to allow it to function independently;

6.15.14.11 Include a minimum one (1) spare port at each transfer unit;

6.15.14.12 Contain receiving bin liners at each station to contain any spills;

6.15.14.13 Have a modular design of system components that will permit changes in the number of stations and/or zones as Owner requirements change in the future;

6.15.14.14 Locate transfer stations to be accessible for maintenance purposes in non-Clinical Spaces;

6.15.14.15 Have directly adjacent a dedicated, standing-height Millwork countertop with two deep drawers below for storage as outlined in Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 3L [Millwork and Modular Casework Matrix];

6.15.14.16 Provide remote arrival indication through a system of audio and visual devices that notify users that a carrier has arrived at the station. Locate the arrival indicator adjacent to a station or in a remote location as determined with the Owner.

6.15.14.17 Consider and reduce all aspects of potential noise as outlined in Appendix 3C [Acoustic and Noise Control Measures]; and

6.15.14.18 Be designed in accordance with Appendix 3C [Acoustic and Noise Control Measures] and include noise reduction features such as:

6.15.14.18(1) Energy-absorbing carrier-receiving ramps consisting of padded, liquid-resistant nylon; and

6.15.14.18(2) Impact-absorbing receiving cushions made of similar material to absorb the shock of the carrier arrival in the station bins.

6.16 Automated Guided Vehicle System

6.16.1 General Requirements

6.16.1.1 Project Co is responsible for designing, supplying, coordinating and installing a fully operational AGV system. The AGV system will use self-guided intelligent vehicles to move materials horizontally, on predetermined pathways, within the Facility. In addition, the AGV system will be interfaced with FM Service Elevators to carry vehicles and payloads vertically within the Facility.

6.16.1.2 The term vehicle refers to a low-profile, motorized device that transport materials contained within trolleys. For the purposes of AGV systems requirements, trolleys and carts are understood to have the same meaning.

6.16.1.3 AGV trolleys, being transported vertically on AGV vehicles, will remain in FM Service Elevator lobbies on all floors other than the Logistics Centre floor. AGV trolleys will then be moved manually from either the FM Service Elevator lobby to

their final destination or support rooms on the upper floors back to the FM Service Elevator lobby.

6.16.1.4 The AGV system will support logistic operations and transport trolleys on an on-demand, basis throughout the day. However, commodities being transported via the AGV will follow the transport schedule noted in Appendix 3R [AGV Cart Matrix]. The commodities that will be transported, on an on-demand basis will include the following:

6.16.1.4(1) Medical supplies (PAR replenishment);

6.16.1.4(2) Housekeeping supplies (PAR replenishment);

6.16.1.4(3) Clean linen (Exchange);

6.16.1.4(4) Soiled linen;

6.16.1.4(5) Patient Food (for the Facility only);

6.16.1.4(6) Nutritional items (PAR replenishment);

6.16.1.4(7) Municipal waste;

6.16.1.4(8) Medical waste;

6.16.1.4(9) Recyclables; and

6.16.1.4(10) Non-narcotic medications for both Patient and unit/pod medication replenishment.

6.16.1.5 Medical records, small equipment, and mail will be transported on an on-demand, ad hoc basis.

6.16.1.6 Additional surge capacity of 15% will be designed into the system to allow for these on-demand transports.

6.16.1.7 The AGV system will transport trolleys within specific time periods noted within Appendix 3R [AGV Cart Matrix]. Project Co is to note that each commodity is planned to be transported within certain time periods during the day. Project Co will demonstrate that the AGV system design is based upon the transport time windows set out in Appendix 3R [AGV Cart Matrix] Schedule Map.

6.16.1.8 Project Co will provide a detailed AGV Cart Matrix that indicates:

6.16.1.8(1) Rooms being serviced by the AGV system, that is, rooms to which clean materials will be delivered and from which soiled commodities will be removed;

6.16.1.8(2) Commodity being transported to each room;

6.16.1.8(3) Dispatch location;

6.16.1.8(4) Time of transport;

6.16.1.8(5) Elevator being used (if required) for that transport's daily cart count by commodity; and

6.16.1.9 Staff will provide daily service to the supply and waste rooms within the Facility, as outlined in the frequency chart included in the AGV Cart Matrix sample. Project Co will submit a detailed AGV Cart Matrix with the proposed service frequencies.

6.16.1.10 The main components of the AGV system are:

6.16.1.10(1) Control centre;

6.16.1.10(2) Self-guided vehicles;

6.16.1.10(3) Dedicated FM Service Elevators;

6.16.1.10(4) FM Service Elevator Lobbies;

6.16.1.10(5) Cart washers;

6.16.1.10(6) Battery chargers; and

6.16.1.10(7) Vehicle-compatible trolleys (trolleys that measure approximately 825 mm wide x 1.52 m long x 1.98 m high with a maximum weight of 455 kg).

6.16.1.11 Project Co will also incorporate any related equipment, control devices, system interfaces, software and licenses required for the full use and implementation of the system within the Facility. The entire AGV system will optimize the safe delivery of clean commodities, and pick-up of soiled items, throughout the Facility.

6.16.1.12 Project Co will provide any space required, including size and configuration, to meet the routing and movement characteristics required by the AGV system.

6.16.1.13 Shop-AGV Requirements

6.16.1.13(1) Project Co will provide all AGV maintenance equipment.

6.16.1.13(2) The Shop-AGV will include:

6.16.1.13(2)(a) X-Y Gantry Ceiling lift, refer to Section 6.11.3.16;

6.16.1.13(2)(b) Vehicle lift, refer to Appendix 2E [Equipment and Furniture];

6.16.1.13(2)(c) Battery charging station;

6.16.1.13(2)(d) Tool crib and spare parts cabinet;

6.16.1.13(2)(e) Workbenches; and

6.16.1.13(2)(f) Work desk (secondary hot back-up computer).

6.16.1.14 Demonstrate that FM Service Elevator send/receive lobbies (secondary staging) are sized and configured based upon calculated peak AGV traffic (send and receive) to each floor. Include the number of send and receive lanes for each staging area;

6.16.1.15 Maximum cart queuing time from cart arrival in the FM Service Elevator lobby to removal is 15 minutes. This is the time for Staff to attend and remove carts from the FM Service Elevator lobbies, with the exception of the logistics floor.

6.16.1.16 Demonstrate that primary staging areas (linen, food service, dock, waste management etc.) are sized and configured based upon calculated peak AGV traffic to and from that area.

6.16.1.17 Submit the number of send and receive lanes (detents) for each staging area.

6.16.1.18 Project Co will provide an FM Service Elevator analysis based upon the peak one (1)-hour traffic for each elevator group, where the peak is derived from Project Co's detailed AGV Cart Matrix. This analysis will include a graph indicating cart elevator traffic throughout the day.

6.16.1.19 During normal operations, pedestrian traffic will not be permitted in the FM Service Elevators. The FM Service Elevators will be equipped with normal service elevator controls to allow them to operate manually if the AGV system is down.

6.16.1.20 Project Co will provide an analysis that identifies the number of vehicles needed to support its detailed AGV Cart Matrix. The analysis will note:

6.16.1.20(1) Total distance travelled by vehicles each day;

6.16.1.20(2) Battery charging to support daily operation; and

6.16.1.20(3) Elevator wait time, i.e. when vehicles use an elevator to move a cart.

6.16.1.21 Project Co will provide an analysis that identifies the number of battery chargers needed to support daily operations.

6.16.1.22 The AGV system will conform to the Owner's infection prevention protocol and will recognize and differentiate between clean and dirty trolleys for proper handling and cleaning.

6.16.1.23 The management of the AGV system vehicles will include provision for their operation in emergency scenarios, including fire alarms, code blue, etc. For example, vehicles will move out of elevators and egress corridors in the event of an emergency situation.

6.16.1.24 Project Co will submit a labour mobilization plan in preparation for the event that human resources are needed to support trolley transport during AGV service interruptions.

6.16.1.25 All requirements for the space, infrastructure and installation related to the integration of the AGV system into the Facility will allow for the appropriate routing of all incoming and outgoing equipment to meet the operating hours of the Components or departments without adversely affecting clinical and non-clinical activities.

6.16.1.26 Circulation corridors and areas for the horizontal movement of the AGV vehicles will be dimensioned and configured to allow for separation of AGV and Staff traffic, including distinct pathways for AGVs and Staff sharing the same corridor or area. Staff traffic areas will be clearly distinguished and allow a flow of traffic that limits as much as possible any crossings with or obstructions of the AGV system vehicles.

6.16.1.27 Circulation corridors accommodating AGV traffic will have the following minimum widths:

6.16.1.27(1) Single-lane (one-directional) AGV flow: 1.728 m

6.16.1.27(2) Single-lane AGV flow with pedestrian/Staff circulation: 3.0 m

6.16.1.27(3) Two-lane (bi-directional) AGV flow: 2.695 m

6.16.1.27(4) Two-lane AGV flow with pedestrian/Staff circulation: 4.0 m

6.16.1.28 Circulation corridors and intersections will accommodate a vehicle turning radius of 1.22 m minimum.

6.16.1.29 Any ramps utilized by the system will not exceed an incline of 2% maximum.

6.16.1.30 The system will be programmable, intelligent, and communicate over the Owner's IMIT data network. Project Co will coordinate the technology requirements of the AGV solution with the Owner to ensure the system operates seamlessly over the Owner's wireless network.

6.16.1.31 The AGV system will be available at all times (24 hours a day, 7 days a week, 365 days a year). Therefore, the AGV system will remain operational in the event of a Facility-wide power outage.

6.16.1.32 Redundancy will be incorporated into the AGV system to avoid excessive effects of failure or unplanned availability of specific components. This includes a hot back-up for the system controller. Should the primary controller become inoperable, the hot back-up will take over without disrupting system operation.

6.16.1.33 Project Co will demonstrate, in its AGV Cart Matrix, that the design of the AGV system will be capable of processing 115% of the estimated daily traffic. In

addition to the demonstrated capacity, Project Co will provide one (1) additional spare vehicle to account for a vehicle that is out of service.

6.16.1.34 The AGV system will interface with the following Facility equipment and systems:

6.16.1.34(1) Automatic doorways and access control systems in the pathway of the vehicles;

6.16.1.34(2) Vehicle pathways and flooring (flatness and static control);

6.16.1.34(3) Fire alarm, smoke control and medical code systems;

6.16.1.34(4) FM Service Elevator controls; and

6.16.1.34(5) VLAN and WLAN communications.

6.16.1.35 Project Co will participate and assist the Owner in the planning and procurement activities related to the Commissioning of the AGV system.

6.16.1.36 In the event that the AGV system does not meet the functional and operational needs of the Project during the 12 months following the Service Commencement Date, Project Co will perform an analysis of the system defect(s) with the assistance of the Owner. Project Co is responsible for all corrective actions required to enable the system to meet the performance requirements set out in Section 6.16.2 without any additional cost to the Owner.

6.16.1.37 Project Co will coordinate the selection of an AGV supplier with the Owner. Project Co will demonstrate that the selected system and equipment are robust, functional and have a proven performance record. The number, quantity and total cost of the vehicles provided by the AGV supplier will be taken into consideration along with other AGV selection criteria. The final selection is the responsibility of Project Co.

6.16.1.38 Crossover of soiled and clean cart flows will be minimized to the maximum extent possible. This principle of separating the flows is reflected in the AGV Cart Matrix schedule, refer to Appendix 3R [AGV Cart Matrix] where the clean flows are primarily scheduled during daytime hours and soiled flows after hours. Crossover of clean and soiled flows is acceptable at the FM Service Elevator lobbies, in the cart marshalling areas and in corridors but only in cases where the AGV compatible carts are enclosed, or at minimum, where the cart contents are enclosed.

6.16.1.39 Linen:

6.16.1.39(1) A minimum of four (4) turns of AGV compatible linen carts will be provided.

6.16.1.39(2) Alcoves for clean linen will hold an AGV compatible linen cart. This is part of an exchange cart operation.

6.16.1.40 Waste:

6.16.1.40(1) Provide separate, AGV compatible carts, for each of trash/municipal, recyclable and bio-hazard waste stream.

6.16.1.40(2) The AGV will transport clean waste carts from the Exchange Cart/Prep/Hold-AGV depot area to the FM Service Elevator lobbies.

6.16.1.40(3) The AGV will transport waste carts to the soiled dock throughout the 3 - 10 pm window noted on Appendix 3R [AGV Cart Matrix].

6.16.1.40(4) In the Disposal Hold areas, provide AGV compatible waste carts for each of the waste streams.

6.16.1.41 Project Co will consider any necessary adjustments resulting from the requirement to deliver a fully functional and operational AGV system that meets the performance requirements set out in Section 6.16.2. Any review or approval by the Owner will not reduce Project Co's responsibility in this regard. The Owner's acceptance of the AGV system, including its various components and quantities, as included in the various documents submitted by Project Co, does not limit the obligation of Project Co to provide a fully functional and operational AGV system including the provision of appropriate equipment and spaces in type and in quantity.

6.16.2 Performance Requirements

6.16.2.1 Project Co will provide an AGV system, as required by the clinical, non-clinical and support services streams identified in Appendix 3R [AGV Cart Matrix], and all of its components for the purposes of horizontal and vertical transport of clean and soiled products and equipment between zones to handlers designated throughout the Facility. Project Co will ensure the quality, quantity, type and characteristics of all components of the AGV system integrated into the Facility.

6.16.2.2 AGV System Components

6.16.2.2(1) The main components of AGV system are:

6.16.2.2(1)(a) System controller;

6.16.2.2(1)(b) Send and I/O panels;

6.16.2.2(1)(c) AGV vehicles (Vehicles that transport trolleys/carts);

6.16.2.2(1)(d) Battery chargers;

6.16.2.2(1)(e) Trolleys; and

6.16.2.2(1)(f) Strategically located AGV designated handling areas (marshaling depots).

6.16.2.3 Designated path of AGV vehicles

6.16.2.3(1) AGV routing will be virtual type using a programmed memory with the support of a laser, grid or inertial guidance system, or combinations thereof. The laser, grid or inertial guidance system will use positive position indicators to check and update the actual positions of the AGV vehicles.

6.16.2.4 Designated Handling Areas

6.16.2.4(1) AGV marshaling depots will be located:

6.16.2.4(1)(a) Adjacent to FM Service Elevator lobbies; and

6.16.2.4(1)(b) Primary staging areas for incoming materials and outgoing waste.

6.16.2.4(2) AGV circulation corridors and areas will extend:

6.16.2.4(2)(a) From primary staging areas for incoming materials and outgoing waste; and

6.16.2.4(2)(b) To and from primary staging areas and the FM Service Elevators.

6.16.2.5 The FM Service Elevators will be dedicated to the AGV system during automated use but allow manual use during system down-time procedures.

6.16.2.6 The operating software of the AGV system, vehicles and controls will interface with Building Systems necessary to facilitate AGV movement.

6.16.2.7 The AGV system will:

6.16.2.7(1) Direct vehicles to pull over and not impede egress pathways during alarm conditions;

6.16.2.7(2) Automatically open closed doors when a vehicle needs to pass through;

6.16.2.7(3) Hold open automatic doors or delay door holder release to prevent interference with vehicles passing through the doorway;

6.16.2.7(4) Incorporate a dispatch panel at each send/receive location;

6.16.2.7(5) Incorporate a control centre within the FM Maintenance Operations;

6.16.2.7(6) Communicate to Staff that a trolley has arrived for pick-up; and

6.16.2.7(7) Incorporate trolley arrival lights on the exterior of receiving rooms adjacent to the FM Service Elevators.

6.16.2.8 Provide AGV battery chargers as follows:

6.16.2.8(1) Quantity of chargers equal to a minimum of 20% of the total number of vehicles estimated for the system, plus an additional charger required in the designated maintenance shop, with all chargers able to operate at 100% of their nameplate charging rate simultaneously;

6.16.2.8(2) Provide power disconnects adjacent to the charger;

6.16.2.8(3) Indicate charger locations noted on Project Co's drawings; and

6.16.2.8(4) Locate chargers in a dedicated vehicle position (not either a send and/or receive location).

6.16.2.9 The AGV system has implications for the various IM/IT interfaces between the AGV operations software and the Facility network, as well as the specific IM/IT systems for materials management, procurement, Building Management and logistics zones used by the Facility. The selection of a Facility-specific IM/IT system whose interface with the AGV operating software is required will be discussed and accepted by Project Co and Owner prior to its acquisition.

6.16.2.10 Project Co will provide the terminals, control panels, fixed and mobile consoles and other communication interfaces necessary for the management of the system by Staff.

6.16.2.11 Project Co is responsible for differentiating the flooring of AGV transport areas from those of Staff zones.

6.16.2.12 Project Co will take full responsibility for the design, procurement, Commissioning and maintenance of the AGV system including the initial training for Staff and team leaders.

6.16.2.13 The AGV system will be fully installed, operational and functional, including all necessary training for Staff and approvals by the Governmental Authorities prior to Service Commencement.

6.16.2.14 Project Co will demonstrate that the AGV system has been implemented and operated successfully in another hospital for a minimum period of three years. Project Co will organize visits to reference sites for the benefit of Staff and team leaders.

6.16.2.15 Project Co will assist the Owner in any external procedure that is the consequence of the integration of the AGV system into the Facility, particularly with regard to the recognition of digital data (RFID, bar code, etc.).

6.16.2.16 The AGV system will be considered an integral part of Project Co's Design for the Facility. In addition, Project Co will obtain all necessary authorizations for the implementation and operation of the AGV system.

6.17 Food Services and Equipment

6.17.1 Basic Requirement

6.17.1.1 Food services includes the Central Food Production (CFP) kitchen that will provide the storage, preparation, cooking, chilling, assembly and refrigerated holding as well as pot washing needs for Patients within the Facility and the VGH campus.

6.17.1.2 Food services will also include the Nutrition Centres, Serveries, Complete Nourishment Centres and Nourishment Rooms within each Component in the Facility to facilitate plating and service for Patients.

6.17.1.3 Patient food for VGH will be assembled in bulk in the CFP and be transported overland by refrigerated truck to food depots at Banfield and the Jim Pattison Tower at the VGH campus.

6.17.1.4 This Section will be read in conjunction with Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 3F [Food Services Equipment List].

6.17.1.5 Project Co will obtain and pay for all design submission, registration, inspection and permit, as required by the British Columbia government for licensing of the kitchen, except for ownership and operation license.

6.17.2 LEAN Planning Principles

6.17.2.1 Functional areas within the Central Food Production (CFP) will be located to ensure flow of product from receiving, storage, preparation, cooking supported by tumble chill technology, blast chilling and freezing, through to prepared food holding and bulk food cart assembly and distribution internally to the Patient units in the Facility and to the food depots at the VGH campus.

6.17.2.2 A forward flow circulation system will be used for all food items to eliminate cross contamination between raw ingredients and prepared food items.

6.17.2.3 Functional areas will be arranged to minimize travel distances from one function to another therefore the placement of equipment and supplies will promote the concept of reducing travel time/distance for Staff.

6.17.3 Decasing and Storage

6.17.3.1(1) All temperature-controlled rooms are constructed of pre-fabricated, walk-in type insulated ULC-listed wall and ceiling panels made of Rockwool at minimum 125 mm or foamed-in-place insulation at minimum 100 mm, sandwiched in place between exterior and interior metal skins. Insulation to meet latest ASHRAE 90.1 – R-25 for coolers, R-32 for freezers and floors insulation at R-28.

6.17.3.1(2) Cooling for all walk-ins, as well as the blast chiller/freezers will be part of a “rack refrigeration system”. This is a self-contained system that allows for an integrated 20% redundancy and continuous cooling in the event of a malfunction in any one of the compressors. The compressors for all the units will have an internal “Tree” piping arrangement, housed in an insulated cabinet complete with fan set up and a digital computer control and monitoring panel. Computer controls also allow temperature monitoring and messages to a central computer/panel in the dietary offices and an internal security station. The system has a smaller footprint and is much cooler than a normal rack system. Cooling of compressors/condensers will utilize the Facility’s chilled water system. Mount the system cabinet on a 100 mm concrete pad.

6.17.3.1(3) The rack refrigeration system will be housed in a separate room with exterior access as required by Code and with the required adjacency to the refrigerators and freezers within Central Food Production.

6.17.3.1(4) Provide floor depressions to accommodate in-slab insulation below all equipment such as cold storage rooms, walk-in refrigerators and freezers and ensure a level access both into and out of the units.

6.17.4 Waste Management

6.17.4.1 The waste pulping equipment utilizes a combination of a waste disposal unit and a water press with re-circulating water and is being provided at the pot washing area to reduce the volume of organic waste by up to 80%. The system is a coupled set up that has the pulper at the soiled scraping area connected by stainless steel piping to the water press located under the tabling.

6.17.4.1(1) A biodigester for solid food waste will be located within the CFP to turn waste food into drain safe “grey water”. The unit churns waste food with infusion of hot and cold water, oxygen and porous plastic “Powerchips” media that distribute microorganisms and enzymes that accelerate the decomposition of solid food waste into nutrient rich grey water that is routed harmlessly down the drain.

6.17.4.1(2) The flow of waste does not cross the flow of food supplies being delivered to the kitchen.

6.17.5 Foodservices Information Management System

6.17.5.1 The existing St. Paul’s Hospital utilizes a computerized foodservice management information system. This system will be maintained in the Facility to support the operation of foodservices. The specific device requirements and selection to

support the service delivery have not been determined. Project Co will not be responsible to provide software or handheld devices for the foodservice information management system.

6.17.5.1(1) The digital information system is maintained and supported centrally at the Facility. A printer is available in the Nutrition Centre for the meal assembly tickets and nourishment labels. Most communication including text messages use the tablet or hand held device dedicated to the Nutrition Centre or Servery.

6.17.5.1(2) A computerized dietary management information system will be used to support the operation. The dietary management information system will be fully integrated into the facilities Admission/Discharge/ Transfer system.

6.17.6 Cold Storage

6.17.6.1 Cold rooms will be capable of maintaining product at a temperature of 2 to 5°C.

6.17.6.2 Frozen storage rooms will be capable of maintaining temperatures of -18°C .

6.17.6.3 Bulk Assembly room (O3.18) will operate at 10°C.

6.17.7 Design Criteria

6.17.7.1 Space

6.17.7.1(1) Refer to the Room Templates for layouts of each functional area and the minimum equipment and system requirements.

6.17.7.1(2) All areas within the CFP will be within one contiguous space.

6.17.7.1(3) Central Food Production areas will have a Ceiling Height of 3.05 m AFF, with the exception of the following:

6.17.7.1(3)(a) All walk-in cold rooms, refrigerators and freezers will have a minimum Ceiling Height of 2.6 m AFF; and

6.17.7.1(3)(b) Walk-in refrigerators that serve as assembly or working coolers will have a maximum Ceiling Height of 2.74 m AFF.

6.17.7.1(4) Consistent with obligations under the Agreement, the commercial kitchen plans, equipment lists and specifications will be submitted for a Health Department Review to the Owner and Provincial Health Services Authority.

6.17.7.1(5) Submissions will also be reviewed by the Governmental Authority for life safety and code compliance.

6.17.7.2 Wash Stations

6.17.7.2(1) Hand hygiene sinks with soap dispensers and/or hand disinfectant stations will be provided in all work areas within the production kitchen.

6.17.7.2(2) Eyewash stations will be provided where bulk chemical storage occurs and where chemicals are used predominantly (dish wash and pot wash areas). Portable eyewash stations are not acceptable.

6.17.7.3 Ventilation/Exhaust

6.17.7.3(1) An island style “demand control” type exhaust hood complete with make- up air to National Fire Protection Association (NFPA) #96 standards will be located above the cooking equipment complete with an automatic fire suppression system for equipment and exhaust hood protection.

6.17.7.3(2) The kitchen exhaust and make up air systems will be provided to allow for year-round tempered air. Slight negative pressure will also be provided for odour control in the kitchen areas.

6.17.7.3(3) The design of the exhaust system will provide for grease laden vapors to be filtered through an engineered system.

6.17.7.3(4) Air-conditioned moderate velocity air as well as ventilation will be provided in all food service areas.

6.17.7.3(5) Slight negative pressure will be provided for odour control in all of these areas.

6.17.7.3(6) Specific kitchen exhaust and make up air systems will be required in the production kitchen that provides year round tempered air. Exhaust hoods to be ULC listed.

6.17.7.3(7) Special exhaust meeting the current NFPA code will be required over any and all cooking. Additional exhaust will be required to vent odours, and humidity from the dish and pot washing equipment.

6.17.7.3(8) Exhaust hoods will have “Demand ventilation” and digital monitoring system. All as required to constitute a fully approved system installed in accordance with NFPA 96, 17a, and the Governmental Authority.

6.17.7.3(9) All exhaust hoods will have built-in recessed LED light fixtures with full spectrum LED lights and high temperature ballasts.

6.17.7.3(10) Construct each hood of 1.25 mm stainless steel with a No. 4 finish and all joints welded and water tight as per NFPA-96, (1994).

6.17.7.3(11) Accomplish high efficiency grease extraction by centrifugal action through multi-directional baffles adjacent and parallel to cooking equipment, without the use of filters, cartridges, or rotating parts.

6.17.7.3(12) Provide and install a fully assembled and pre-wired control panel constructed of 1.25 mm stainless steel with No. 4 finish.

6.17.7.3(13) Provide electrical components, including fan selector switch, and FAN ON pilots with a visual screen and touch pad components.

6.17.7.3(14) Provide interconnecting wiring and piping within hoods for on-site assembly. Provide control panels ready for final connections.

6.17.7.3(15) Provide and install removable stainless steel, enclosure panels and trim between hood and all adjacent surfaces.

6.17.7.3(16) Provide battery operated 120 Volt uninterrupted power supply for controls with a seven second delay.

6.17.7.3(17) Hang hoods, supplying and installing mild steel, hanging rods, turnbuckles and miscellaneous hardware necessary for secure, level and plumb installation ready for duct connection. Anchors to slab or beams to be supplied to General Contractor for installation, if required.

6.17.7.3(18) Provide variable speed fan control system for exhaust systems over 2359 L/sec total air flow volumes as per current UBC code requirements. Provide automatic balancing control dampers on individual exhaust hoods. Supply system with variable speed drive for exhaust fan matched to exhaust fan provided by Mechanical Division.

6.17.7.4 Condensate Hoods

6.17.7.4(1) Fabricate hoods of 1.25 mm stainless steel type 304, No. 4 finish with joints and seams fully welded and liquid tight.

6.17.7.4(2) Provide removable stainless steel condensate baffles.

6.17.7.4(3) Duct collars will be 1.6 mm stainless steel all welded complete with 25 mm flanged perimeter connection.

6.17.7.4(4) Provide 13 mm stainless steel condensate drain coupling and condensate trough.

6.17.7.4(5) Stainless steel removable enclosure panels will be provided from top of condensate hoods to underside of finished ceilings.

6.17.7.4(6) Support and hang condensate hoods by means of mild steel threaded rod, secured to structural ceiling member. Utilize turn-buckles to ensure a plumb and level installation, ready for duct connection.

6.17.7.4(7) Approved manufacturers to be HALTON or SPRING AIR.

6.17.7.5 Fire Suppression Systems

6.17.7.5(1) Fire suppression system to NFPA #96 and 17A standards and the Governmental Authority, will be provided for surface protection of all cooking, hood plenums and ducts. System to be capable of fully automatic detection and actuation or remote actuation with the ability to alert the security station in case of a fire condition. Automatic mechanical, electrical or gas shut-off to equipment is mandatory.

6.17.7.5(2) Provide hood, duct and surface protection for all cooking units.

6.17.7.5(3) Hood and duct protection achieved as part of hood construction or in combination with surface protection.

6.17.7.5(4) Fire detection by preset thermostats or fusible links, or both, with activation setting of 176°C or higher according to type of equipment beneath

6.17.7.5(5) Activation of systems will generate closing of dampers, discharge of water and/or chemical extinguishing medium, fan and fuel shutdowns.

6.17.7.5(6) Locate thermostats or links within 914.4 mm of potentially hazardous equipment.

6.17.7.5(7) Locate extinguishing discharge nozzle over hazardous equipment and provide maximum efficiency and efficient discharge of extinguishing medium.

6.17.7.5(8) Fit discharge nozzles with grease caps.

6.17.7.5(9) Supply gas control valve for installation by Mechanical Division.

6.17.7.5(10) Will conform to NFPA 96 and to UL-300 or latest version and to the requirements of the Governmental Authority.

6.17.7.5(11) Provide one ‘K’ class fire extinguisher and mounting bracket per coverage zone.

6.17.7.6 Materials

6.17.7.6(1) Materials for fixed surfaces to be impervious to moisture, corrosion resistant, smooth and easily cleaned.

6.17.7.6(2) Materials will be new, first grade, thickness will be standard gauge for sheet and plates.

6.17.7.6(3) Thickness of sheets and tubing are in millimeters. All tubing to be 1.6 mm wall, sizes shown are outside diameter and face

6.17.7.6(4) Stainless steel will be Analysis 18-8, Type 304, No. 4 finish, 180 grit free from pits and imperfections. All finish lines to run vertically

6.17.7.6(5) Galvanized iron, copper bearing sheet 381 grams per square meter, hot dipped and finished with one coat primer and one coat grey hammerloid air dry enamel.

6.17.7.6(6) Plywood, Douglas Fir, waterproof, conforming to CSA 0121. Plywood will be free of added urea-formaldehyde

6.17.7.6(7) Plastic, non-absorbent thermoplastic with hardness Durometer 60 D to thicknesses as specified under individual items.

6.17.7.6(8) Plastic laminate conforming to CSA A172. Types 1 or 3, 1.6 mm and 1.3 mm thick respectively having standard 0.5 mm compensating backing sheet.

6.17.7.6(9) Sound deadening under all stainless steel tops to be Aquaplas DL-10, 3 mm thick, grey, rigid, waterproof insulation. Bituminous backing not accepted.

6.17.7.7 Miscellaneous

6.17.7.7(1) Plastic, non-absorbent thermoplastic with hardness Durometer 60 D to thicknesses as specified under individual items.

6.17.7.7(2) Garbage container to be Rubbermaid #2620, yellow, complete with lid. Custom fabricate dolly and properly size to fit waste container.

6.17.7.7(3) Cutting boards to be removable and reversible, 12.7 mm thick, white, sanitary, plastic material (non-porous) and dishwasher safe. Board to have 76.2 mm x 25.4 mm elongated slot to serve as a handle. Mount in stainless steel slides with back stop.

6.17.7.7(4) Bumpers- Will have metal insert support and exterior casing in 1.6 mm stainless steel. Secure bumpers specified on purchased or fabricated mobile equipment at identical height.

6.17.7.7(5) Corner bumpers to be Colson #6927, fastened to unit with stainless steel screws. Seal all exposed gaps.

6.17.7.7(6) Wrap around bumpers to be Colson #6915, set into stainless steel channel, fastened to unit with stainless steel screws. Seal all exposed gaps

6.17.7.7(7) Insert Neoprene buttons in housings or bodies to soften noise on drawer or door closing

6.17.7.7(8) Castings to be rough ground, polished, buffed to bright lustre, free from pit-marks, runs, checks, burrs and other surface imperfections. Low nickel-content, white metal which yellows on exposure to atmosphere will not be accepted.

6.17.7.7(9) Sanitary bullet type feet of stainless steel with internal adjustment of 38.1 mm.

6.17.7.7(10) Clips will be stainless steel.

6.17.7.7(11) Casters will be stem or plate mounted as required, diameter of wheel as specified. Units with swivel casters will have locking devices on two swivel casters (unless foot lock is specified). All casters to have non marking cushion rubber wheels with thread guards.

6.17.7.7(12) Acceptable casters manufacturers are Colson, Darcor, Flexello, Kilian or an acceptable alternative as reviewed by the Owner.

6.17.7.7(13) Purchased or custom fabricated equipment to be fitted with casters from only one (1) manufacturer unless moulded forms prevent substitution. Minimum mass rating of 363 kg per set of four (4). Adaptable for tubular legs or base frames.

6.17.7.7(14) Unless otherwise noted, wheels will be metal disc type with Delrin bearings and neoprene or polyolefin tread, 127 mm diameter (or standard size of purchased equipment), and without threadguards.

6.17.7.7(15) Swivel bearings will be sealed ball or roller bearing. Brakes and wheel locks or other accessories will be provided as noted.

6.17.7.7(16) Casters on equipment which are to be used for freezer storage will have suitable tread and lubricant to withstand temperature differentials.

6.17.7.8 Hardware

6.17.7.8(1) All hardware components will be highly polished chrome plated, heavy duty Kason or Component Hardware Group Inc., unless otherwise specified.

6.17.7.8(2) Sliding door handles to be an integral part of door and to be full height of door.

6.17.7.8(3) Catches to be either concealed, self-aligning floating magnet, or friction type, solid brass with satin nickel finish, or rustproof steel balls and springs with set screws for adjustable tension. Magnet holding power of 14 kgs minimum.

6.17.7.8(4) Supply and install Tamper Resistant cylinder locks for all custom made and standard doors and drawers with locks for functional groups keyed differently.

6.17.7.9 Approved Manufacturers and Models

6.17.7.9(1) All equipment included in Appendix 3F [Food Services Equipment List] is for planning purposes only. Project Co is responsible to coordinate all infrastructure requirements with the final equipment selection.

6.17.7.9(2) All preparation and production equipment listed below will be heavy duty series or an acceptable alternative as reviewed by the Owner.

6.17.7.9(2)(a) All tray assembly units to be manufactured by Hatch Industries.

6.17.7.10 Fabrication

6.17.7.10(1) Fabricated equipment to be all stainless steel construction unless otherwise specified.

6.17.7.10(2) Millwork will have tight joints using 25.4 mm X 50.8 mm, or 50.8 mm X 101.6 mm framing where required and rigidly held in place. Use glue block where necessary.

6.17.7.10(3) Exposed plywood edges will have solid hardwood edge facing.

6.17.7.10(4) All work to be glued and blind screwed or nailed. Surface nails or screws will be set or plugged.

6.17.7.10(5) Arrange adjacent parts of continuous laminate work to match in colour and pattern.

6.17.7.10(6) Apply plastic laminate in accordance with manufacturers' directions. Apply to fir plywood or poplar faced fir plywood,

phenolic bonded graded solid on both faces, with a thermosetting adhesive. No urea formaldehyde adhesives permitted.

6.17.7.10(7) Straight self-edging to be plastic laminate. Do not mitre the edge corners. Accurately fit plastic laminate together to provide tight, flush, butt joints.

6.17.7.10(8) Gables, bottoms, tops, sides and doors to be 19.1 mm thick plywood. Drawers to have 19.1 mm thick solid wood fronts, 12.7 mm thick solid wood sides and backs and 6.4 mm thick hardboard bottom.

6.17.7.10(9) Shelving will be 19.1 mm thick plywood and adjustable. Particle board is not acceptable.

6.17.7.10(10) Machine dressed work and finished work will be free from drag, feathers or roughness of any kind. Remove machine marks by sanding.

6.17.7.10(11) Construction methods will allow for expansion and contraction of the materials

6.17.7.11 Stainless Steel Worktables and Counters

6.17.7.11(1) Tops of 2.0 mm stainless steel cut out for sink bowls, etc., reinforced as required with 2.75 mm stainless steel channels.

6.17.7.11(2) Work tables with sinks have dished and boxed edge, unless otherwise specified.

6.17.7.11(3) Reinforcing channels or saddles not to be exposed below edges.

6.17.7.11(4) Provide kickplates where specified of 1.6 mm stainless steel with G.I. backing and secured to equipment, easily removed. Seal to floor.

6.17.7.11(5) Use foodservice industry standard edges.

6.17.7.11(6) Worktable and counters with sink, work tops to slope towards sinks at a slope of 20 mm per meter. For dish tables 8 mm per metre toward dishwashing machine. Front edge level over full length.

6.17.7.12 Sink Bowls

6.17.7.12(1) All of 2.0 mm stainless steel polished inside and outside, where exposed, integrally welded into tops.

6.17.7.12(2) Round corners of 19.1 mm rad. in all vertical and horizontal corners, all welded. Solder not accepted.

6.17.7.12(3) Bottoms drawn, not creased to drain hole.

6.17.7.12(4) Drain hole at lowest point to suit type of waste specified for item.

6.17.7.12.4.(a).1 Centre type, with removable basket strainers and tailpiece.

6.17.7.12.4.(a).2 Lever type, with one piece connected overflow assembly, 'snap-in' strainer and tailpiece.

6.17.7.12.4.(a).3 Corner type, with stainless steel overflow, removable strainer and tailpiece

6.17.7.12(5) Sound deadening compound as specified under tops and multiple sink bowls.

6.17.7.12(6) Multiple sinks to have 1.0 mm stainless steel front apron over full length of bowls. Island units to have apron on both sides.

6.17.7.12(7) Faucets and valves will be T and S, or Fisher supplied including pre-rinse fixtures, pot fillers, PRV, check valves and anti-syphon valves as required for the proper operation of equipment.

6.17.7.12(8) Drain-troughs 127 mm wide x 50.8 mm deep, all welded, square cornered, pitched to drain.

6.17.7.12(9) Anti-splash inserts of expanded stainless steel in 50.8 mm x 50.8 mm stainless steel angle frame, with lift out holes or handles.

6.17.7.13 Room Finishes

6.17.7.13(1) Heavy duty non slip flooring that is washable, impervious to food acids and oils, suitable for rolling equipment with anti-mould/anti-fungi characteristics will be provided throughout the Central Food Production and distributed Food Services areas and inside any refrigerated/freezers.

6.17.7.13(2) All corners between walls, floors, and ceilings within food service areas will be coved.

6.17.7.13(3) Ensure that all general areas relating to Food services are gradually sloped to central floor drains for general drainage and to enable mechanically assisted spray wash and chemical sanitation.

6.17.7.13(4) Provide wall finishes that are smooth, washable and durable in all food service areas and provide protection from cart damage.

6.17.7.13(5) Provide durable bumpers at bottom and midpoint of walls for additional protection from rolling carts and trucks. Stainless steel corner guards to be provided on all exterior corners.

6.17.7.13(6) The kitchen will include aluminum tread plate from the top of floor coving to at least 1.0 meters high to protect from cart damage.

6.17.7.13(7) The kitchen will include aluminum tread plate from the top of floor coving to at least 1.0 meters high on all exposed walk-in coolers and freezers to protect from cart damage.

6.17.7.13(8) Walls behind cooking equipment, dishwashing and pot washing equipment will be protected with stainless steel sheets to underside of ceilings.

6.17.7.14 Walk-In Cold Rooms, Freezers and Refrigerators

6.17.7.14(1) Provide walk-in cold rooms, refrigerators and freezers with insulated walls and ceiling panels in accordance with the requirements in the kitchen design by the Project Co kitchen consultant, complete with all refrigeration systems, piping, fittings and controls to render the walk-in cold rooms, refrigerators and freezers complete and fully operational. Cold rooms will have an operating temperature range of 2 to 5ºC and freezers will have an operating temperature of -18ºC. Walk-in refrigerator operating temperature range is from 2 to 15ºC.

6.17.7.14(2) All temperature controlled rooms will be constructed of rigid pre-fabricated, walk-in type ULC-listed, CSA- and NSF-approved wall and ceiling panels with insulation between exterior and interior metal skins, meeting the requirements of the latest ASHRAE 90.1, current VBBL and BC Fire Code.

6.17.7.14(3) The unexposed exterior top of ceiling will be 0.6 mm steel unfinished. The exposed interior and exterior wall and ceiling panels will be 1.0 mm colour coat PVC plastisol steel finish. Stainless steel sheet will be to ASTM A167, type 302/304 with No. 4 finish.

6.17.7.14(4) All insulated wall and ceiling panels, refrigeration lines, suspended HVAC and light fixtures will be installed in accordance with the VBBL.

6.17.7.14(5) Panel edges will have a matching groove type profile formed during manufacturing to provide a continuous foam to foam airtight contact without the use of gaskets or seals, locked in position by means of male and female eccentric cam locking fastening devices from interior of the box. Use of gaskets only if applicable.

6.17.7.14(6) Install cold room and freezer units within 50 mm of Facility walls.

6.17.7.14(7) Wall panels will be a minimum of 2.74 m high angle sections will be utilized as specified at wall junctions. All pre-fabricated walk-ins will be self-supporting structures and constructed with fire rated insulation carrying ULC listing/rating.

6.17.7.14(8) All insulated wall and ceiling panels will be a minimum of 100 mm thick for rigid poured in place polyurethane panels and 125 mm thick for “Rockwool” panels to maintain 55ºC temperature differential. All insulated wall and ceiling panels will have minimum R30 insulating value. Insulation to be rated self-extinguishing fire retardant to meet current codes for health care/hospital installations and will comply with CAN/ULC-S138, CAN/ULC-S102 and VBBL. Flame spread ratings to meet the requirements of the National Building Code, VBBL and their specific sections.

6.17.7.14(9) Caulk around perimeter of floor panels after installation on building floor slab. Fill space between perimeter of floor panels and edge of floor depression with concrete or non-shrink grout and trowel flush with building floor.

6.17.7.14(9)(a) Doors complete with 100 mm high aluminum tread plate on exterior, interior and frame of doors.

6.17.7.14(9)(b) Lock, inside safety release, 450 mm long stainless steel pull handle complete with floor door guide and door jamming device on fully closed status, 3 piece 40 mm x 150 mm door frame mounted against the walk-in opening and on which the aluminum track is mounted. Track complete with rubber door stops at either ends.

6.17.7.14(9)(c) Door openings will be trimmed with non-conductive breaker strips.

6.17.7.14(9)(d) Door will be 1.07 m x 2.13 m hinged infitting type, to fit door opening, insulated and finished same as panels, with perimeter PVC accordion type removable/replaceable gasket with magnetic core at the top and alongside perimeter, door closer, inside safety release, brushed aluminum hardware with provisions for a padlock supplied by others. Door insulation as specified for wall panels. If required, reinforce adjacent panels to prevent door panels from twisting, racking or warping.

6.17.7.14(9)(e) Provide heavy duty self-closing spring loaded hinges and latches, 2 hinges per door.

6.17.7.14(9)(f) Provide each door section on the latch side approximately 1.5 m above floor, one Celsius dial indicating thermometer with a range of -25 to 18°C.

6.17.7.14(9)(g) Freezer doors will be complete with heater cable around perimeter of frame.

6.17.7.14(9)(h) Threshold plate will be 2.0 mm stainless steel fastened to floor with stainless steel fastenings.

6.17.7.14(9)(i) Provide checkered aluminum kickplate/bumper 1.0 m high on door fronts, rear and edges, frame and edges.

6.17.7.14(10) For sliding doors, provide manual type door 1.22 m and 1.53 m wide complete with corresponding traffic doors to fit openings, all with extruded aluminum sliding track, vision panels, kickplates, locks, safety release hardware, overhead railing, roller guides and door gasket.

6.17.7.14(10)(a) Door complete with 100 mm high aluminum tread plate on exterior, interior and frame of doors.

6.17.7.14(10)(b) Door complete with 400 mm x 400 mm, double thermal safety glass unit, heated window in stainless steel window frame.

6.17.7.14(10)(c) Lock, inside safety release, 450 mm long stainless steel pull handle complete with floor door guide and door jamming device on fully closed status, 3 piece 40 mm by 150 door frame to mount against the walk-in opening and on which the aluminum track is mounted, track complete with rubber door stops at either end.

6.17.7.14(11) Each Freezer sliding door with door frame heaters and prewired heated vent port. 200 mm floor depressions will be provided in the floor slab underneath all cold rooms and freezers to accommodate 100 mm rigid urethane board insulation with 100 mm concrete topping reinforced with wire mesh, specified control joints and floor finish. Freezers to have electrical under floor heating cables. This will avoid equipping cold rooms and freezers with insulated floors mounted on top of the Facility floor slab or use of internal ramps. All floor insulation needs to be encased in concrete and not used as a finished floor. Floor insulation to be minimum R-28 as per ASHRAE 90.1.

6.17.7.14(12) Finished flooring to be applied to concrete topping to match kitchen flooring if a rolled product is used. An ”Altro” or equal product to be installed in all cooler or freezers if a poured type of flooring is used in the kitchen.

6.17.7.14(13) The refrigerator and freezer walk-ins and refrigeration systems will be equipped with a sophisticated alarm system. The alarm system will monitor internal temperatures and compressor pressures to ensure that all systems are maintained within the specified

temperature and pressure ranges. In the event that either a temperature or pressure goes outside the specified range the alarm system will go into an audio and visual alarm state. The cold rooms and freezers will be equipped with a local audible and visual hi/low temperature alarm as well as connected to the BMS for signaling faults.

6.17.7.14(14) Evaporator coils inside each cooler or freezer to be equipped with the latest digital monitoring device capable of alerting the monitoring station of any malfunction.

6.17.7.14(15) All mechanical refrigeration systems will utilize CFC free refrigerants meeting current codes.

6.17.7.14(16) Heat tape wrapped condensate drain lines are required from the evaporator coil to funnel type floor drains and in all applications, defrost heaters for freezers will be provided.

6.17.7.14(17) Cold rooms and freezers will be equipped with ceiling hung packaged evaporator coils connected to liquid refrigerant supply lines and gas suction lines leading to the condensing units. Condensing units will be air cooled or water cooled if a chilled water loop is available all year long. Reinforce ceiling panels as required to support evaporator.

6.17.7.14(18) All light fixtures within the cold rooms and freezers will have LED light fixtures for -18 to 2°C operation.

6.17.7.14(19) Provide 18 mm x 200 mm white crystaplex double nylon bumpers at height of 200 mm and 800 mm to centre of bumpers from floor at interior of walk-in coolers that hold mobile carts and trucks.

6.17.7.14(20) Provide through wall grommets for service penetrations through cold room wall and ceiling panels. Seal grommets with sealing compound.

6.17.7.14(21) Provide 125 mm x 125 mm x 1.80 m high 2.8 mm stainless steel corner guards on all exterior corners.

6.17.7.14(22) Provide 454 mm x 454 mm insulated ceiling access panel, finished as per exterior and interior panels.

6.17.7.14(23) Condensate drains from the cooling coil will be installed and connected to hub or floor drains complete with traps and cleanouts as required by local authorities having jurisdiction.

6.17.7.14(24) Compressors will operate from a minimum of 16 – 18 hours of operation at ambient temperatures of 35ºC.

6.17.7.14(25) Project Co to provide submittals in accordance with LEED for review.

6.17.7.14(26) Provide minimum one year warranty of equipment against defects of materials of workmanship. All compressors to have minimum 5 year warranty.

6.17.7.15 Metal Storage Units

6.17.7.15(1) Provide storage units with wire shelves and associated accessories for walk-in cold rooms, walk-in refrigerators and walk-in freezers to meet the functional requirements of the Owner.

6.17.7.15(2) References

6.17.7.15(2)(a) ASTM A480/A480M-15 Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

6.17.7.15(2)(b) ASTM A484/A484M-15 Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings.

6.17.7.15(3) Storage units and shelving will be constructed of carbon steel and coated with antimicrobial zinc phosphate base electrostatically applied. Stainless steel wire will be series 304.

6.17.7.15(4) Shelves will be adjustable in 50 mm increments to permit easy assembly and adjustment without the use of tools and able to support a uniform load of 360 kg per shelf.

6.17.7.15(5) Storage units will be able to withstand cleaning chemicals and solutions used in repeated cleaning and maintenance operations and maximize infection prevention and control.

6.17.7.15(6) Fabricated shelving components will include tubular posts with bolt down foot or casters, shelves, and ‘S’ hooks for connecting units, if required. Provide clips for 4 shelves per storage unit.

6.17.7.15(7) Where required, drawers will be constructed from wire and installed with additional space in the rear to allow full air circulation. Bins and baskets will be constructed from wire.

6.17.7.15(8) Where storage units are required to be mobile, caster wheels will be lockable.

6.17.7.15(9) No shelves mounted on doors of walk-in cold rooms, refrigerators or freezers will be accepted.

6.17.7.15(10) Shelving will be minimum 150 mm above floor finish and 50 mm from the adjacent walls.

6.17.7.15(11) Provide engineered seismic restraints by manufacturer in compliance with local building codes.

6.17.7.15(12) Storage units will be guaranteed for one year against defective materials, design and workmanship.

6.17.7.16 Emergency Power

6.17.7.16(1) At a minimum, the following equipment will be on delayed vital power:

6.17.7.16(1)(a) Foodservices walk-in cold rooms and freezers;

6.17.7.16(1)(b) 50% of cooking equipment;

6.17.7.16(1)(c) Pot and Dishwashing within the kitchen;

6.17.7.16(1)(d) Coffee makers, hot water urns and microwaves in NC/serveries;

6.17.7.16(1)(e) Lighting; and

6.17.7.16(1)(f) Food Services management system that maintains Patient diet profiles.

6.17.7.16(2) All other food service equipment will be on conditional power.

6.17.7.16(3) Production equipment will be a combination of gas and electric power to ensure production capability during power outages.

6.17.7.16(4) Food production equipment is to be last on the list of load shedding when generator power is used.

6.17.7.17 Flexibility and Adaptability

6.17.7.17(1) To the extent practical, mobile equipment will be used to allow for movement and repositioning in the future, easy replacement and ease of cleaning below and behind.

6.17.7.17(2) To the extent possible, kitchen to be enhanced by natural light.

6.17.7.17(3) Additional space is provided underneath cooking exhaust hood (1.4 m) to allow for positioning of equipment in the future.

6.17.7.17(4) For grease interceptor requirements including location, refer to Section 7.4.4.13(6).

6.17.7.17(5) Floor drains in kitchen to be directed to the grease traps.

6.17.7.17(6) All food service areas will support Staff safety by incorporating features to control hazards and minimize risk, consistent with current legislation, guidelines and best practices i.e.: chemical, ergonomic, biological, physical.

PART 7. FACILITIES SERVICES SUBGROUP SPECIFICATIONS

7.1 Mechanical Systems Design Principles

7.1.1 Project Co will provide HVAC, Plumbing, Fire Protection, Specialty and Medical Gas Systems that:

7.1.1.1 Comply with the latest version of the applicable clauses of ASHRAE, ASTM, ASPE, ASME, AWWA, CSA, NFPA, all local, provincial, and national codes and standards. Where a conflict exists between any codes or standards, the most stringent applies.

7.1.1.2 Are designed to provide a healing, comfortable and productive environment for the Facility Users, meet the required environmental conditions for all equipment and the requirements set out in the Agreement. Building systems will meet the initial Facility requirements in accordance with this Schedule. At a minimum, Project Co will provide space for equipment including Future Expansion spaces, as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]. Provide building systems and building equipment spare capacity in accordance with the requirements of this Schedule. Peak design conditions used for the Facility cooling load equipment and system sizing will be based on the year 2050 weather file conditions produced by Pacific Climate Impacts Consortium (PCIC).

7.1.1.2(1) For the purposes of designing for the peak cooling conditions, as well as allowance for future provisions, the following weather files DB/WB temperatures and enthalpies will be used:

7.1.1.2(1)(a) Year 2050:

- 7.1.1.2.1.(a).1 July peak occurrence (%): Dry Bulb (°C), Wet Bulb (°C), Enthalpy (KJ/kg)
- 7.1.1.2.1.(a).2 July peak occurrence 1.0%: 31.9°C (DB), 24.6°C (WB), 74.22KJ/kg (enthalpy)
- 7.1.1.2.1.(a).3 July peak occurrence 2.5%: 32°C (DB) 23.54°C (WB) 69.72KJ/kg (enthalpy)
- 7.1.1.2.1.(a).4 July peak occurrence 5.0%: 27.6°C (DB) 22.9°C (WB) 67.45KJ/kg (enthalpy)

7.1.1.2(1)(b) Year 2080:

- 7.1.1.2.1.(b).1 July peak occurrence (%): Dry Bulb (°C) Wet Bulb (°C) Enthalpy (KJ/kg)
- 7.1.1.2.1.(b).2 July peak occurrence 1.0%: 33.3°C(DB), 24.6°C(WB), 74.14KJ/kg(enthalpy)
- 7.1.1.2.1.(b).3 July peak occurrence 2.5%: 33.1°C(DB), 23.83°C(WB), 70.80KJ/kg (enthalpy)
- 7.1.1.2.1.(b).4 July peak occurrence 5.0%: 29°C(DB), 23.17°C(WB), 68.54 KJ/kg (enthalpy)

7.1.1.2(2) Equipment and plant(s) sizing for catastrophic event management mode, CSA Z317.2-15 Section 6.16 applies. Use Figure 3 “airflow

and design parameters for catastrophic events management" for Class A-1 Health Care Facilities with the following exception(s):

7.1.1.2(2)(a) Type I areas to maintain 100% of the airflow; and

7.1.1.2(2)(b) Type 1 and Type 2 areas are operating on 100% outdoor air systems.

7.1.1.3 Systems are developed to provide reliability of continual operation. Adequate standby capacity and redundancy will be included in system design. Unless noted otherwise, major mechanical equipment redundancy will be minimum N+1 with each piece of equipment at maximum 50% of required capacity to avoid short cycling during low load conditions;

7.1.1.3(1) All major equipment will be located at or above the Flood Construction Level including at minimum: domestic water booster pumps, fire pumps, and other equipment as determined by the Owner to be critical to Facility operation.

7.1.1.3(1)(a) Provide redundant PRVs designed to accommodate low and high flow conditions for all main domestic water, steam, and natural gas services, and in other locations, as determined by the Owner, such that critical Facility functions are uninterrupted during PRV maintenance or failure. Coordinate with Utility providers as required.

7.1.1.4 Comply with standard acoustical requirements of CSA or current ASHRAE applicable handbooks and all acoustical requirements in Appendix 3C [Acoustic and Noise Control Measures]. Provide silencers in HVAC air driven systems design to meet the acoustical criteria;

7.1.1.5 Are designed to meet he Facility's Design and Construction energy targets as required in Schedule 2, Appendix 2D [Energy];

7.1.1.6 Are located and designed to be sound attenuated for outdoor spaces, Secure Outdoor Spaces, places of respite for Patient and Staff use and from adjacent residential properties surrounding the Facility, as required in Appendix 3C [Acoustic and Noise Control Measures];

7.1.1.7 Are vibration isolated to minimize noise and vibration through the structure and other components of the Facility;

7.1.1.8 Minimize impact on the natural and physical environment, through energy efficiency, optimization of resource use, and simplification of the systems;

7.1.1.9 Are configured and located in such a way that maintenance and repair can be performed with minimal impact to Clinical Spaces as follows:

7.1.1.9(1) Piping distribution, valves, and HVAC terminal units will be located above Type III spaces such as Soiled Utility rooms and Housekeeping Closets wherever possible, avoiding Type I and II spaces as defined in CSA Z317.2. Service routing and equipment placement in ceiling spaces above corridors will enable access with a control cube without blocking any doorway or interrupting clinical workflow as per Section 5.1.2.1(10).

7.1.1.9(1)(a) For all Patient Rooms, dedicated terminal units such as VAV boxes with reheat coils and control valves are permitted to be located within Patient Rooms, as long as they are located away from the Patient and not blocking the path of room entry or access to the bed or washroom, while taking into account that any work on these terminal units would require the use of a mobile containment cube (approx.1.2 m x 1.2 m) with required 1 m clearance on all sides.

7.1.1.9(2) Pressure reducing valves, backflow prevention devices, and other similar equipment requiring maintenance or servicing will be centralized and located in mechanical spaces or Type III spaces without public access whenever possible. When located at equipment or in any finished space (including Type III spaces), these devices will be installed behind fully recessed, lockable access panels.

7.1.1.10 Are configured and located such that all components that require maintenance, service and inspection are accessible from a standing position on the floor or when using a maximum 2.5 m height ladder. When use of a ladder is not acceptable or practical, provide access by means of a fixed access system such as overhead maintenance walkways (or catwalk) and/or allocate sufficient open space, free of obstruction from other equipment and services for the use of a scissor lift. Stairs will be installed to access maintenance walkways; ladder access is not acceptable. Provide maintenance walkways for access to the following systems and components, at a minimum: steam headers, all steam and hot water boiler safety valves, and other spaces as determined by the Owner such that frequently accessed components can be properly inspected, maintained and serviced. All system components within the Energy Centre and major mechanical spaces that are subject to regular inspection and/or must accommodate awkward or heavy equipment replacement will be accessed without the use of ladder(s). Where maintenance or component equipment replacement, such as safety relief valves, motors or pumps, within Energy Centre or major mechanical spaces requires lifting in excess of 50 lbs, provide connections and/or space for suitable removal equipment (i.e. lever block chain hoists).

7.1.1.11 Are configured and located to provide sufficient clearance around equipment and components for servicing and replacement including:

7.1.1.11(1) Compliance with manufacturers service clearance requirements;

7.1.1.11(2) Minimum of 1.5 m clear floor space clearance at all locations where maintenance will be performed; and

7.1.1.11(3) Pathways for service personnel and maintenance carts, equipment removal and replacement sized to accommodate the largest piece of equipment that will be moved along the pathway with a clear space not less than 2.5 m wide and 2.5 m high.

7.1.1.12 Incorporate flexibility and adaptability for Future Expansion without major disruption or alteration to the Facility operations and infrastructure. All Building Systems will be designed and sized to suit the consumption and discharge needs of the Facility at peak operational requirements, including the anticipated year 2050 cooling requirements, as described in this Schedule, with the ability to further increase the flow or capacity as follows:

7.1.1.12(1) Size branch piping and ducting to meet the initial Facility requirements. For perimeter zones, size the ventilation system based on CSA Z317.2 air change rates or the air change rates to meet the 2080 cooling requirement, whichever is greater;

7.1.1.12(2) Size distribution piping and ducting systems including air terminal boxes, for 20% additional capacity; in addition:

7.1.1.12(2)(a) Size all VAV box reheat coils with an additional 20% heating capacity to provide flexibility to heat spaces over the highest room temperature indicated by CSA Z317.2. Provide reheat coils serving the Operating Rooms with the capability to heat the rooms to 26 °C or 20% additional heating capacity, whichever is greater;

7.1.1.12(3) Pipe shafts and pipe risers will be designed to accommodate an additional 20% increased capacity. Provide duct shaft areas with 20% additional space for future services to be installed. Shaft space for future services will be vertically continuous from top to bottom without offset or impedance by other services. Shaft space for future services will be easily accessible at each floor level. Provide permanent personnel access doors, minimum 1.8m high and 750 mm wide at the top and bottom of shafts, and on alternating floors in between;

7.1.1.12(4) Air handling equipment, exhaust fans, and pumps will be sized for additional capacity. Provide fans and pumps sized with the capacity to deliver 10% additional flow through the distribution systems without changing motors.

7.1.1.12(5) Air handling and chilled water plant equipment will meet initial Facility requirements and anticipated year 2050 cooling capacity requirements, in addition to the requirements as set out in this Schedule.

7.1.1.12(6) Should the anticipated year 2080 cooling requirement, when compared to the year 2050 cooling requirement, trigger need for additional equipment or equipment upsizing, the following will apply as minimum:

7.1.1.12(6)(a) All ductwork and piping infrastructure, including terminal units are sized/installed to meet 2080 cooling requirements, as part of initial Facility requirements;

7.1.1.12(6)(b) Demonstrate that an upgrade to Air Handling Units capacity for future 2080 year loads is minimal disruption (by upsizing motors only) while avoiding need for installation of additional air handling units systems; and

7.1.1.12(6)(c) Provide valved and capped pipe connections and space for future equipment (such as chillers, pumps and cooling towers).

7.1.1.12(7) Project Co will demonstrate to the Owner, that an upgrade to air handling unit capacity for future loads through upsizing of motors or similar, will be minimally disruptive.

7.1.1.12(8) Within mechanical rooms, provide spare floor area space for future expansion of the following systems:

7.1.1.12(8)(a) Medical gas systems;

7.1.1.12(8)(b) Medical vacuum systems;

7.1.1.12(8)(c) AGSS vacuum systems;

7.1.1.12(8)(d) RO system(s);

7.1.1.12(8)(e) Lab instrumentation air systems;

7.1.1.12(8)(f) Lab nitrogen generating system;

7.1.1.12(8)(g) Compressed air systems;

7.1.1.12(8)(h) AGSS vacuum systems; and

7.1.1.12(8)(i) Other similar systems.

7.1.1.12(9) The spare floor area described above, will allow for the future equipment capacity equal to that installed to meet the initial Facility requirements. Spare space floor area will be located adjacent to respective type of system.

7.1.1.12(10) Make all provisions necessary to accommodate space and Equipment requirements including all related capped ductwork and piping for Future Expansion spaces as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and Section 5.1 Adaptability, Flexibility and Maintainability.

7.1.1.12(11) Medical gas air compressor, vacuum pump and AGSS vacuum pump systems will be designed to accommodate an additional 20% capacity. Control panels for this equipment will be sized to accommodate the current demand plus the additional 20% control and power requirements.

7.1.1.12(12) Design piping, ductwork, heating, cooling, heat recovery coils, control valves, air filters, and louvres to meet the following minimum parameters, while accounting for the required spare/additional capacities:

7.1.1.12(12)(a) Hydronic pressure drop – maximum piping friction loss of 4 m/100 m;

7.1.1.12(12)(b) Hydronic velocity – maximum velocity based on pipe manufacturer's recommendations;

7.1.1.12(12)(c) Supply and return ductwork will be sized within the ASHRAE Fundamentals upper and lower limits for duct air velocities and pressure drop, with upper limit capped at 7.6 m/s [1500 fpm] at Service Commencement. Duct velocity will be limited to not exceed a level of 5 dB less than the maximum allowable noise levels within the space where the ductwork is located;

7.1.1.12(12)(d) Heating/ cooling/heat recovery coil face velocity of a maximum velocity of 2.0 m/s;

7.1.1.12(12)(e) Heating/cooling/heat recovery coil minimum hydronic temperature differential of 8.5°C;

7.1.1.12(12)(f) Heat recovery coil maximum leaving air temperature of 7°C;

7.1.1.12(12)(g) Control valve and hydronic coil pressure drop of a maximum 21 kPa each;

7.1.1.12(12)(h) Air filter face velocity of a maximum velocity 2.0 m/s; and

7.1.1.12(12)(i) Ventilation system air intake louvre free area face velocity of a maximum velocity 2.5 m/s.

7.1.1.12(13) The following will apply to specific piping joint method, as a minimum:

7.1.1.12(13)(a) Press-fit piping joint method is allowed only on stainless steel piping used for domestic cold water, domestic hot water, and domestic hot water recirculation lines, up to 50 mm diameter. Stainless steel piping joint method for RO water systems are to be fully welded. Press-fit installation is to be supported by local vendor (single product manufacturer), by providing services for inspection of each installed joint, with signed certificate confirming proper installation, including extended 25 years warranty inclusive of parts and labour;

7.1.1.12(13)(b) T-drill piping joint method is not permitted for any pipe material;

7.1.1.12(13)(c) Mechanical grooved piping joint method is acceptable for all hydronic applications. Following are minimum requirements for mechanical grooved piping installation:

7.1.1.12.13.(c).1 All grooved products to be of a single ISO certified manufacturer, couplings to be installation-ready complete with pre-lubricated center leg gaskets DN15 to DN300. Couplings to have wide width Flush Seal Gaskets DN350 to DN1250 with coupling housings that have lead-in chamfer on housing key section to mate with wedge-shaped grooves. Couplings will have two (2) symmetrical halves from DN 15 DN 1250 with no other loose parts. Couplings must have bolts of equal length and diameter, and multi-segmented couplings will not be accepted at any size.

7.1.1.12.13.(c).2 Include gaskets that are engineered, blended, and extruded in-house by the coupling housing manufacturer, assuring system integrity. Include gaskets that feature an integral center leg DN15 to DN 300 to ensure correct alignment of the coupling key with the

prepared pipe end, wide width Flush Seal Gaskets DN 350 to DN 1250, and that are suited for vacuum up to 29.9 in Hg/760 mm Hg. Feature a gasket suited to systems that may cycle within the operating temperature range of –30ºF to +250ºF/–34ºC to +121ºC, for the entire life of the pipe system without the application of supplementary protective lubricants or gasket treatments to achieve this service range.

7.1.1.12.13.(c).3 Be manufactured along with grooved end fittings, valves, strainers, specialties, and accessories to ISO 9001 standards. All gaskets, coupling housings, valve bodies and discs will be dated stamped for quality assurance and traceability. Valves with rubber encapsulated disc will not be accepted for use on any hydronic or domestic pipe systems.

7.1.1.12.13.(c).4 Join pipe ends that are prepared (grooved) by tooling will be manufactured by the same manufacturer as the mechanical couplings, fitting, valves, and specialties. Supply correct roles for material being grooved. Gaskets that require special lubricant to meet performance criteria will not be accepted.

7.1.1.12.13.(c).5 Grooved manufacturer will employ a Thermal & Stress Analysis piping designer who is a Professional Engineer registered in the Province of British Columbia to support design and installation applications. Provide product data points for independent 3rd party to confirm stress analysis. Project Co and grooved manufacturer will ensure all stress, thermal, seismic and pressure expansion requirements are adhered to and will supply an annotated piping layout drawing complete with thermal movement calculations, anchor locations and force loads, and flexible coupling/ expansion joint locations, for review by the Owner. The grooved manufacturer will ensure all seismic requirements can be accommodated by the piping system(s) through implementation of the design data for seismic applications into the piping layout.

7.1.1.12.13.(c).6 Feature seismic, vibration attenuation and differential settlement accommodation properties that are validated by industry-

	recognized 3rd party tests (i.e. institutional or government testing facilities).
7.1.1.12.13.(c).7	The mechanical couplings, grooved end fittings, valves and accessories will be installed exclusively by installers who have completed a Grooved Manufacturer Certification Program within 24 months of the Effective Date, direct from a ISO certified grooved manufacturer who holds a IACET Accredited Provider accreditation in good standing and follows the ANSI/IACET Standard for Continuing Education and Training.
7.1.1.12.13.(c).8	100% of installed mechanical couplings will be inspected by the grooved manufacturer's inspection services representative. The trained representative will report any deficiency to Project Co, consultant and Owner's representative. All identified deficiencies will be resolved prior to commissioning, at Project Co cost. Manufacturer or Owner Rep/Engineer may request at their discretion any field grooved and installed joints be dissembled for verification of pipe groove dimensions.
7.1.1.12.13.(c).9	At the end of the project, confirmation and inspection reports are to be submitted indicating that 100% of couplings have been inspected and approved by an authorized inspector from grooved product manufacturer. All test information and data to be provided by Project Co and reviewed by the CxA.
7.1.1.12.13.(c).10	Project Co will adhere to the Inspection services specification by the manufacturer. Inspections must be by a factory trained inspector from an ISO certified grooved manufacturer who holds an IACET Accredited Provider accreditation in good standing and follows the ANSI/IACET Standard for Continuing Education and Training.
7.1.1.12.13.(c).11	The grooved manufacturer will provide a 25-year warranty, inclusive of parts and labour for all grooved mechanical connections.
7.1.1.12.13.(c).12	Project Co will ensure that the grooved manufacturer authorize the scope of the work to be covered by the warranty. The contractor will include a project specific draft version from

the Manufacturer of the final warranty document.

7.1.1.12.13.(c).13 Mechanical Plant/Energy Centre Design Conditions:

(c).13.1 If grooved mechanical joints are used for the mechanical plant, the design will meet the following: Grooved couplings, fittings, balancing, isolation, pressure reducing valves, control valves, check valves, Vibration Isolation Pump Drops (VIPD) and strainers will be the primary construction method for this warranted system. The grooved manufacturer Virtual Design & Construction group will produce a piping layout model in REVIT to level 350 and provide pad and equipment layout, hanger and supports, as well as isometric spool drawings to fabrication-level detail. Ensuring that all stress, seismic and thermal accommodations have been coordinated and meet local codes and standards. Provide the Owner the virtual model and fabrication spool maps, along with valve and accessory shop drawings.

7.1.1.12(13)(d) All fuel oil piping will be fully welded.

7.1.1.12(14) Cast iron valves are not acceptable for any application.

7.1.2 Pipes, ducts and fittings will be insulated as necessary to conserve energy, prevent condensation, attenuate noise and prevent accidental burns. All insulation will have coverings that are appropriate for the location and service involved. Provision of insulation will be in accordance with BCBC requirements and ASHRAE 90.1.

7.1.3 Coordinate all mechanical systems with the Equipment requirements and provide all required connections to mechanical systems to allow for a fully functioning system that meets the applicable codes, standards and Equipment manufacturer's requirements, refer to Appendix 2E [Equipment List] and Future Expansion as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]. Make allowances within the mechanical systems' designs so all Equipment can be removed or replaced without disrupting the operation of other Equipment connected to the mechanical systems. Coordinate with Appendix 2E [Equipment and Furniture] and Appendix 3A [Clinical Specifications and Functional Space Requirements] to ensure that all Equipment, rough in for Equipment and support systems have been provided. Project Co will include for procurement, design integration, storage, delivery to site, setting in place, making

mechanical service connections, providing mechanical service connections for future Equipment, installation, commissioning, etc. as indicated.

7.1.4 Provide required conduit tubing to protect bundled detergent/chemical dispensing lines associated with Equipment including instrument washers, cart washers, and chemical dispensing units used in Store-Lubricant Detergent and Store-Chemical in Central Food Production Component. Conduit tubing will house single or multiple detergent/chemical dispensing lines as necessary and will enclose the entire run of dispensing lines or as required by the equipment manufacturer.

7.1.5 Provide rough-in for all Equipment noted as future Equipment in Category F requiring mechanical services.

7.1.6 Size water, sanitary, storm and gas Utilities as required to suit the consumption and discharge need of the Facility, based on Schedule 3 requirements, plus an additional 20% spare capacity to allow for future flexibility.

7.1.7 The design of the roof drainage and rainwater leaders will account for the future climate change data. Capacity of design will be increased by an additional 20% above current VBBL requirements for future adaptation or meet the CD-1 (-) Bylaw requirements, whichever is greater.

7.1.8 Expansion space will be demonstrated within mechanical rooms for future installation of equipment. Valved connection points will be provided to connect future equipment to the associated systems.

7.1.9 Systems will be developed to provide reliability of uninterrupted continual operation. Redundancy will be included in Facility systems design to ensure uninterrupted service and maintain all spaces in accordance with CSA Z317.2 Table 1 parameters in the case of a source equipment or component failure while under normal operating conditions. Refer to Section 7.1.31.2(2) for specific air-handling redundancy requirements. Specialty areas such as laboratories and pharmacies will be designed in accordance with industry standards for these speciality areas. Where a conflict exists between any of the applicable standards, the most stringent applies. Redundancy and spare capacity will be demonstrated in real-time to the Owner after the Facility is commissioned and balanced.

7.1.10 All mechanical piping systems including heating, cooling, domestic water, sewer storm, plumbing vents, medical gas and natural gas will have 20% additional capacity, above the initial Facility requirements at Service Commencement, built into all main piping distribution systems sizing.

7.1.11 Provide isolation valves at the top and bottom of all risers.

7.1.12 Provide specialty systems as required by the Owner to meet functional requirements. Specialty systems may include acid waste and vent, grease waste and vent, solids waste and vent, contaminated waste and vent, radioactive waste and vent, RO water, laboratory air, laboratory vacuum, shop compressed air, utility compressed air, instrument compressed air oncology pharmaceutical preparations, natural gas, laser cooling water, and dialysate solutions. Refer to Appendix 3A [Clinical Specifications and Functional

Space Requirements], and the minimum requirements outlined in Appendix 3J [Sinks Matrix] and Appendix 3K [Medical gas matrix] for a list of required services.

7.1.13 Medical gas compressors and pumps will be located in a designated clean area of the mechanical room away from or physically separated from spaces that house Equipment such as boilers and chillers.

7.1.14 The domestic hot water and hot water recirculation systems will be designed to prevent the growth of Legionella

7.1.15 Provide premium efficiency motors for all mechanical equipment. Where motors are controlled by VFD, provide motors with shaft grounding measure, filters and/or reactors to meet the power quality requirements of Division 26. VFDs will control no more than one motor. On all VFD driven motors, safely dissipate common-mode electrical charge on the rotor and prevent electrically-induced bearing damage with shaft grounding, filters, insulating components, or other means demonstrated to be effective.

7.1.16 Where a single pump, or a pair of pumps in an N+1 arrangement for redundancy, would result in each pump having a motor exceeding 25HP, provide multiple pumps at 50% of design flow piped in parallel.

7.1.17 Mechanical services within Electrical, UPS and Communications Rooms will be limited to minor intrusions to allow mechanical cooling, ventilation and sprinklers where permitted. Mechanical services installed within Communications Rooms will maintain a minimum clear height of 3.0 m AFF. Any Equipment requiring a water connection, plumbing, drain pipes or hydronic distribution piping will not be installed through the ceiling space of Electrical or Communications Rooms.

7.1.18 Coordinate with all Electrical and Communications requirements for all mechanical systems that will maintain operation during planned or unexpected shutdown of the Facility's main electrical service. UPS power provided to mechanical equipment will originate from the central UPS system. Where mechanical equipment and devices are required to be served by emergency power, provide UPS, vital, or delayed vital power. Determine requirements for redundancy of power sources for maintenance purposes in consultation with the Owner.

7.1.19 Equipment, pipes, ducts and fittings will be insulated to BCICA and ASHRAE standards to conserve energy, prevent condensation, attenuate noise and prevent accidental burns. All services including those requiring insulation that are exposed on the exterior of the Facility are to be covered, painted and finished in a manner consistent with the façade and building envelope design. All services located at or below 3 m AFF in the Energy Centre and mechanical rooms, including tunnels will be painted and finished.

7.1.20 Equipment, pipes and ducts will be clearly labelled with information such as flow direction, temperature, pressure and or anything relevant to the fluid or gas moving in the service.

7.1.21 Integrate requirements for energy incentive programs into the mechanical systems. Apply for relevant Provincial and Federal incentives, including BC Hydro Power Smart and FortisBC incentives. Refer to Schedule 2, Appendix 2D [Energy] for details.

7.1.22 Coordinate all mechanical systems with requirements of all Equipment, and provide all connections required to mechanical systems. Provide dielectric isolation between pipes of dissimilar metals.

7.1.23 Make allowances within the mechanical systems' designs for all Equipment to be removed or replaced without disrupting the operation of other Equipment connected to the mechanical systems.

7.1.24 For spaces designated for Commercial Opportunity and Retail, as described in Section 5.10, design all mechanical systems so that the work required to modify the systems for the fit-out of these spaces will not disrupt the operation of the Facility's systems. Allow for mechanical infrastructure for each kiosk/vendor, including floor drains, grease interceptor, and 1" valved and capped domestic hot and cold water connections. Allow for mechanical infrastructure for each Coffee Shop/Café, including floor drains, grease interceptor, 1½" valved and capped domestic hot and cold water connections, and capped connections for ventilation including exhaust system for ovens. Provide hot water heating and chilled water capped connections at demising walls for future connection to the retail space. Natural gas service is not required for these areas. Project Co is not required to provide NFPA-96 compliant commercial kitchen exhaust as it will be provided and installed by the future tenants/licensed vendors. The Commercial and Retail Opportunity spaces will be located in proximity to the building exterior with consideration for placement of exhaust and make-up air louvers.

7.1.25 For rooms listed Appendix 3A [Clinical Specifications and Functional Space Requirements] that require a differential pressure monitor and/or rooms that require a specific differential pressure by the applicable standards including CSA Z317.2 and USP 797, Project Co will construct the rooms to be airtight. Construction features for Divisions 21, 22, 23 and 25 include gasketed sprinkler escutcheons and gaskets around diffusers, grilles and radiant panels (where applicable). Provide seals around medical gas outlets, headwalls, valve boxes, extinguisher cabinets, sensor junction boxes, fixture drains and water supply piping and other components that are recessed within walls and form part of the air seal. Seal ends of controls conduits that terminate within pressurized rooms. Refer to other Sections for sealing required by other Divisions.

7.1.25.1 When there are multiple options for room relative pressurization or room classification is unclear in CSA Z317.2 Table 1, Project Co will consult the Owner for input during design.

7.1.25.2 For all special precautions rooms as defined in CSA Z317.2 Table 1, consult with the Owner for input during HVAC design.

7.1.25.3 H1.3.2.4 Procedure Room-Respiratory Diagnostics will have negative relative pressurization as indicated in CSA 317.2, Table 1 reference 36.2.

7.1.25.4 The Decontamination Room will be negatively pressurized relative to adjacent spaces/rooms.

7.1.25.5 Bronchoscopy and Endoscopy Suites will be designed with the ability to operate with both positive and negative relative pressurization. Provide VAV boxes,

ductwork layout, and BMS sequences to enable the Owner to switch between positive and negative mode in the future without requiring any modification to mechanical infrastructure or BMS programming.

7.1.26 Provide adequate expansion compensation for piping systems that experience thermal expansion and contraction including heating water, steam, chilled water and domestic hot water. Locate anchors and guides, design expansion compensation loops and select expansion compensation devices based on a thorough review of piping layout and engineered piping stress analysis. Stress analysis will include equipment nozzle/connection point load evaluation.

7.1.27 Where unavoidable, all equipment located on the roof will be constructed to withstand the year 2050 wind loads. Refer to LMFM publication *Moving Towards Climate Resilient Health Facilities for Vancouver Coastal Health* and City publication *Climate Change Adaptation Strategy* for information on anticipated wind loads.

7.1.28 Refer to Section 3.7 for LEED requirements.

7.1.29 Facility Heating and Cooling Services

7.1.29.1 The Facility's heating and cooling services will be supplied from the Energy Centre.

7.1.29.2 Manual valves larger than 150 mm [6"] will be gear operated type.

7.1.29.3 Major equipment such as air handlers, chillers, cooling towers, hot water boilers, and steam boilers may be certified per ICC-ES AC156 - Seismic Certification by Shake-table Testing of Nonstructural Components or meet the requirements detailed in ANSI 1270 Requirements for Seismic Qualification of HVACR Equipment.

7.1.30 All computer based systems required to operate or monitor mechanical systems will be in accordance with vendor specifications and Section 7.7 Integrated Automation (Division 25).

7.1.30.1 All control panels which contain control equipment, whether packaged with equipment or provided by the controls contractor, will be fully waterproof with liquid-tight conduit connections and sealed wiring at entry to control panels. For sections of conduits above control panels with nearby wet piping, liquid-tight fittings are required. Set-screw type fittings are not permitted. NEMA 1 Top cover is acceptable in areas where VFDs are located in clean and dry areas with no overhead risk of water ingress. Drip trays located above control panels and components complete with a NEMA 3R enclosure with an O-ring sealed conduit feed may be acceptable to the Owner on a case-by-case basis.

7.1.31 Post-Disaster Design

7.1.31.1 Design all mechanical piping, ductwork, Equipment, and system seismic restraints in accordance with the requirements of post-disaster buildings, as outlined in

Section 5.2. The above noted requirements are in addition to the requirements of the VBBL and CD-1 (-) Bylaw.

7.1.31.2 In addition to Section 5.2 and the minimums of the referenced standards and regulations:

7.1.31.2(1) Equipment will have sufficient redundancy, structural integrity, and seismic protection to ensure the Facility remains operational in accordance with Section 5.2 Post-disaster and other sections of this Schedule.

7.1.31.2(2) Air-handling systems will be provided with sufficient redundancy at all times to ensure no disruptions in Facility operation. Type I spaces will maintain 100% redundancy. CSA Type II and Type III spaces will maintain 70% redundancy. The Emergency Operations Centre will be treated as a Type I space. Refer to CSA Z317.2 for space Type definitions.

7.1.31.2(3) The heating plant (hot water and steam) will have two (2) sources of energy; primary and secondary. Secondary fuel stored on Site will supply operation of the heating plant for a minimum of 72 hours.

7.1.31.2(4) The fuel storage system will also have sufficient capacity to supply fuel to the emergency generators (per Division 26) for a minimum period of 72 hours. If the heating plant and emergency generators use the same fuel, the supplies will be stored in separate tanks per applicable regulations, including CSA Z32.

7.1.31.2(5) Boilers and pumping equipment will have sufficient redundancy to ensure the Facility continues to be operational after an event in accordance with Section 5.2 Post-disaster and other sections of this Schedule.

7.1.31.3 Water Storage System Requirements

7.1.31.3(1) Provide a bottled water storage room of minimum 23.0 NSM to allow the Owner to store six (6) pallets containing bottled potable water to supply the Facility's Staff for a minimum period of 72 hours. Bottled water storage room will have a double door with clear opening width of approximately 1.80 m. The location of the room will be proximal to the Logistics Centre area.

7.1.31.3(2) The Owner will store bottled water with sufficient capacity to supply the Patients for a minimum period of 72 hours in room O3.30, Store-Emergency Supplies within Central Food Production.

7.1.31.3(3) Process water (rainwater harvesting to assist in meeting the City's rainwater management targets, as per the requirements of the Integrated Rainwater Management Plan) with sufficient capacity to supply the Facility's requirements for a minimum period of 72 hours. This includes all process loads and make-up water for heating and cooling systems and excludes landscaping irrigation systems.

7.1.31.3(4) Fire suppression water with sufficient capacity to supply the Facility's requirements for a major fire event, as required by the applicable NFPA standards.

7.1.31.3(5) The process water and fire suppression water storage systems can be interconnected, provided that backflow prevention devices are provided as required by applicable codes and standards and that the required minimum fire storage capacity is never compromised.

7.1.31.4 Provide a minimum sanitary storage capacity of 50,000gal (190,000L). Storage may consist of a single, or multiple, interconnected tanks piped in a manner that allows for the complete emptying of the tank or tanks from one (1) emergency pump out location directly adjacent to the layby designated for the sewage pump truck.

7.1.31.5 The tank(s) will have drain valves, and liquid level sensors that will initiate alarm conditions to a local alarm panel to the BMS at 50% full condition.

7.1.31.6 The storm water drainage system will be capable of handling flow from a 100-year storm event and or meet all requirements of the CD-1 (-) Bylaw, whichever is greater.

7.1.31.7 The medical gas systems will be capable of maintaining a sufficient supply of medical gases to meet the requirements of the Facility's post-disaster operational areas as specified in this Schedule. Where reserve for associated medical gases is strictly compressed gas bottle/cylinder-based reserve, provide a means to automatically switch over to this source, such that this source can be automatically used in lieu of primary sources, when in testing mode, in addition to manual PRV settings to engage this source when main pressure drops to set point of reserve source activation.

7.1.31.8 Provide the following emergency service connections on the exterior of the Facility:

7.1.31.8(1) Process Water System

7.1.31.8(1)(a) The inlet connection for the process water system will allow for supply of water to the process water tank from an external tanker truck. The water will be circulated from the tank via the process water

pumping system to feed the Facility system. The process water pumping system will be sized for an N +1 condition and will address partial and full load conditions. The water pumping systems will be connected to the Facility's emergency electrical system.

7.1.31.8(2) Domestic Water

7.1.31.8(2)(a) Provide a minimum 100 mm diameter Kamlock connection on the exterior of the Facility to allow for a water tanker to connect to the Facility services. The connection will be valved and capped and be provided in a locked, secure noncorrosive cabinet adjacent to the layby parking location for a water tanker. The domestic water inlet connection from the exterior will need to be connected to the domestic water booster pumps complete with appropriate valves and safety controls;

7.1.31.8(3) Sanitary Sewer Pump-Out

7.1.31.8(3)(a) Sanitary sewer pump-out connection will be provided from the sanitary storage tank system. If the design includes more than one tank, each of the tanks will be interconnected to allow for one pump out connection.

7.1.31.8(3)(b) The connection will be located directly adjacent to the layby designated for the sewage pump truck. The sanitary pump out connection will be located in a free-standing heavy duty, non-corrosive kiosk and will have permanent signage affixed to the kiosk to identify the service and function.

7.1.31.8(4) Medical Oxygen

7.1.31.8(4)(a) Provide a medical oxygen connection on the exterior of the Facility for supplying oxygen to the Facility from external bulk storage tanks or truck. The emergency oxygen inlet will be mounted in a Tamper Resistant and weatherproof, lockable recessed wall mounted enclosure complete with regulator valves in an area accessible to supply vehicles but not in the vicinity of the designated bulk oxygen site. The exterior of the enclosure door will be factory labelled to indicate emergency oxygen inlet. The interior of the enclosure will be clearly

labelled with instructions for the connection to and operation of the emergency oxygen inlet. The connection to the oxygen pipeline system will be downstream of the designated bulk oxygen site shut-off valve inside the Facility.

7.1.31.8(5) Decontamination Tank

7.1.31.8(5)(a) A pump-out connection will be provided from the decontamination storage tank.

7.1.31.8(6) Fuel Oil

7.1.31.8(6)(a) Provide separate fuel supply connections for boiler fuel and generator fuel.

7.1.31.9 Unless otherwise stated, all connections will be secure terminations which are valved, capped and locked such that they are Tamper Resistant and to protect from vandalism.

7.1.31.10 All external connections will be located in service areas away from general circulation routes, where readily accessible by individual service vehicles. The Design will take into account the size of the service vehicles while maintaining clear access for all vehicles.

7.1.31.11 Select all preliminary connections (size, fittings, pressure, etc.) in consultation with the Owner.

7.1.31.12 Emergency Disaster Response Area - Ambulance Garage

7.1.31.12(1) An Emergency Disaster Response Area will be established inside of the Ambulance Garage. To support activities that occur within the space, the following services are required:

7.1.31.12(1)(a) Medical Gases

7.1.31.12.1.(a).1 A total of sixteen (16) concealed Tamper Resistant headwalls each containing one (1) of the following services; medical air, oxygen, and vacuum outlets distributed inside the perimeter of the Ambulance Garage.

7.1.31.12(1)(b) Water Services

7.1.31.12.1.(b).1 A total of three (3) wall mounted tempered water shower assemblies are to be mounted within the Ambulance Garage to allow for wash-down of incoming Patients. Each of the shower assemblies will be housed in a stainless steel surface mounted enclosure with a shower head and shut-off valve.

7.1.31.12.1.(b).2 Two hose bibs, hoses, and tempered water hose reels will be mounted on the wall in the same location as the shower stations. Each hose reel will hold a 15 m hose with a fine spray nozzle attached.

7.1.31.12.1.(b).3 The shower assembly supplied by tempered water from the central mixing valve.

7.1.31.12.1.(b).4 The entire tempered water system will be totally drainable after each use.

7.1.31.12.1.(b).5 The tempered water system will be fed from a central thermostatic mixing valve located in a secure location within the Ambulance Garage.

7.1.31.12.1.(b).6 An electrically operated solenoid valve will be located upstream of the mixing valve with a mushroom style activation switch located near the shower location.

7.1.31.12.1.(b).7 The shower areas will be serviced by a continuous trench drain which will be separate from the Ambulance Garage drains but the discharge will connect upstream of the oil interceptor serving the Ambulance Garage.

7.1.31.12(2) Mechanical service connections (domestic hot water and domestic cold water) that support the emergency disaster response area will be mounted on the exterior face of the Facility adjacent to the Emergency Department/Ambulance Garage. Each of the two (2) services will be a 65 mm fire hydrant style outlet with an internal shut-off valve controlled from the exterior. Each service will have a bronze face plate that is appropriately labeled to identify the service and function.

7.1.31.12(3) Water services connection will be provided from the external 65 mm fire hydrant outlets on the face of the Facility using 65 mm fire hoses between the Facility and the emergency disaster response area. At the emergency disaster response area, a water manifold assembly will be required to allow for distribution of the hot and cold water. The water manifold will be a heavy-duty wheeled wagon that can be anchored into position, and will contain 65 mm hose connections, valves, PRV, and a manifold that will have 10 - 20 mm hose connections on each of the hot and cold manifolds. A 40 mm institutional grade thermostatic mixing valve, complete with thermometers connected to the hot and cold manifold to provide tempered water to shower stations will be provided. Provide a total of 10 – 20 mm hose connections to the tempered water manifold.

7.1.31.12(4) Provide local catch basins for surface water run-off. No additional waste water provisions are required.

7.1.32 Decontamination Room

7.1.32.1 The Decontamination room located adjacent to the Emergency Department will include following services:

7.1.32.1(1) Provide surface mounted shower assemblies containing a handheld shower and a pressure balanced mixing valve to provide individual temperature control to each shower. Provide trench drains to service each of the shower areas to ensure that water is contained within the area. All water from the shower trench drains will be directed to the decontamination water storage tank.

7.1.32.1(2) Provide additional floor drains in the general area of the Decontamination Room. Water from these drains will also be taken to the decontamination water storage tank

7.1.32.1(3) Provide two (2) emergency eyewash stations complete with mixing valves and drainage to the decontamination tank.

7.1.32.1(4) Provide a separate decontamination waste storage system to serve the Decontamination Room, with sufficient capacity to contain all flow from this area during a decontamination event.

7.1.32.1(5) Design the dedicated decontamination waste storage system as a sanitary system complete with p-traps, trap primer, and vents such that noxious fumes will not return into the Facility.

7.1.32.1(6) Install a bypass / diverter complete with full port plug valves that will permit waste to be diverted to the sanitary system.

7.1.32.1(7) Diverter valve(s) will be located to allow quick and easy access without having to remove Equipment or having to dig up the location to operate the valves.

7.1.32.1(8) Decontamination water storage tank will be minimum 45,000 L.

7.1.32.1(9) The decontamination tank will either be buried or concealed in an accessible location above ground; complete with ULC listings and equipped with inlet port(s), vent(s) and suction outlet port(s) for pumper truck connection to evacuate the system. Only the remote suction outlet port will be located on the Facility’s exterior. Tank design and access will comply with WorkSafe BC requirements for confined space entry.

7.1.32.1(10) The decontamination water storage tank will have drain valves, and liquid level sensors that will initiate alarm conditions to a local alarm panel to the BMS at 50% full condition.

7.2 Energy Centre

7.2.1 The Energy Centre will be sized to serve the initial Facility requirements with heating hot water, domestic hot water, steam, chilled water and electrical infrastructure as described in Sections 7.1 and 7.8. The Energy Centre will also house heat recovery chiller plant including pumps and associated equipment. All required equipment and space for NEU supply, as per the CD-1 (-) Bylaw and future rejection to the NEU, the Facility heat exchangers and other associated equipment, will be co-located and housed in the Energy Centre. Refer to Section 7.5 for more detailed information on systems housed within Energy Centre.

7.2.2 The Energy Centre structure, space and systems will facilitate the installation of future equipment, with installed tie ins complete with isolation valves and similar isolation accessories, without disruption to the ongoing operations of the Facility. All supporting services will be sized to accommodate the Energy Centre requirements including all planned future equipment as described in this Schedule. Supporting systems include incoming services, fuel piping, space heating, cooling and ventilation systems, interconnecting piping and control systems.

7.2.3 Hot water heating plant will be designed to meet the initial Facility requirements. Provide redundancy such that the plant capacity is continuously maintained with the largest boiler out of service and the largest heat recovery system or component out of service. Hydronic heating boiler plant peak capacity will be based on the Facility’s heating needs. Although the heating boiler plant will serve as a back-up to supply energy to the NEU in the future, the capacity will be sized only for the Facility peak heating conditions. Boiler plant will be sized with following allowances:

7.2.3.1 Catastrophic mode as described in Section 7.1; and

7.2.3.2 Boiler plant will be sized based on the assumption that 70% of the Facility’s BGSM, accounting for areas/floor plates with the highest air change rates, will be operating under catastrophic event management mode, while the remaining 30% of the Facility will be operating under normal mode.

7.2.4 Steam boiler plant will be designed to meet the initial Facility requirements. Provide redundancy such that the required plant capacity maintains the MDRD loads with one (1) boiler out of service. Steam Boiler plant will be sized in accordance with CSA Z317.2. The requirements for N+1 redundancy for MDRD steam load will be in accordance with the requirements described in Section 7.5.3.1. Provide space and stubbed connections for future steam to hot-water heat exchangers that will supplement, and be redundant to, the Facility's heating system supply to the NEU in future. Although the Facility's steam boiler plant will serve as a back-up, in addition to the heating boiler plant, to supply energy to the NEU in the future, its capacity will remain the same, i.e. sized only for the Facility's peak steam demand.

7.2.5 Primary chilled water cooling plant will be designed to meet the initial Facility requirements. Initial plant capacity will serve the year 2050 cooling requirements as described in Section 7.1. Provide redundancy such that the design load and required plant capacity is continuously maintained with one (1) chiller compressor module or cooling tower out of service as per CSA Z317.2. If utilizing large dual compressor chillers to meet plant redundancy requirement, each compressor must be provided with a VFD and disconnect. In addition, the dual compressor chiller must be provided with a means of bypassing the single touch screen controller in the event of a controller failure. Bypass device will be provided and configured by the manufacturer with appropriate training for FMO.

7.2.6 Chilled water cooling plant will be designed to meet the initial Facility requirements. Provide redundancy such that the plant capacity is continuously maintained with one (1) chiller module out of service.

7.2.7 Provide a below-grade fuel storage system with capacity to supply fuel to the emergency generators for a minimum period of seventy-two (72) hours with all emergency generators loaded to their nameplate prime kW rating. If the heating plant and emergency generators use the same fuel, the supplies will be stored in separate double-wall tanks designed in accordance with applicable regulations, including CSA Z32.

7.2.8 Each dedicated boiler or generator fuel storage system will be complete with a fuel polishing system to ensure the stored fuel remains clean and available for its intended use at any time.

7.2.8.1 Provide a fuel polishing system that meets SAE J1488 201010 filtration specifications. The system will include a minimum of 2-stages. The first stage will be coarse water fuel separator with a 30 micron pre-screen plus conditioning with a ULC or FM listed coalescent type filter. Second stage filtration will be 1 - 3 micron maximum that removes solids and emulsified water. The system will incorporate an interconnection to pump from tank to tank in a multiple tank systems. Provide stand-alone control system with BMS alarm output for filter blockage monitoring, and automatic programmable timer function for pump control.

7.2.8.1(1) Pump sizing will meet the following requirements:

7.2.8.1(1)(a) All tanks will be polished once a month. The polishing flowrate will be selected to achieve three (3) turnovers of each tank volume;

7.2.8.1(1)(b) Polishing flowrate will be selected to enable completion of a polishing sequence during FMO normal daytime operations M-F 7am - 3pm; and

7.2.8.1(1)(c) Pumping demands to be completely separate from generator fuel system supply pumps.

7.2.8.1(2) Provide fuel measurement and leak detection system for bulk fuel storage systems which will be monitored by the generator alarm system and displayed on the generator HMI monitor. Provide

HTTP webserver address and FMO network connection for online fuel level monitoring.

7.2.9 Boilers and pumping equipment will have sufficient redundancy to ensure the Facility continues to be operational in accordance with Section 5.2 Post-disaster and other sections of this Schedule.

7.2.10 Energy Centre design will accommodate seasonal part load demands to avoid frequent cycling of equipment or forced shutdown of equipment due to light loads.

7.2.11 If located in two (2) separate buildings, provide a concrete service trench between the Energy Centre and the Facility. This dedicated service trench will house services that will be routed to and from the Energy Centre and the Facility. Services will initially include steam, condensate, chilled water (supply and return), and heating hot water (supply and return), domestic hot, domestic cold, and domestic hot water recirculation, and fire suppression. Project Co will provide 20% spare capacity within the service trench for future services.

7.2.12 All service links will be constructed to meet post-disaster standards and will be seismically independent of any other structures.

7.2.13 Provide a central Control Room for the Energy Centre that allows observation through angled glazing for views of the steam plant. Where hydronic plant and chiller plants are not visible through viewing windows, provide dedicated screens in control room locations, as determined by the Owner, with IP Video Surveillance System camera views monitoring these plants. The Control Room will be elevated a minimum of 2.5 m AFF of the steam boiler plant and connected to a catwalk access for regular inspection of steam components not visible or accessible from a standing position at the floor level such as the steam header, safety valves, pressure gauges, sight glasses, etc. The Control Room will be fully ventilated and air conditioned, complying with standards for typical meeting room spaces in accordance with ASHRAE 55 Thermal Comfort Standard.

7.3 Fire Suppression (Division 21)

7.3.1 Fire Protection

7.3.1.1 Basic Requirements

7.3.1.1(1) Provide all required fire protection for the Facility.

7.3.1.1(2) Fire protection sprinkler and standpipe systems will be combined systems with 65 mm fire department hose connections for the standpipes located in exits in accordance with the VBBL and NFPA 14 Installation of Standpipe and Hose Systems. If required, additional hose connections will be provided to meet the area limitations as indicated by NFPA 14.

7.3.1.1(3) Installation of the sprinkler systems will be in accordance with the VBBL and NFPA 13 Installation of Sprinkler Systems.

7.3.1.1(4) 65 mm fire department hose connections will also be at the highest landing of stairways with stairway access to a roof or on roofs with a slope less than 4 in 12 where stairways do not access the roof.

7.3.1.1(5) The Facility will be divided into sprinkler zones that coincide with smoke control and fire alarm zones. Each sprinkler zone will be served by a zone control valve connected to the fire protection riser. Fire protection sprinkler zones containing Patient sleeping rooms will coincide with the Facility fire compartment floor areas as defined by NFPA 13 and VBBL. Sprinkler zones containing Patient sleeping rooms will comply with limitations of NFPA 13.

7.3.1.1(6) Provide seismic bracing for all fire protection systems in compliance with the VBBL and NFPA requirements.

7.3.1.1(7) The fire protection systems and Equipment will be designed to the occupancy classification that it protects.

7.3.1.1(8) The primary sources of water for fire protection systems will be fed from three different Municipal water services. Connections will have premise protection consisting of FM- or ULC-listed detector-type double check valve assemblies with approved listed OS&Y gate valves on both sides complete with Tamper Resistant switches.

7.3.1.1(9) The secondary (back-up) source of water for fire protection systems will be fed from an on-site, below-grade fire water storage tank. The water storage tank will be sized to comply with NFPA 13, 14, 22 requirements and all other applicable codes and standards. Tank capacity will allow for the maximum NFPA system demand water flow duration. Tank design and access will comply with WorkSafe BC requirements for confined space entry. The tank will be equipped with a pump-out connection at the building exterior to enable maintenance or repair. The tank will be equipped with ULC or FM listed low and high level sensors connected to the fire alarm panel as well as an ultrasonic level sensor connected to the BMS.

7.3.1.1(10) Incorporate redundancy in the installation of fire protection systems, as follows:

7.3.1.1(10)(a) For redundancy, provide two (2) separate sets of electric fire pump systems connected to three (3) separate incoming water mains. Each set of fire pumps will meet the system pressure/water flow demands of the entire Facility and the design will be based on the lowest incoming water pressure. Fire

pumps will be provided with a means of conducting a closed loop flow test and a flow test via hose streams in compliance with NFPA 25 Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems.

7.3.1.1(10)(b) Provide two (2) separate but adjacent fire pump rooms located above the fire water storage tank, each sized to accommodate one (1) set of fire pumps. Access to the fire pump rooms will be from the exterior for ease of access by the fire department. The three (3) incoming water mains will be interconnected such that if one (1) water supply is disrupted, the pump suction and storage tank water supply will be maintained. Valves associated with all fire pumps will be in the same area for ease of accessibility. Pump discharge piping will be looped to provide water supply to the sprinkler zone valves and combined standpipe/sprinkler risers serving 65 mm fire department connections and sprinkler floor control valves.

7.3.1.1(11) The fire pumps rooms will be free from storage, Equipment and penetrations not essential to the operation of the pump and related components in compliance with NFPA 20 Installation of Stationary Pumps for Fire Protection.

7.3.1.1(12) Each fire pump will be complete with a fire pump controller with integral transfer switch for emergency system power supply in compliance with CSA Z32. The fire pump assembly will be approved by UL, ULC, FM, CSA and comply with NFPA 20. Each fire pump will be complete with a pressure maintenance pump (jockey pump) and controller installed in compliance with NFPA 20.

7.3.1.1(13) Provide dry-type sprinkler heads and /or a dry-type sprinkler system in all areas that may be subject to freezing temperatures. Wet sprinkler piping serving dry-type sprinkler heads will run within heated spaces. Heat tracing of branch lines will not be permitted.

7.3.1.1(14) Provide a double interlocked pre-action sprinkler system complete with detection devices in critical sprinklered rooms where water damage will affect the operation of key areas/Equipment, including the following rooms:

7.3.1.1(14)(a) All medical imaging rooms and rooms with fixed medical imaging Equipment; refer to Appendix 2E [Equipment and Furniture];

7.3.1.1(14)(b) J4.4.1 Automated High-Volume Analyzer Area and J4.5.2 Automated High-Volume Analyzer Area-Small areas in J4 - Main Laboratories; and

7.3.1.1(14)(c) All Communications Rooms. In addition, each MER will also be equipped with a clean agent system.

7.3.1.1(15) All sprinkler system piping, hangers, sprinkler heads and accessories installed in MRI spaces and future MRI spaces will be non-ferrous. Sprinkler heads will be listed and approved for installation in MRI spaces.

7.3.1.1(16) Provide water curtain sprinklers or other fire protection measures necessary to maintain fire ratings at or near adjacent buildings, along paths of egress, and/or as required for any code equivalencies.

7.3.1.1(17) Provide pendant type, quick response concealed type and Ligature Resistant, Tamper Resistant sprinkler heads in spaces as described in Appendix 3N [Safety and Risk Reduction Matrix].

7.3.1.1(18) Concealed sprinkler heads within Operating Rooms, laboratories and cleanrooms will be provided with an air and dust seal as provided by the sprinkler head manufacturer for an acceptable sprinkler seal in clean areas.

7.3.1.1(19) Provide wire cage guards over sprinkler heads in Back of House areas. Wire cage guard will be required for sprinkler heads in all Communications Rooms.

7.3.1.1(20) Ligature Resistant Tamper Resistant sprinkler heads will be ULC Listed quick response Tyco “Raven” or an acceptable alternative as reviewed by the Owner. Institutional escutcheons will be of zinc or aluminum construction with zinc ring plate and Tamper Resistant screws.

7.3.1.1(21) Provide all fire extinguishers as required under NFPA 10 and any additional as required by the local Governmental Authorities. Fire extinguishers will be selected and installed based on the hazard classification of the space it serves.

7.3.1.1(22) Fire extinguishers in finished areas will be installed within fully recessed cabinets. Fire extinguisher cabinets in Mental Health Areas will have a lockable door without glass.

7.3.1.1(23) Provide fully recessed sprinkler zone control cabinets with shut-off valves, flow switches and flow switch test connections that are readily identifiable and accessible from the floor level. Zone control valves will not be located in ceiling spaces. Cabinets will have recessed hinges and latches.

7.3.1.1(24) Fire department connection(s) and location(s) will be approved by the Governmental Authorities. Type of hose inlet connections (threaded or Storz) will be as required by the fire department.

7.3.1.1(25) Provide the Owner with spare sprinkler heads of each type and a wrench suitable for each head type:

7.3.1.1(25)(a) 6 extra sprinkler heads for less than 300 sprinklers;

7.3.1.1(25)(b) 12 for 300 to 1000 sprinklers; and

7.3.1.1(25)(c) 24 for over 1000 sprinkler heads of each type.

7.3.1.1(26) Provide fire suppression systems for all commercial kitchen NFPA 96 range hoods. Each individual hood will be served by a separate system.

7.3.2 Performance Criteria:

7.3.2.1 All fire protection systems will be hydraulically sized to NFPA standards. Hydraulic calculations will include the applicable inside/outside hose stream allowance for the hazard served.

7.3.2.2 All fire protection Equipment will be ULC approved.

7.3.2.3 All fire protection Equipment installations will be in accordance with manufacturers' requirements, in compliance with all VBBL and applicable NFPA requirements.

7.3.2.4 Fire suppression system supply piping mains (i.e. 100 mm and larger) will be routed away from Clinical Spaces where a leak or a break could endanger vulnerable Patients, Equipment or supplies.

7.3.2.5 Fire suppression piping will not be run within or through Communications Rooms or Electrical Rooms except for fire suppression piping required to service these rooms.

7.3.2.6 Project Co installer will be licensed and regularly engaged in the installations of fire protection systems and will install, test, commission and certify all fire protection systems and Equipment. Commissioning will include the kitchen exhaust hoods fire suppression systems.

7.4 Plumbing (Division 22)

7.4.1 Connections to Site Services

7.4.1.1 Basic Requirements

7.4.1.1(1) Provide municipal water service for domestic water use and fire protection. Additionally, provide natural gas, sanitary, and storm services as required to meet the usage needs of the Facility, plus 20% additional capacity in each service for future allowance. Coordinate locations of these services with the Owner and the municipal service providers.

7.4.1.1(2) Water supply to the Facility will be provided by three separated and isolatable Municipal water services for full redundancy to the Facility. Each water supply will be complete with pairs of 100% redundant premise isolation backflow prevention stations. Each water supply will combine into a common main within the Facility, complete with isolation valve, upstream of required PRV station and domestic water booster pumps. Each water service will be capable of supplying the domestic and fire service demands plus an additional future demand of 20%. Each service will connect to isolatable City sources located on different streets adjacent to the Site, with the connection points a minimum of 50 m apart. Refer to Section 7.3 for fire protection water service requirements.

7.4.1.1(3) Provide storm, sanitary, water, natural gas and medical gas inlet connections from the exterior of the Facility as described in Section 5.2.4 and Section 7.1.

7.4.1.1(4) Natural Gas services will be delivered to the Site by the local gas service provider. Project Co will be responsible for providing all on-site civil, architectural and ancillary infrastructure required by natural gas supplier to accommodate the service connection. All infrastructure and equipment for the incoming service will be in conformance with the requirements of Natural gas supplier. Steam and hydronic heating boiler pilot lights will be on firm supply or have a standby bottle gas supply. Coordinate the location of the gas service on-site and ensure that protected gas meter locations are established complete with all necessary architectural screens, access to the meter and proper service clearances in accordance with CSA B149.1, NFPA requirements and the local natural gas service provider. Piping from the meter location to the Facility will include all necessary flexibility and seismic requirements.

7.4.1.1(5) The natural gas system design within the Facility will be distributed to the following major users:

7.4.1.1(5)(a) Heating Plant/ Energy Centre;

7.4.1.1.5.(a).1 Provide interruptible natural gas supply.

7.4.1.1(5)(b) Component O3 - Central Food Production;

7.4.1.1.5.(b).1 Provide firm natural gas supply.

7.4.1.1(5)(c) Laboratories in Component J - Clinical Support Services;

7.4.1.1.5.(c).1 Provide a 1" firm natural gas supply to the Labs. Location and quantity of outlets to be determined during design in consultation with Owner.

7.4.1.1(6) Provide medical oxygen services from the designated bulk oxygen site to the Facility. Coordinate with Owner's medical gas supplier all potential gas tank and services and all work such as enclosure, seismic concrete base pad, connection point, routing, and tie in locations. Provide flexible connection(s) between the Facility and the designated bulk oxygen site. In addition, provide medical oxygen manifolded reserve system sized to meet the following requirements:

7.4.1.1(6)(a) The oxygen reserve manifold system will be sized to provide 20,000 cubic feet of reserve capacity with interchangeable duty/stand sources.

7.4.1.1(7) Provide on-site rainwater harvesting. All water discharged from this system within the Facility will be designated as “Process water”.

7.4.1.1(8) Provide flexible pipe connection on all water, sewer and medical gas services at the exterior face of the Facility. Flexible connectors will be specifically designed to withstand seismic activity and will have the ability to accommodate both vertical and horizontal seismic movement.

7.4.2 Sub Surface Drainage

7.4.2.1 Project Co will retain a Geotechnical Engineer to determine the extent and scope of ground water subsurface drainage. The design and supporting Geotechnical Report will be reviewed by the Owner.

7.4.2.2 The groundwater subsurface drainage requirements will be confirmed in consultation with the Geotechnical Engineer and Structural Engineer-of-Record. Provide ground water protection under slab, as required to prevent groundwater ingress into the Facility.

7.4.2.3 All work will be in accordance with the recommendations of the Geotechnical Engineer’s report.

7.4.2.4 All exterior drainage will be required to be collected into a sediment sump chamber and pump chamber, sized to accommodate the maximum design flow rate and delivering discharge to the storm-water system.

7.4.2.5 All interior drainage for underground parking will be incorporated into a drain / sediment collection system and pump chamber that is fully integrated into the structural system. No plumbing penetrations of the structure will be permitted in the lowest level of underground parking. All waste pumped from the lowest level of underground parking will be pumped up to a gravity drain line.

7.4.2.6 All elements of the drainage system are to be coordinated with the structural design.

7.4.2.7 For minimum site metering requirements, refer to Appendix 3Q [Metering Matrix].

7.4.3 Performance Criteria

7.4.3.1(1) Municipal water services provided to the Facility will meet the water quality requirements outlined in CSA Z317.1 and the British Columbia Drinking Water Protection Regulation.

7.4.3.1(2) Installation of the new water service will meet the requirements of NFPA 13 and 14 for all fire services supply mains.

7.4.3.1(3) Installation will provide redundancy to maintain uninterrupted Facility operation while cleaning, repairing, or replacing devices.

7.4.3.1(4) Domestic water pressure serving the Facility will be as provided by the City and Metro Vancouver water system and should be considered constant under all normal operating and seasonal conditions.

7.4.3.1(5) If domestic water system pressure exceeds the acceptable delivery pressure noted in the VBBL of 80 PSI, then PRVs will be provided with 100% redundancy.

7.4.3.1(6) Locate the PRV stations in an accessible location within the mechanical rooms.

7.4.3.1(7) All service piping within the Facility will be accessible. No service piping inside or outside the Facility will run in or under any concrete slabs.

7.4.4 Plumbing Distribution Systems

7.4.4.1 Basic Requirements

7.4.4.1(1) Design the plumbing distribution systems to avoid disruption to the operation of the Facility during maintenance or repairs. Locate all isolation, balancing, and other service valves in the corridor ceiling spaces, such that they are accessible in accordance with the requirements of Section 7.1 or locate valves behind lockable security access panels outside the rooms and ensure they are accessible to Staff.

7.4.4.1(2) Provide isolation valves for all plumbing services and fixtures and clearly identify the location of all valves on site and on the Record drawings.

7.4.4.1(3) At a minimum, provide valves at the following locations:

- 7.4.4.1(3)(a) at each set of piping branches from the main distribution line;
- 7.4.4.1(3)(b) at all locations where the branches serve groups of rooms with similar uses;
- 7.4.4.1(3)(c) to each Patient washroom group on branches serving individual speciality equipment and fixtures;
- 7.4.4.1(3)(d) on all branch lines to hose bibs; and
- 7.4.4.1(3)(e) other locations as required for maintenance or emergency shut-off.

7.4.4.1(4) For Patient washrooms, provide shut-offs valves on water supply lines serving a maximum of four (4) grouped washrooms. For Patient ensuite washrooms which are back to back, provide shut-off valves for a maximum of two (2) grouped washrooms. The shut-off valve for grouped fixtures will be on the same floor level as the fixtures in an accessible location, either in the ceiling space above a corridor or in a fully recessed, locked access panel located at 1.5 m AFF in the corridor.

7.4.4.1(5) In addition to shut-off valves for grouped fixtures, each fixture will be supplied with a local shut-off valve at the fixture.

7.4.4.1(6) In Mental Health Areas, including Secure Rooms, provide a master solenoid shut-off valve on each of the hot and cold water services to each washroom and where Patients will be contained. The solenoid valve(s) will be located at the Care Team Station. Each electrical solenoid valve will be connected and controlled from an electronic control panel located at the Care Team Station and will be monitored and controlled from the BMS. The Care Team Station control panel will have the ability to shut down and reset each of the valves. Each solenoid valve will have a manual shut-off valve installed up stream of the electrical valve for maintenance purposes. The individual isolation valves for each critical room, such as Patient accessible washroom/shower rooms, tub/shower rooms, Utility-Personal Laundry rooms, Secure Rooms, and similar spaces in Mental Health Areas, will be located within the public area in a fully recessed, locked access panel located at 1.5 m AFF.

7.4.4.1(6)(a) Provide maximum 35 degree C tempered water at the point of use for washrooms with urine pass throughs as identified in Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.4.4.1(7) Each access panel will require a key lock system for access.

7.4.4.1(8) The Facility main water supply system will be designed such that each 92,903 m^2 (1,000,000 ft^2) floor area is served by a separate domestic water service. Each domestic water service from the City will operate as a stand-alone system There will be no dead-legs in any service mains or branch lines.

7.4.4.1(9) Cross-connect all three new incoming water service mains within the Facility to allow for seamless Facility operation from any water service and meet redundancy requirements as set out in this Schedule.

7.4.4.1(10) All backflow preventers will be installed and located in CSA Type III areas where maintenance and testing of the devices can be properly and easily addressed.

7.4.4.1(11) Drainage for all backflow preventers will be provided in the immediate vicinity of the backflow prevention stations and will be sized to manage flow rates from the backflow preventers in full operational mode.

7.4.4.1(12) In locations throughout the Facility where backflow preventers are required to serve Equipment in finished areas, the entire assembly will be installed in a locked stainless steel cabinet with a solid door. The cabinet will have a drain connection adequately sized to accommodate the discharge from the backflow preventer relief ports. All downstream drainage piping will be sized to accommodate the relief port flow. Back flow preventer assemblies will not be installed in sterile or CSA Type I areas.

7.4.4.1(13) Distribute domestic water and recirculation systems by means of risers to each floor area to a maximum of 33% of the total floor area with a minimum of three (3) risers per floor plate for non-podium floor plates and sub-grade Components and by means of risers to each floor area to a maximum of 18% of the total floor area with minimum of six (6) risers per floor plate for podium floor plates. Provide isolation valves to limit on-floor areas served by each zone valve from the riser to a maximum of 18% of the total floor area in each zone. Provide isolation valves in the riser up and downstream of all branch lines serving floor zones. Each of the vertical domestic water risers will be interconnected at the top and bottom of the risers with 32 mm diameter connections

complete with isolation valves in serviceable locations as set out in Section 7.1. All RO systems, MDRD, Central Food Production, Laboratory, steam boilers and cooling towers will be fed from two (2) risers to provide the required level of redundancy. Domestic water/RO system serving the MDRD area will have, in addition to the above requirements, a looped system.

7.4.4.1(14) Provide utility meters for domestic water and natural gas services to the Facility. The location of the water and gas meters will be coordinated with the appropriate Utility provider. Each meter will have the ability to connect to the Facility BMS and will have remote readers compatible with the City water meter program.

7.4.4.1(15) Provide a self-cleaning strainer, turbine style water meter with remote readers, meeting City requirements with connection to the Facility BMS including:

7.4.4.1(15)(a) a minimum of two (2) reduced pressure backflow preventers,

7.4.4.1(15)(b) a minimum of two (2) 25 micron self-cleaning filtration units; and

7.4.4.1(15)(c) two (2) sets of high/low flow PRVs. Where domestic water system pressure exceeds the acceptable delivery pressure noted in the VBBL of 80 psi; supply independent shut-off valves on each of the domestic water supplies to the Facility.

7.4.4.1(16) The incoming water stations will incorporate 100% redundancy to maintain uninterrupted Facility operation while cleaning, repairing, or replacing devices including PRVs within the water station.

7.4.4.1(17) Place the valves stations in accessible locations within the mechanical rooms with provisions for adequate drainage of all components in the immediate vicinity of the stations.

7.4.4.1(18) PRV's dedicated to specific Equipment throughout the Facility may be mounted beside Equipment served and do not require redundancy unless the specific piece of Equipment is essential as determined by the Owner. Make-up water to cooling towers and RO systems are essential and require redundant PRV's. PRVs in finished spaces will be provided in fully recessed lockable boxes.

7.4.4.1(19) Provide a domestic water booster pump system, in an N+1 configuration, to serve the Facility, if the lowest expected Municipal service pressure is insufficient to meet the worst-case pressure requirements.

7.4.4.1(20) Provide the domestic water booster pumping system per the requirements of CSA Z317.1. Base the design on the lowest incoming pressure of the three water mains during peak summer operation. The number and arrangement of pumps will be such that peak demand will be met in the event of failure of any one pump. The number of pumps in the pump package will address both high and low flow conditions and the associated issues related to variable speed capabilities. If all conditions cannot be met, then additional pumps will be added to the package.

7.4.4.1(21) Pumps will be connected to emergency power as described in Section 7.8 and provide minimum pressure requirements on the highest floor level. Include the domestic water pumping system in the emergency generator calculations. The system will provide uninterrupted water service and constant pressure under all conditions including during the post-disaster period.

7.4.4.1(22) The domestic water booster pump system serving the Facility will be capable of operating during post-disaster conditions. Supply will be from a tanker truck only, with gravity feed. The booster pump package unit operating in post-disaster conditions will be capable of supplying a maximum flow rate of 10% of the Facility normal demand with 100% of the required pressure. The booster pump package unit will be connected to delayed vital power and will connect to the main water distribution system downstream of the Facility's main domestic water pump system. Refer to Section 5.2 and Section 7.1.31 for post-disaster requirements.

7.4.4.1(23) Domestic water service to point-of-use filtration such as water/ice dispenser units will utilize filters with 5 micron charcoal cartridges and will be designed with bypasses to allow for filter replacement without affecting water flow to Equipment.

7.4.4.1(24) For specialized Equipment such as scope washers requiring finer level of filtration, review all filtration requirements with final Equipment selection in Appendix 2E [Equipment and Furniture], and provide a redundant external filter that is equal to or better than the onboard equipment filter. In addition, provide 5 micron pre-filters upstream of specialized Equipment's external filter. Pre-filters and final filters will have pressure gauges on both sides and bypasses to allow for filter replacement without affecting water flow to Equipment.

7.4.4.1(24)(a) Provide three (3) sets of 0.2 micron filter assemblies, each with quick connect fittings, mounted in an accessible location to serve Heater-Cooler Equipment in Soiled Utility Perfusion rooms and other areas as indicated in Appendix 2E

[Equipment and Furniture]. Provide upstream and downstream pressure gauges, bypasses, and isolation valves to enable monitoring and maintenance.

7.4.4.1(25) Filter housings will be:

7.4.4.1(25)(a) transparent styrene acrylonitrile or similar meeting NSF 42; and

7.4.4.1(25)(b) have pressure gauges before and after filters.

7.4.4.1(26) The plumbing system designs will incorporate flexibility to accommodate future alterations and allow for expansion capacity in the systems.

7.4.4.1(27) All systems will be clearly labeled, and colour coded in accordance with industry standards including painting and labelling of all pipes, ceiling identification dots, valve tagging, flow directions and emergency valve identification signage.

7.4.4.1(28) Provide water systems within the Facility which supply water at the required pressures for optimal fixture operation to all water outlets. Minimum water pressure will be maintained at 35 PSI to the most remote fixture and will be demonstrated during Commissioning.

7.4.4.1(29) Durable piping materials will allow for 24 hour a day operation with minimal downtime and ensure an operational life of at least 30 years. Copper used in domestic water piping application will be Type K. Unless otherwise required by this Schedule, provide pipe materials in accordance with the VBBL for above ground potable and non-potable water distribution systems.

7.4.4.1(30) Provide flushing and disinfection of domestic water systems in accordance *with LMFM Flushing and Sanitation of Potable Water Systems.* Provide independent testing of piping systems once flushing and cleaning has been completed and provide documentation of testing to the CxA.

7.4.4.1(31) Provide appropriately sized domestic water supply connections for equipment and fixtures throughout the Facility. All branch lines to fixtures and the supply lines to individual fixtures will be in accordance with BC Plumbing Code.

7.4.4.1(32) Where PEX-style piping is used, the following minimum requirements will apply:

7.4.4.1(32)(a) Piping is to be high density cross-linked polyethylene (PEX-a), conforming to NSF P171-CL-R, ASTM F876, ASTM 877, ASTM F1960 and CSA B137.5;

7.4.4.1(32)(b) All PEX tubing fittings and fitting assemblies will be by one manufacturer;

7.4.4.1(32)(c) Pipe will be rated for continuous operation of 690 kPa @ 82° C (100 psi @ 180° F), and 550 kPa @ 93° C (80 psi @ 200° F);

7.4.4.1(32)(d) CAN/ULC S102.2 listed for flame spread and smoke developed rating of 25/50;

7.4.4.1(32)(e) CAN/ULC S115 Standard Method of Fire Tests of Firestop systems;

7.4.4.1(32)(f) PEX pipe to have a UV protective coating of UV resistant material;

7.4.4.1(32)(g) Manufacturer's warranty will be twenty five (25) years on pipe and fittings;

7.4.4.1(32)(h) Fittings will be in accordance with ASTM F877, ASTM F1960 and CSA B137.5 and approved by the manufacturer's PEX piping system, with applicable plumbing and mechanical code certifications;

7.4.4.1(32)(i) PEX joints will comply with ASTM F1960 Cold Expansion Fittings with PEX Reinforcing Rings for Use with Crosslinked Polyethylene (PEX) Tubing and as approved by the manufacturer of the PEX piping system; and

7.4.4.1(32)(j) The style of pipe and fittings will maintain a consistent cross-sectional area of the pipe.

7.4.4.1(33) PEX piping will only be accepted for plumbing branch lines to fixtures that are located within the wall systems.

7.4.4.1(34) Provide all accessories required for connection to fixtures and Equipment suitable for the intended use, in accordance with applicable standards, and manufacturer's requirements for any connected Equipment. This includes shut-off valves, point-of-use micron filtration, PRVs, thermostatic mixing valves and backflow preventers.

7.4.4.1(35) Provide plumbing connections to all Equipment. Refer to Appendix 2E [Equipment and Furniture] and Appendix 3F [Food Services Equipment List].

7.4.4.1(36) Design plumbing systems to accommodate the requirements of commercial spaces. Make allowance within the Facility systems described in Section 7.1.24 for any future plumbing systems required for the Commercial Opportunity and Retail Spaces.

7.4.4.1(37) Ensure the domestic cold water and domestic hot water quality complies with the applicable codes, standards, and manufacturer's recommendations for all Equipment.

7.4.4.1(38) Plumbing system design, fixtures and values will comply with requirements of CSA-Z8000, CSA Z317.1, and the VBBL.

7.4.4.1(39) All piping, fittings, valves, and accessories that come in contact with domestic water will be NSF 61 and NSF 372 certified.

7.4.4.2 Performance Criteria

7.4.4.2(1) Water supply systems will convey water to the Facility which meets the water quality requirements of all applicable standards and laws, including CSA-A317.1 and the Drinking Water Protection Regulation (British Columbia). Provide water filter systems which are designed to operate at high turbidity levels.

7.4.4.2(2) Provide isolation valves for all plumbing services and clearly identify the location of all valves.

7.4.4.2(3) Valves will be located at a minimum, at each set of piping branches from the main distribution line, and at all locations where the branches serve a group of rooms as described in Section 7.4.4.1(4).

7.4.4.2(4) Isolation valves for piping 50 mm and smaller will be ball valves with solid bronze body and chrome plated bronze ball with lever handles.

7.4.4.2(5) All isolation valves 100 mm and larger will be of a butterfly style with gear operators.

7.4.4.2(6) Ensure that the design of the incoming domestic water station provides for adequate drainage systems designed to accommodate both the maintenance and operational flow rates from the strainer discharge and the backflow preventers in full operational mode.

7.4.4.3 RO Water Systems – Non-Dialysis

7.4.4.3(1) Provide separate and individual central RO filtered water systems. All RO water systems will be chemically disinfected prior to Service Commencement., RO water systems will be used in following non-dialysis areas of the Facility:

7.4.4.3(1)(a) Laboratory – serving laboratory Equipment and two (2) faucet stations;

7.4.4.3(1)(b) MDRD – serving MDRD cleaning systems. Feed water quality will comply with CSA Z317.2 and all manufacturer requirements; and

7.4.4.3(1)(c) Energy Centre – feed water for clean steam boilers serving sterilizers and humidification throughout the Facility. Clean steam feed water quality and steam condensate quality will meet or exceed CSA Z314-18 Canadian Medical Device Reprocessing standard.

7.4.4.3(2) Each system will be sized for the current system demands plus an additional 20% future demand.

7.4.4.3(3) Each system will be complete with redundant components that will allow for the systems to maintain full capacity during all maintenance, cleaning and disinfection.

7.4.4.3(4) Each system will be separate and not interconnected to any other system.

7.4.4.3(5) Install distribution piping in accessible locations to allow replacement with minimal disruption of Patient Care Areas.

7.4.4.3(6) All piping for the entire system will be type 316 L stainless steel with orbital welded joints.

7.4.4.3(7) All welding of the stainless steel piping will include for pickling and passivation after the welding process.

7.4.4.3(8) Stainless steel piping installation will make allowances for expansion and contraction of the piping system when the piping is subjected to a maximum disinfection cycle temperature of 90 ºC. The RO water generation packaged system/skid and the associated RO water distribution systems (SDS), including as a minimum tanks, pumps and piping loop, require supply with packaged automatic electrical heat disinfection systems. In addition, both the skid and the distribution systems require a means of conducting chemical disinfection.

7.4.4.3(9) Each system will include the following minimum components:

7.4.4.3(9)(a) Backflow prevention;

7.4.4.3(9)(b) Tempered water supply;

7.4.4.3(9)(c) Particulate filtration;

7.4.4.3(9)(d) Dechlorination system;

7.4.4.3(9)(e) Pumps;

7.4.4.3(9)(f) UV Sterilizers;

7.4.4.3(9)(g) Bacterial Traps;

7.4.4.3(9)(h) Storage tanks;

7.4.4.3(9)(i) De-ionation filter beds;

7.4.4.3(9)(j) RO filtration; and

7.4.4.3(9)(k) All necessary valves and fittings.

7.4.4.3(10) Base-building drainage will be required to be provided to meet all the drainage needs of the entire RO water assembly.

7.4.4.3(11) All drain piping systems will be of the appropriate material for the quality of water discharged and will be sized to handle the maximum flow that would be anticipated from the system.

7.4.4.4 RO Water Systems – Renal Dialysis

7.4.4.4(1) Provide chemically disinfected RO water systems, including distribution systems (SDS's) that will be chemically disinfected prior to Service Commencement, from Owner’s approved vendor list refer to Appendix 3S [Acceptable Manufacturers and Vendors List].

7.4.4.4(1)(a) RO water systems, except distributed piping, will be located in mechanical spaces accessed through Back of House circulation and out of Clinical Spaces to avoid interruption to clinical work flow.

7.4.4.4(2) Provide a separate central RO filtered water system for use in locations as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and in the following locations, at minimum:

7.4.4.4(2)(a) Renal Outpatients;

7.4.4.4.2.(a).1 Provide a complete system with RO plant, storage and mixing tanks, recirculation

system, non-corrosive drainage and purpose-built dialysis wall boxes including two (2) connections and all other associated items required. Provide flushing connections on all non-corrosive drains in Renal Hemodialysis as per 7.4.4.13.4.(n).2.

7.4.4.4(2)(b) Critical Care Complex;

7.4.4.4.2.(b).1 Provide a complete system with RO Plant, storage and mixing tanks, recirculation system, non-corrosive drainage, purpose-built dialysis wall boxes and all other ancillary equipment required. Provide additional capacity for Future Expansion as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.4.4.4(2)(c) Anesthetic Care Unit (ACU)

7.4.4.4.2.(c).1 Provide a complete piping system as an extension to one of the dedicated dialysis RO systems. The extension to this area will be a separate loop serving the locations as described in Appendix 3A [Clinical Specifications and Functional Space Requirements] and will loop back to one of the dedicated dialysis RO plants.

7.4.4.4(2)(d) Inpatient Care (IPU)

7.4.4.4.2.(d).1 Provide a complete system with RO Plant, storage and mixing tanks, recirculation system, non-corrosive drainage, purpose-built dialysis wall boxes and all other miscellaneous items required.

7.4.4.4.2.(d).2 The wall boxes for the IPU area will be connected to RO water and to a non-corrosive drainage system, similar to the boxes in the Renal Outpatient area.

7.4.4.4(2)(e) Emergency Department

7.4.4.4.2.(e).1 Service to the Emergency Department for renal Equipment will be provided with portable renal dialysis machines and domestic water supplied wall boxes that are similar to the renal dialysis RO wall boxes. Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for the number of rooms that require service. Refer to and coordinate with Appendix 2E [Equipment

and Furniture] regarding portable Equipment requirements.

7.4.4.4.2.(e).2 Each wall box will require two (2) domestic water connections and a non-corrosive drain connection similar to the boxes in the Renal Hemodialysis and Peritoneal Dialysis. Provide backflow prevention on domestic water connections to meet City requirements.

7.4.4.4(2)(f) Maternity and Newborn Care Department

7.4.4.4.2.(f).1 Service to the Maternity and Newborn Care Department for renal Equipment will be provided with portable renal dialysis machines and domestic water supplied wall boxes that are similar to the renal dialysis RO wall boxes. There is only one room in Maternity department which will require a domestic water/drain box for mobile RO. The room type will be selected in detailed design. Refer to and coordinate with Appendix 2E [Equipment and Furniture] regarding portable Equipment requirements.

7.4.4.4.2.(f).2 Each wall box will require two (2) domestic water connections and a non-corrosive drain connection similar to the boxes in the Renal Hemodialysis and Peritoneal Dialysis. Provide backflow prevention on domestic water connections to meet City requirements.

7.4.4.4(3) Each of the systems will be sized for the current system demand plus an additional 20% future capacity.

7.4.4.4(4) Each renal dialysis system will be a complete package unit supplied from one (1) manufacturer to meet the current standard of ISO /FDIS 13959 and be capable of providing ultrapure dialysis continuously circulated throughout the distribution loop(s).

7.4.4.4(5) Each system will be complete with redundant components that will allow for the systems to be maintained at full capacity during all stages of maintenance cleaning and disinfection. This requirement does not apply to RO piping loops, which are addressed in Section 7.4.4.4(10).

7.4.4.4(6) Install distribution piping in accessible locations to allow replacement with minimal disruption of Patient Care Areas.

7.4.4.4(7) All piping for the entire system will be type 316 L stainless steel with orbital welded joints.

7.4.4.4(8) All welding of the stainless steel piping will include for pickling and passivation after the welding process.

7.4.4.4(9) Stainless steel piping installation will make allowances for expansion and contraction of the piping system when the piping is subjected to a maximum disinfection cycle of 90 ºC. The RO water generation packaged system/skid and the associated RO water distribution systems (SDS), including as a minimum, tanks, pumps and piping loop, require supply with packaged automatic electrical heat disinfection systems. In addition, both the skid and the distribution systems require a means of conducting chemical disinfection.

7.4.4.4(10) Each of the renal dialysis systems will be separated into several loops with a maximum of twenty (20) RO stations or boxes per loop. Loop design will align with rooms, bays, pods and other groupings of RO boxes as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]. No RO loop will serve more than one (1) Component. RO system design will be finalized in consultation with the Owner.

7.4.4.4(11) All loops will return to a central mixing / storage tank or tanks at the central production plant(s). Provide a shutoff valve with threaded hose connection on each tank to allow for emergency cross connection if necessary. At minimum, a single tank will be provided for each of the following areas: Inpatient Unit, Critical Care Unit, Anesthetic Care Unit, Renal Peritoneal Dialysis, and other areas as described in Appendix 3A [Clinical Specifications and Functional Space Requirements]. At minimum, two tanks will be provided for Renal Hemodialysis.

7.4.4.4(12) Each Patient station will include a recessed type 316 stainless steel wall box sized to contain the following components:

7.4.4.4(12)(a) Two stainless steel – type 316 piping inlets with stainless steel type 316 diaphragm valves and Swagelok style quick connections; and

7.4.4.4(12)(b) Two stainless steel – type 316 piping discharge quick connection through an air gap to non-corrosive piping standpipe firmly connected to the wall box.

7.4.4.4(13) Each standpipe and associated p-trap will have an electronic solenoid style trap primer assembly to maintain the trap seal.

7.4.4.4(14) Each wall box will have a removable stainless steel door.

7.4.4.4(15) Each system will include the following minimum components:

7.4.4.4(15)(a) Backflow prevention tempered water supply;

7.4.4.4(15)(b) Particulate filtration;

7.4.4.4(15)(c) Dechlorinating system;

7.4.4.4(15)(d) Pumps;

7.4.4.4(15)(e) UV Sterilizers;

7.4.4.4(15)(f) Bacterial Traps;

7.4.4.4(15)(g) Storage tanks;

7.4.4.4(15)(h) De-ionation filter beds;

7.4.4.4(15)(i) RO filtration; and

7.4.4.4(15)(j) All necessary valves and fittings.

7.4.4.4(16) Base-building drainage will meet all the drainage needs of the entire RO water packaged assembly.

7.4.4.4(17) All drains will be appropriate for the quality of water discharged and will be sized to handle the maximum flow that would be anticipated from the system.

7.4.4.4(18) Provisions for the use of emergency portable RO machines:

7.4.4.4(18)(a) Provide domestic water wall boxes on a per loop basis to enable the use of portable RO units during failure or maintenance of RO systems. At a minimum, provide domestic water wall boxes in the following locations and quantities: five (5) boxes per RO loop in Renal Hemodialysis and Peritoneal Dialysis, and one (1) box per RO loop in the Critical Care Unit and Anesthetic Care Unit. The total quantity of domestic water wall boxes required is dependent on the proposed RO loop system. Location of emergency-use domestic water wall boxes will be determined in consultation with the Owner. The intent is to distribute these boxes throughout the impacted Components with one (1) box per room, bay, pod or grouping of RO wall boxes to align RO loop distribution per Section 7.4.4.4(10). RO loop layout will align with the physical distribution of RO boxes described in Appendix 3A [Clinical Specifications and Functional Space Requirements] (i.e. rooms, bays, pods and other groupings). Refer to and coordinate with

Appendix 2E [Equipment and Furniture] regarding portable Equipment requirements. Refer to Section 7.8.10.2 for power requirements for portable RO machines.

7.4.4.4(18)(b) Each domestic water wall box will require two (2) domestic water connections and a non-corrosive drain connection similar to the boxes in the Renal Hemodialysis and Peritoneal Dialysis. Provide backflow prevention on domestic water connections to meet City requirements.

7.4.4.5 Process Water System

7.4.4.5(1) Distribution of process water, meaning the non-potable water system, will be independent and separated from the domestic water system and be completely isolated from any portion of the domestic water system.

7.4.4.5(2) Provide shut-off valves and backflow prevention on all make-up connections from the domestic water system to the process water system.

7.4.4.5(2)(a) Provide a full sized DCW connection for cooling tower make-up water to serve as back-up to the normal make-up supply from the process water system. The back-up DCW connection will be located above the Flood Construction Level (FCL) and automatically supply cooling tower make-up water during failure or maintenance of the process water system and pumps.

7.4.4.6 Process Water Storage System

7.4.4.6(1) Provide a below-grade process water storage tank system in conformance with City requirements for reuse water and CSA B128.1/2.

7.4.4.6(2) Process water storage tank system will provide 250 cubic metres volume. Water storage tank will have minimum of either three (3) independent, equal size compartments or three (3) tanks of 80 cubic metres each, that can be connected to allow safe cleaning of one (1) tank while the other two (2) tanks remain in full operation. Maintain a minimum 1/3 or 80 cubic metre capacity volume at all times for process water. Process water will be used as make-up water for cooling towers. Provide double isolation valves on connections between tanks/compartments. Tank interior will be smooth without obstructions and all corners will be rounded. Tank will be covered and vents will be filtered.

7.4.4.6(3) Process water will be gathered from the on-site rain harvesting system and piped directly to the process water storage tank system.

7.4.4.6(4) Provide a process water storage tank system which includes:

7.4.4.6(4)(a) A water treatment system to maintain water quality which includes a circulation system to promote mixing and ensure stagnation does not occur. The system will also include a disinfection system complete with BMS monitoring to ensure that the system remains biologically inactive;

7.4.4.6(4)(b) First flush style filters installed on the water piping entering tank to ensure that no debris is deposited into the process water storage tank. All debris rejected from the first flush style filter will be deposited into a suitable collection strainer/ floor drain system;

7.4.4.6(4)(c) Inlet piping fitted with an electric three-way butterfly valve connected to the fire alarm panel on the Future Heliport. If the Future Heliport foam fire protection system has been activated, then the valve will be activated to direct the storm water to the exterior storm water drainage system;

7.4.4.6(4)(d) Pump suction for process water complete with an anti-vortex inlet including a suction strainer to minimize ingestion of sediment from the bottom of the tank system;

7.4.4.6(4)(e) External still tube for level transmitter/switch and alarms (Low, Low/Low, High, High/High); and

7.4.4.6(4)(f) Safe access on both inside and outside of the tank for maintenance and cleaning.

7.4.4.7 Performance Criteria

7.4.4.7(1) Insulate storm water drainage, domestic water piping, cooling water and exposed p-traps throughout the Facility. Where piping and/or piping components are subject to freezing, provide insulation and thermostatically-controlled heat tracing. Ensure Life Safety Systems are not installed in locations subject to freezing.

7.4.4.8 Domestic Hot Water Systems

7.4.4.8(1) Basic Requirements

7.4.4.8(1)(a)	Provide a domestic hot water system with sufficient capacity and recovery rate for the hot water requirements of the Facility. Allow for 20% expansion capacity within each system for future flexibility.
7.4.4.8(1)(b)	Provide domestic hot water calculated to meet the demand in accordance with ASPE Plumbing Engineering Design Handbook and CSA Z317.1.
7.4.4.8(1)(c)	Domestic hot water recirculation piping will only be stainless steel piping. PEX is acceptable for recirculate drops in the walls.
7.4.4.8(1)(d)	Domestic hot water supply will be of adequate temperature to serve the needs of the Facility and will be stored and circulated at temperatures noted in CSA Z317.1 Table 1.
7.4.4.8(1)(e)	Provide a central mixing valve, in N + 1 configuration, to reduce the distributed temperature from stored tank temperature to distribution temperature.
7.4.4.8(1)(f)	Provide pressure / balance, thermostatic mixing valves, where water temperatures are required to be less than 60 ºC at point-of-use.
7.4.4.8(1)(g)	Provide fail-safe bypass for over temperature water after central mixing valve.
7.4.4.8(1)(h)	Provide alarm to BMS for over temperature conditions.
7.4.4.8(1)(i)	To permit uninterrupted service, provide normally closed bypass around the mixing and diverting valves complete with lockable valve.
7.4.4.8(1)(j)	Bypass will connect to piping upstream of over temperature monitoring sensor to permit continuous monitoring of domestic hot water system supply temperature.
7.4.4.8(1)(k)	The domestic hot water heating system will be configured to provide N+1 redundancy and will meet or exceed the energy efficiency requirements of ASHRAE 90.1.

7.4.4.8(1)(l)	The domestic hot water system will contain minimum two (2) storage tanks of 2000 L capacity (500gal) with the remaining capacity to be supplied by a minimum of two (2) heat exchangers in an N +1 configuration.
7.4.4.8(1)(m)	Each pressure zone will have a separate domestic hot water recirculation system complete with reheat capability to maintain the pressure and temperature integrity of each zone.
7.4.4.8(1)(n)	Calculate and submit an electronic spreadsheet calculation to the Owner of the estimated maximum flow requirement for the domestic hot water supply, refer to Section 2.5.6.1(2) for submittal requirements.
7.4.4.8(1)(o)	Ensure that the domestic hot water system is designed to deliver hot water to all fixtures with no dead legs. Provide a recirculation system between the distribution system and the hot water generation equipment.
7.4.4.8(1)(p)	Locate pressure balance, thermostatic mixing valves serving plumbing fixtures as close as possible to the fixture it serves.
7.4.4.8(1)(q)	Provide tempered water, set for 42 ºC, through local under counter mixing valves when serving individual plumbing fixtures.
7.4.4.8(1)(r)	Domestic hot water mixing valves when used for temperature sensitive locations within the Facility such as scope reprocessing, or other equipment as determined by Owner, will be required to have visual temperature gauges accessible at the point-of-use and are to have a high temperature alarm that will be both local and on the BMS.
7.4.4.8(1)(s)	Design the domestic hot water system to prevent growth and spread of Legionella bacteria. Design strategies may include heat-based control, active treatment systems, eliminating dead-leg piping, flush to drain valves, and minimizing stagnant water by connecting the domestic hot water circulation system as close as possible to fixtures, including drops in a wall as described in this Schedule.

Design will conform to the latest ASPE standards on Legionella Design for Healthcare Facilities.

7.4.4.8(2) Performance Criteria

7.4.4.8(2)(a) Provide a domestic hot water generating plant and hot water storage equipment to meet the requirements of CSA Z317.1 and the requirements set out in this Schedule

7.4.4.8(2)(b) Recirculate domestic hot water from the distribution system(s) back to the generating Equipment within each appropriate pressure zone. Provide stainless steel auto-flow thermostatic balancing valves on each recirculation branch.

7.4.4.8(2)(c) Piping and valves will be appropriately sized to ensure adequate flow that prevents stagnation or accelerated pipe erosion.

7.4.4.8(2)(d) Monitor hot water temperatures, at the storage tank, in the supply and return piping, and at the ends of each piping loop on each floor, on the BMS and provide alarm outputs when the temperature exceeds or drops below the design set point range.

7.4.4.9 Natural Gas System

7.4.4.9(1) The natural gas systems will be designed and installed in accordance with CSA / CAN B149.

7.4.4.9(2) Provide natural gas piping for all uses within the Facility.

7.4.4.9(3) The natural gas system will be connected to two (2) main points of entry into the Facility and distributed to the points of use. Provide fully redundant PRV's sized for partial and full load conditions. Coordinate with the Utility provider as required.

7.4.4.9(4) The Facility will be supplied by two (2) sources of natural gas. Provide a firm natural gas supply available during all periods of operation, and a second natural gas supply subject to periodic disruption (interruptible) based on the natural gas providers ability to supply. The Equipment within the Facility will be connected to the appropriate natural gas service as required by Appendix 2E [Equipment and Furniture].

7.4.4.10 Plumbing Fixtures

7.4.4.10(1) Basic Requirements

7.4.4.10(1)(a) Provide fixtures as indicated and as necessary to achieve the functionality described in Appendix 3A [Clinical Specification and Function Space Requirements] and the minimum sink locations and quantities outlined in Appendix 3J [Sink Matrix], and as needed to comply with all applicable codes and regulations.

7.4.4.10(1)(b) Comply with the performance requirements outlined in CSA Z317.1 and CSA Z8000.

7.4.4.10(1)(c) Plumbing fixtures will be selected in consultation with the Owner.

7.4.4.10(2) Performance Criteria

7.4.4.10(2)(a) Electronic sensor activated fixtures will meet the following requirements:

- 7.4.4.10.2.(a).1 All sensors will be hard-wired and served by the vital electrical system so water is available during a power outage;
- 7.4.4.10.2.(a).2 The duration of sensor faucet flow will be adjustable. All sensors will be set at 10 seconds but will be able to operate for a minimum of 45 seconds without interruption of flow, to facilitate proper hand washing. Faucets will have temperature range adjustment as part of the faucet.
- 7.4.4.10.2.(a).3 Sensors will retain the ability to turn off automatically when hands are no longer in the sensor range.
- 7.4.4.10.2.(a).4 The domestic hot water recirculation system will be connected to the fixture's hot water supply immediately next to the fixture shut-off at the wall.
- 7.4.4.10.2.(a).5 Provide water hammer arresters on the cold water and hot water supply to each fixture or bank of fixtures served by a single branch in accordance with PDI Standards.
- 7.4.4.10.2.(a).6 Ensure fixtures with electronic flush valves also have a manual flush operator. Pressure assist flush valves will not be used.
- 7.4.4.10.2.(a).7 If system pressure exceeds the acceptable delivery pressure, then provide PRV with 100% redundancy. Place the valves in accessible locations.
- 7.4.4.10.2.(a).8 Where possible, provide fixtures with antimicrobial coatings.

7.4.4.10(3) Provide plumbing fixtures that comply with the following requirements:

7.4.4.10(3)(a) Toilets (Patient) - 4.8 L/flush (1.2 gpf);

7.4.4.10(3)(b) Toilets (public) - 4.8 L/flush (1.2 gpf);

7.4.4.10(3)(c) Urinals – 1.9 L/flush (0.5 gpf);

7.4.4.10(3)(d) Staff showers – 7.8 L/min (2.0 gpm);

7.4.4.10(3)(e) Patient showers – 7.8 L/min (2.0 gpm);

7.4.4.10(3)(f) Hand hygiene sinks – 6.8 L/min (1.7 gpm);

7.4.4.10(3)(g) Sinks and lavatories – 5.7 L/min (1.5 gpm); and

7.4.4.10(3)(h) Metering faucets – 0.95 L/cycle (0.25 gallons/cycle).

7.4.4.10(4) Sinks will be required to meet the specific requirement of ASTM A112.19.3-2017/CSA B45.4-17 for construction materials and methods of fabrication.

7.4.4.10(5) Sinks will meet the requirements of CSA Z317.1 and CSA Z8000 including materials, size, performance, construction, installation, location, controls, operation, including items such as backsplash, soap and lotion dispensers, and accessibility. In addition, lavatories will meet all VBBL requirements.

7.4.4.10(6) All plumbing fixtures will be impervious, durable materials suitable for the Facility. Fixtures selected will have proven acceptable healthcare performance, from similar previous installations.

7.4.4.10(7) All plumbing fixtures will be supplied complete with all hangers, accessories for mounting, water supplies and shutoffs, flexible connectors, drain waste and vent connections, water hammer arrestors, all low voltage wiring supplies, wall boxes and access panels.

7.4.4.10(8) Provide frames for Owner supplied Equipment. Refer to Appendix 2E [Equipment and Furniture].

7.4.4.10(9) Provide solid water supply tubing to sinks and lavatories for ease of cleaning. No braided flex supplies are permitted in Clinical Spaces, unless covered with a skirt or shroud.

7.4.4.10(10) All low voltage wiring and cables will be mounted in junction boxes located within the wall below the fixture and will include stainless steel face plates with Tamper Resistant screws.

7.4.4.10(11) All line voltage plugs to low voltage wiring connections will be concealed in access boxes that are not accessible to the public or in concealed ceiling locations that are not visible without removal of an access panel.

7.4.4.10(12) Provide fixtures with antimicrobial coatings in CSA Type I areas.

7.4.4.10(13) Cup or bar sinks will not be permitted.

7.4.4.10(14) Lavatory and hand hygiene sinks will be shaped to prevent splash-back from the basin.

7.4.4.10(15) All sinks will be equipped with a drain and waste piping that can accommodate the intended basin discharge.

7.4.4.10(16) Overflows will not be used, unless the risk of flooding in the space is greater than the risk of infection transmission, as determined by the Owner.

7.4.4.10(17) For sinks installed in nuclear medicine radiotherapy suite provide overflows as set out in RD-52 Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms.

7.4.4.10(18) Provide gooseneck faucet fittings; low-profile gooseneck faucet fittings are not acceptable;

7.4.4.10(18)(a) The spout will not discharge water directly into the drain;

7.4.4.10(19) Faucets will be laminar flow and free of aerators, modulators and rose-sprays. Faucets will not swivel. Strainers and anti-splash fittings at outlets will not be used. Additional requirements for faucets and sinks include:

7.4.4.10(19)(a) All openings required for the faucet installation will be factory installed;

7.4.4.10(19)(b) The outside rim will be of minimal width and have the surface angled down towards the inside to prevent pooling of water and placement of objects on the rim;

7.4.4.10(19)(c) Select all sink basin and faucet combinations and adjust flow rates to minimize the potential for splash-back from the basin;

7.4.4.10(19)(d) Provide multiple basin and or bowl sinks where required. Trap materials in conformance with CSA Z317.1. Supply traps with antimicrobial coatings in all CSA Type I spaces.

7.4.4.10(19)(e) Gaskets at the sink/drain connection will be plastic or neoprene. Rubber gaskets are not acceptable.

7.4.4.10(19)(f) Trap size will be 40 mm diameter for sink waste.

7.4.4.10(19)(g) Adequate flow rate will be provided to ensure the removal of soap residue.

7.4.4.10(20) Provide lavatories and faucets for the Facility to meet the following requirements:

7.4.4.10(20)(a) The lavatory fixtures will be wall hung style fixture unless otherwise required to be solid surface integral fixture that is molded into a countertop; refer to Section 6.6.3.8;

7.4.4.10(20)(b) Wall hung fixtures will be complete with floor mounted lavatory carrier, hanger plate and support arms;

7.4.4.10(20)(c) All openings required for the faucet installation will be factory installed;

7.4.4.10(20)(d) Faucets will have laminar flow;

7.4.4.10(20)(e) Will be hands-free design;

7.4.4.10(20)(f) Will have high profile gooseneck lavatory faucet fittings faucets will have anti-splash, anti-aerosolizing, faucet fittings (e.g. laminar flow) that do not retain air;

7.4.4.10(20)(g) Traps will be 40 mm and have an internal antimicrobial coating in all CSA Type I spaces. All traps and waste arm will be removable for maintenance and replacement (welded not permitted).

7.4.4.10(20)(h) Lavatory basins will not have an overflow opening installed in the body of the basin. Lavatories with overflow outlets that are plugged with aftermarket plugs will not be accepted.

7.4.4.10(20)(i) All public washroom lavatory basins will be installed complete with PO perforated drain openings. Removable drain plugs will not be accepted.

7.4.4.10(20)(j) All lavatory basins will have the water and waste fittings below the fixture protected with a skirt or shroud, provided by the manufacturer with Tamper

Resistant fasteners, to hide the plumbing components and to address infection control requirements. The design of the skirt or shroud will be accessible to Persons with Disabilities.

7.4.4.10(20)(k) Public washroom lavatory fixtures will have electronic hands-free type faucets with single temperature discharge that can be adjusted and set to the desired temperature, at the mixing valve, located below the fixture. Initial temperature setting will be 42^{o} Celsius.

7.4.4.10.20.(k).1 Electronic faucets will be connected to the base-building power source with hard wired vital power source, concealed power boxes and transformers.

7.4.4.10.20.(k).2 Access for the plumbing and electrical to these fixtures will be provided external to the actual washroom complete with access panels.

7.4.4.10.20.(k).3 Fixtures selected for these applications are to have totally enclosed basins and skirts and be specifically designed for Ligature Resistant and Tamper Resistant applications; refer to Appendix 3N [Safety and Risk Reduction Matrix].

7.4.4.10(21) Bariatric lavatories will be constructed as a wall-mounted epoxy coated stainless steel or cast solid surface sinks suitable for use by bariatric users. The fixture will be capable of withstanding a downward pressure of 500 kg on the front of the fixture.

7.4.4.10(22) All bariatric fixtures will be supported by an independent support structure that is attached to the floor on which the fixture is installed. The Bariatric fixtures will not be supported from the Facility walls;

7.4.4.10(22)(a) Bariatric washroom lavatory fixtures will be hands-free type.

7.4.4.10(23) Provide sinks and sink / faucet to meet the following requirements:

7.4.4.10(23)(a) In addition to the sinks noted in Appendix 3J [Sinks Matrix] and in Appendix 3A [Clinical Specifications and Functional Space Requirements], provide additional sinks as required to meet the functional requirements of the Owner and/or of CSA Z8000 and CSA Z317.1;

7.4.4.10(23)(b) Sinks will be required to meet the specific requirement of ASTM A112.19.3-2017/CSA B45.4-17 for construction materials and methods of fabrication;

7.4.4.10(23)(c) Process sinks used in Clinical Spaces, will be either stand-alone wall hung stainless steel fixtures with wall hangers or will be stainless steel bowls which have been integrally welded into a continuous stainless-steel counter;

7.4.4.10(23)(d) The size, depth, number of bowls and the grade of the stainless steel used for the fixture will be selected to match the application in which the fixture will be used;

7.4.4.10(23)(e) Accommodate proper washing of equipment and intended application;

7.4.4.10(23)(f) Sink bowls will have fully rounded corners complete with a drain assembly which is appropriate for the intended end-use of the fixture;

7.4.4.10(23)(g) Drop in or under mounted stainless steel sinks will not be acceptable in clean areas of the Facility.

7.4.4.10(23)(h) Drop in style stainless steel sinks will be considered for non-clinical areas such as lounges, staff areas, and general purpose work rooms only.

7.4.4.10(23)(i) All drop in stainless steel sinks will have a back ledge included with only the necessary openings that are required to accommodate the selected faucets.

7.4.4.10(23)(j) Faucets selected for non-clinical areas such as lounges, staff areas, and general purpose work rooms may be deck mounted, 200 mm centre to centre with gooseneck spout and 150 mm manual blade handles.

7.4.4.10(23)(k) Faucets selected for all other areas will include under deck mounted faucet body, gooseneck spout with laminar flow discharge and hands-free operation.

7.4.4.10(24) Pharmacy Sinks will meet the following requirements:

7.4.4.10(24)(a) Provide type 316 stainless steel sinks for modular cleanrooms, scrub stations, anterooms, and medication dispensary areas in Pharmacy.

7.4.4.10(24)(b) Sinks will be integrally welded into a solid stainless steel deck.

7.4.4.10(24)(c) Provide 150 mm manual blade handle faucets complete with swing gooseneck laminar flow.

7.4.4.10(25) Scrub sinks will be provided for scrub stations, procedure rooms and other Patient treatment rooms and include the following:

7.4.4.10(25)(a) Integral backsplash, electronic hands-free faucets, and soap dispenser for hand hygiene;

7.4.4.10(25)(b) Be suitable for a user conducting surgery or other sterile procedures as a proprietary equipment item by a medical equipment manufacturer.

7.4.4.10(25)(c) Meet all requirements of CSA Z317.1;

7.4.4.10(25)(d) The faucet will have sufficient clearance and height to allow for proper surgical scrubbing to occur and will have a spray head that will provide no splash coverage during usage. Additional faucet requirements include:

- 7.4.4.10.25.(d).1 Provide electronic hands-free type faucets specifically designed to the needs of surgical scrubbing for procedures and remain on as required by the Facility Users;
- 7.4.4.10.25.(d).2 Will have single temperature discharge and means of manual adjustment at the faucet;
- 7.4.4.10.25.(d).3 Faucet will have a temperature and pressure balanced mixing valve located below the fixture; and
- 7.4.4.10.25.(d).4 Electronic faucets will be connected to the base-building power source with hard wired vital power source, concealed power boxes and transformers.

7.4.4.10(25)(e) Access for the plumbing and electrical will be provided below the scrub sink(s) complete with access panels.

7.4.4.10(25)(f) Fixtures selected for these applications are to have totally enclosed basins and skirts and be specifically designed for scrub procedures.

7.4.4.10(25)(g) Scrub sinks for Operating Rooms will accommodate two (2) positions per Operating Room;

7.4.4.10(26) Kitchen and seamless kitchen sinks will meet the following requirements:

7.4.4.10(26)(a) Provide type 316 stainless steel or cast solid surface sinks with under-deck mount faucets with 150 mm blade handle and gooseneck spout;

7.4.4.10(26)(b) Seamless kitchen sinks will be integrated into countertops of the same material; and

7.4.4.10(26)(c) Sink material, dimensions and number of basins will be finalized the Owner during detailed design.

7.4.4.10(27) Utility / Process Sinks

7.4.4.10(27)(a) Provide each utility / process sinks as indicated in Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 3J [Sinks Matrix].

7.4.4.10(27)(b) Sinks will be large stainless steel sink for Staff use in wash up of equipment and clinical supplies. Sink will be integral type within a stainless steel work surface. All corners will be coved and seamless. The sink basin drains will be located to prevent direct contact from the water stream.

7.4.4.10(27)(c) For single compartment sinks, provide a work surface on one side of the sink. For double compartment sinks, provide work surfaces on both sides of the sink.

7.4.4.10(27)(d) Sink dimensions will accommodate the intended use and be finalized with the Owner during detailed design. Minimum sink basin dimensions will be 450 x 600 x 250 mm. Minimum work surface dimensions will be 600 x 600 mm. Sinks will be height adjustable with a nominal 900 mm height.

7.4.4.10(27)(e) Provide a 900 mm high integral stainless steel back splash on all walls and stainless steel shelves above and below all sinks.

7.4.4.10(27)(f) Provide sinks with under deck mounted, 150 mm manual blade handle faucets and gooseneck laminar flow spout. The gooseneck spout will pivot.

7.4.4.10(28) Shampoo style sinks in Exam Room-Ophthalmology, Exam/Treatment Room-ENT and Exam/Treatment Room-EYE will meet the following requirements:

7.4.4.10(28)(a) Specialty sink consisting of moulded acrylic design with 300 mm vertical adjustable height;

7.4.4.10(28)(b) Height controlled by a stainless steel foot pump mechanism;

7.4.4.10(28)(c) The sink bowl design will minimize splashing on surrounding floor;

7.4.4.10(28)(d) Provide a manually controlled faucet supplied with the sink complete with separate spray hose. Provide a thermostatic mixing valve for hot – cold water temperature adjustment; and

7.4.4.10(28)(e) Drainage and water services will meet the adjustable heights requirements of the sink.

7.4.4.10(29) ADL kitchen sink will meet the following requirements:

7.4.4.10(29)(a) Will be a kitchen sink with an adjustable height counter to accessible for Persons with Disabilities;

7.4.4.10(29)(b) Faucet to be blade handles for hot and cold water with gooseneck swivel faucet; and

7.4.4.10(29)(c) Drainage and water will meet the adjustable heights requirements of the sink.

7.4.4.10(30) Chapel sink will meet the following requirements

7.4.4.10(30)(a) Will be a sacristy sink, or sacrarium; and

7.4.4.10(30)(b) The drain from this sink will be required to empty into a rock pit located exterior of the building.

7.4.4.10(31) Hand Hygiene Sinks

7.4.4.10(31)(a) Provide hand hygiene sinks at the minimum locations and quantities outlined in Appendix 3J [Sinks Matrix] or as otherwise noted in Appendix 3A [Clinical Specifications and Functional Space Requirements] to suit the Owner’s functional requirements.

7.4.4.10(31)(b) Hand hygiene sinks will comply with Best Practices for Hand Hygiene Facilities and Infrastructure in Healthcare Settings.

7.4.4.10(31)(c) Hand hygiene sink will be a wall hung and comply with CSA Z8000 requirements unless otherwise noted.

7.4.4.10(31)(d) Hand hygiene sinks will have electronic hands-free type faucets with either a gooseneck wall-mounted spouts or an ozonated system that will supply single temperature water to the sink.

7.4.4.10(31)(e) The water supply is to be pre-adjusted and be set for a temperature of 42 Celsius at the concealed mixing valve.

7.4.4.10(31)(f) Electronic sensor faucets for hand hygiene sinks will have means for users to adjust water temperature.

7.4.4.10(31)(g) Prepare a workflow pattern and risk assessment in collaboration with the Owner to address placement of hand hygiene sinks and alcohol-based hand rub dispensers.

7.4.4.10(31)(h) All hand hygiene sinks in laboratory areas will be equipped with integrated eye/face wash stations.

7.4.4.10(31)(i) Hand hygiene sinks in Mental Health Areas will be Ligature Resistant and Vandal Resistant solid surface sinks with removable shrouds, offset drain location, infrared controls, and laminar flow supply of ozonated water.

7.4.4.10(32) Soiled Utility and Soiled Equipment Hold plumbing fixtures will meet the following requirements:

7.4.4.10(32)(a) Provide each Soiled Utility room, as indicated in Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 3J [Sinks Matrix], with a large stainless steel sink for Staff use in wash up of equipment and clinical supplies.

7.4.4.10(32)(b) Sink will be integral type within a stainless steel work surface. Minimum overall dimension will be 1.50 m long, 600 mm deep, and 900 mm high. The work surface will be recessed on three sides and slope towards the sink basin to prevent water from running onto the floor. Provide a 900 mm high

integral stainless steel back splash on all walls. All corners will be coved and seamless.

7.4.4.10(32)(c) Sink dimensions will accommodate the equipment and supplies to be washed. Minimum sink basin dimensions will be 450 x 600 x 250 mm. The sink drain will be located to prevent direct contact from the water stream.

7.4.4.10(32)(d) Provide a stainless steel shelf above the sink spanning the full length of the integrated sink and work surface. Provide a slatted stainless steel shelf below the work surface(s) located at 1.5 m AFF. The sink and work surface design will allow a sharps bin to be placed beneath it.

7.4.4.10(32)(e) Provide stainless steel hooks beside the sink to accommodate draining IV bags. Hooks will be mounted on an adjacent wall or a raised stainless steel ledge.

7.4.4.10(32)(f) Provide each sink with a below deck mounted faucet with gooseneck spout and a 200 mm single lever control on the hot and cold water supply. The gooseneck faucet will pivot.

7.4.4.10(32)(g) In each Soiled Utility room, coordinate freestanding bedpan disinfector requirements with Appendix 2E [Equipment and Furniture].

7.4.4.10(32)(h) Freestanding bedpan disinfector installation will be tight against the wall.

7.4.4.10(32)(i) Provide recessed hot and cold water connections complete with backflow prevention and shut off valves in a recessed stainless steel wall box to enable Equipment installation tight against the wall.

7.4.4.10(32)(j) Water, drainage and sanitary vent piping to be installed in accordance with the VBBL and the manufacturer’s recommendations.

7.4.4.10(32)(k) Each Soiled Utility Room will be supplied with a plumbed in wall-mounted exposed emergency eyewash station positioned next to the hand hygiene sink.

7.4.4.10(32)(l) Each Soiled Utility room will have a hand hygiene sink located in the room.

7.4.4.10(33) Housekeeping Closets will meet the following requirements:

7.4.4.10(33)(a) Each Housekeeping Closet will be supplied with a plumbed in wall-mounted exposed emergency eyewash station positioned next to the hand hygiene sink.

7.4.4.10(33)(b) Each Housekeeping Closet will have a floor mounted molded stone sink.

7.4.4.10(33)(c) Provide detergent/mixing stations with backflow prevention, including check valves, at all floor sinks in all Housekeeping Closets.

7.4.4.10(34) Floor Sinks will meet the following requirements:

7.4.4.10(34)(a) Provide floor sinks which are minimum 600 mm x 900 mm x 250 mm deep complete with rigid vinyl protective caps on exposed sides.

7.4.4.10(34)(b) Each fixture will have two (2) sets of wall-mounted faucets, each with manual cross blade handles on the hot and cold water supply.

7.4.4.10(34)(c) One (1) set of faucets will include a top pail brace, integral vacuum breaker, hose end and integral stops for general water supply to mop pails.

7.4.4.10(34)(d) The second faucet will be complete with 12 mm reduced pressure back flow preventers on the hot and cold water supply, hose end supply, integral stops, hose end connections to allow for connection of chemical mix tanks.

7.4.4.10(34)(e) The reduced pressure back flow preventers will be mounted in a stainless steel box with hinged solid door located within the walls complete with a direct drain from the box to the floor sink.

7.4.4.10(35) Provide plaster trap sinks to meet the following requirements:

7.4.4.10(35)(a) Provide plaster trap sinks at locations where casting procedures are being performed as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.4.4.10(35)(b) Single compartment, wall hung, type 304 stainless steel, minimum dimensions to be 850 mm x 375 mm x 200 mm interior dimensions.

7.4.4.10(35)(c) Wall mount sink faucet, 200 centers gooseneck spout with laminar flow outlet, manual 100 mm wrist blade handles, and mounted on wall behind the sink.

7.4.4.10(35)(d) Wall mounted pre-rinse spray assembly with heavy duty hose and hose retainer. Water supply to be complete with a thermostatic mixing valve with temperature set for 42° Celsius.

7.4.4.10(35)(e) Provide plaster trap sinks complete with a stainless steel solids interceptor with perforated removable stainless steel basket.

7.4.4.10(35)(f) Stainless steel solids interceptor will be mounted on a stainless steel dolly with ball caster complete with valves and couplings on both inlet and outlet to allow for removal and cleaning.

7.4.4.10(36) Fixtures in Mental Health Areas

7.4.4.10(36)(a) Provide plumbing fixtures, pipe and valve covers, floor drains and access panels which are Vandal Resistant and Ligature Resistant at locations described in the Appendix 3N [Safety and Risk Reduction Matrix].

7.4.4.10(36)(b) Provide combination sink/toilet fixtures in Secure Rooms, as described in Section 7.4.4.12(1)(k).

7.4.4.10(36)(c) Water closet will have a contoured seat, Ligature Resistant skirt, and blowout style operation.

7.4.4.10(36)(d) Provide Ligature Resistant piezo electric operated flush valve and bubbler / filler, slow drain, and a 4-point anchor system for installation in a service chase.

7.4.4.10(37) Energy Centre Fixtures

7.4.4.10(37)(a) Provide double bowl stainless steel sinks with under-deck mount faucets with 150 mm blade handle and gooseneck spout integrated into stainless steel counter-tops for processing water samples and performing chemical treatment.

7.4.4.10(37)(b) In addition to Energy Centre sinks listed in Appendix 3J [Sinks Matrix], provide an additional sink of the same type in a mechanical space near

the cooling towers to facilitate cooling tower water testing treatment.

7.4.4.10(37)(c) Sinks will be large and deep enough to accommodate the intended application.

7.4.4.10(37)(d) Provide one (1) emergency eyewash and shower station complying with Section 7.4.4.12(9) adjacent to each pressurized system such as the steam plant, hydronic boiler plant, chiller plant, and other similar systems. If plants equipment is located in multiple rooms, provide an additional emergency eyewash and shower station in each room.

7.4.4.11 Performance Criteria for Sinks

7.4.4.11(1) Provide hard-wired electronic faucets with concealed power boxes and transformers which are connected to the base-building vital power source.

7.4.4.11(2) All low voltage wiring, cables etc. will be mounted in junction boxes located within the wall below the fixture and will include stainless steel face plates with Tamper Resistant fastenings;

7.4.4.11(3) All line voltage plugs to low voltage wiring connections will be concealed in access boxes that are not accessible to the public or in concealed ceiling locations that are not visible without removal of an access panel;

7.4.4.11(4) All sensors will be able to operate for a minimum of 30 seconds without interruption of flow, to facilitate proper hand washing. All electronically operated faucets will have a means for user temperature adjustment. Sensors will retain the ability to turn off automatically when hands are no longer in the sensor range;

7.4.4.11(5) All sensors on scrub sinks will be able to operate for a range of time without interruption of flow, to facilitate proper hand washing for procedures. Sensors will retain the ability to turn off automatically when hands are no longer in the sensor range.

7.4.4.11(6) Provide sinks for Patient with a removable purpose built skirt or shroud to conceal the water and drain components which are accessible to Persons with Disabilities.

7.4.4.11(7) Plumbing fixtures, fittings, and carriers will be accessible for Persons with Disabilities where designated as accessible in Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.4.4.12 Provide water closets to meet the following requirements:

7.4.4.12(1)(a) Unless otherwise noted, water closets will be constructed of vitreous china to reduce the spread of infection.

7.4.4.12(1)(b) The bowl will be designed to accommodate the flow rate of the flush valve and to minimize the aerosolization of the toilet contents. All water closets will meet a certified MAP rating of 1000.

7.4.4.12(1)(c) All wall-hung fixtures are to be designed for installation using fixture carriers in accordance with the manufacturer recommendations.

7.4.4.12(1)(d) Water closets serving Patient ensuite washrooms and Patient washrooms will be installed with recessed wall-mounted bedpan disinfectors as listed Appendix 2E [Equipment and Furniture]. Bedpan disinfector frame, fixture carrier, water closets and concealed manually operated flush valves will be supplied and installed by Project Co and integrated with the bedpan disinfector. Project Co will provide a complete functioning system which is installed and commissioned.

7.4.4.12(1)(e) All water closets in Mental Health Areas and other areas as described in Appendix 3N [Safety and Risk Reduction Matrix], will be Vandal Resistant and Ligature Resistant.

7.4.4.12(1)(f) Provide seat covers on all Patient and accessible water closets. Ensure that all flush valve operators extend above the height of the open cover. All water closet seats are to be heavy-duty construction with stainless steel posts and self-sustaining hinges.

7.4.4.12(1)(g) Water closets described as public use in Appendix 3A [Clinical Specifications and Functional Space Requirements] will consist of wall hung elongated bowls with an open front seat with no cover and include the following:

7.4.4.12.1.(g).1 Flush valve will be manual in Clinical Spaces.

7.4.4.12.1.(g).2 Flush valve connection to the water closet will be through an exposed top spud, unless otherwise noted in Appendix 3N [Safety and Risk Reduction Matrix].

7.4.4.12.1.(g).3 Mounting height to be 430 to 480 mm from floor to rim of seat.

7.4.4.12.1.(g).4 Flush valve connection to the water closet will be through an exposed top spud.

7.4.4.12(1)(h) Water closets described as for Patient use in Appendix 3A [Clinical Specifications and Functional Space Requirements] will consist of wall-hung elongated bowls with an open front seat and include the following features:

7.4.4.12.1.(h).1 Flush valve connection to the water closet will be through an exposed top spud;

7.4.4.12.1.(h).2 Cover or backrest requirements will be determined in consultation with the Owner; and

7.4.4.12.1.(h).3 Mounting height to be 430 to 480 mm from floor to rim of seat.

7.4.4.12(1)(i) Water closets described as accessible in Appendix 3A [Clinical Specifications and Functional Space Requirements] will consist of wall hung elongated bowls, with an open front seat, and include the following features:

7.4.4.12.1.(i).1 Mounting height of 430 to 480 mm from floor to rim of seat;

7.4.4.12.1.(i).2 Cover or backrest will be determined in consultation with the Owner; and

7.4.4.12.1.(i).3 The location of the flush valve will be in accordance with the accessibility requirements of the VBBL.

7.4.4.12(1)(j) Water closets in Mental Health Area Patient ensuite washrooms will be Vandal Resistant, Ligature Resistant floor mounted, vitreous china with smooth rounded surface and minimal indentations or undulating surfaces for ease of cleaning. Water closets will be back outlet water supply type, with flush values recessed into the wall and activated by push button. Flush valves will be suitably sized for the water consumption of the bowl. Mounting height will be 430 to 480 mm from floor to rim of seat.

7.4.4.12(1)(k) In Secure Rooms, provide a white powder-coated stainless steel, floor-mounted, back-discharge, Ligature Resistant, one-piece sink/toilet combination unit that includes the following features:

7.4.4.12.1.(k).1 hemispherical penal filler/bubbler with mouth guard, integral seat, push button controls and in-wall concealed flush valve;

7.4.4.12.1.(k).2 oval shaped bowl built into the assembly on the back of the toilet; and

7.4.4.12.1.(k).3 anti-flood device with either piezo electric or pneumatic controls on supplies/waste to toilet and/or sink components.

7.4.4.12(1)(l) Provide bariatric Patient ensuite washrooms with water closets that meet the requirements of Section 7.4.4.12(1)(h) and located to allow Staff to position a bariatric Patient over the fixture with the use of a bariatric commode.

7.4.4.12(2) Provide installation of recessed wall-mounted bedpan disinfectors to meet the following requirements:

7.4.4.12(2)(a) As a minimum, install one (1) recessed wall-mounted bedpan disinfector for each Patient ensuite washroom and in Patient washrooms and other locations as indicated in Appendix 2E [Equipment and Furniture]. The recessed wall-mounted bedpan disinfector will be integrated with the water closet and complete with a frame and a floor-mounted, recessed fixture carrier that is independent of the wall system.

7.4.4.12(2)(b) Project Co will plan for two distinctly separate stages of installation: installation of the recessed fixture carrier prior to and distinctly separate from the installation of the recessed wall-mounted bedpan disinfectors.

7.4.4.12(2)(c) The recessed wall-mounted bedpan disinfector installation will be flush to the wall with a fixture carrier and will have hot and cold water connections complete with all shut-off valves and back flow preventers necessary for a concealed application.

7.4.4.12(2)(d) Water, drainage and sanitary vent piping to be installed in accordance with the VBBL and the manufacturer’s recommendations.

7.4.4.12(3) Provide urinals to meet the following requirements:

7.4.4.12(3)(a) Urinals will be wall-hung vitreous china institutional fixture with partitions to contain splashing.

7.4.4.12(3)(b) Each fixture will be complete with a low-consumption concealed electronic hands-free flush valve operation.

7.4.4.12(3)(c) Each urinal will be installed with a separate urinal carrier that is floor mounted and independent of the wall systems.

7.4.4.12(4) Provide drinking fountains to meet the following requirements:

7.4.4.12(4)(a) drinking fountains are to be stainless steel, semi recessed, wall hung, dual height, barrier free, electric water coolers.

7.4.4.12(4)(b) With a hands-free bottle filling station

7.4.4.12(4)(c) Each water station is to include for a fixture carrier that is floor mounted and independent of the wall systems and in accordance with the manufacturer's recommendation.

7.4.4.12(4)(d) The fixtures will be complete with domestic water connection, shut-off valves, carbon filter and all necessary drainage connections.

7.4.4.12(5) Provide showers to meet the following requirements:

7.4.4.12(5)(a) Mental Health Area Patient Showers:

7.4.4.12.5.(a).1 Provide an electronically controlled pressure balanced and high temperature limit shower valves, for tempered water supply through single push button (Piezo) that are flush and Ligature Resistant.

7.4.4.12.5.(a).2 Provide a single Ligature Resistant fixed shower head and a quick disconnect Ligature Resistant hand held shower assembly controlled through a diverter valve assembly.

7.4.4.12.5.(a).3 Provide additional soft seated check valves on each of the water supplies.

7.4.4.12.5.(a).4 Locate the mixing valve away from Patient reach within secured cabinet while reducing dead-leg to shower.

7.4.4.12.5.(a).5 Floor drains will be required to have Vandal Resistant fastenings and to be of Ligature Resistant design.

7.4.4.12(5)(b) Patient Shower:

7.4.4.12.5.(b).1 Provide a pressure balanced and high limit shower mixing valve with additional soft

seated check valves on each of the water supplies.

7.4.4.12.5.(b).2 Patient showers will be a handheld style shower including Ligature Resistant shower elbow with check valve and quick disconnect fitting.

7.4.4.12.5.(b).3 Handheld shower hoses will have a smooth easy to clean surface.

7.4.4.12.5.(b).4 The length of the shower hoses to be sized to ensure the shower head cannot be submerged in any adjacent plumbing fixture.

7.4.4.12.5.(b).5 Slide bars provided for handheld showers will be designed and load rated to act as grab bars.

7.4.4.12.5.(b).6 Each of the floor drains will be required to have Vandal Resistant fastenings.

7.4.4.12.5.(b).7 Shower bases constructed of fibreglass or acrylic will not be considered.

7.4.4.12(5)(c) Staff Showers

7.4.4.12.5.(c).1 Shower stalls will be fibreglass or acrylic but will not be less than 1.20 m x 1.20 m and be complete with a full top in the enclosure.

7.4.4.12.5.(c).2 Staff showers will be provided with a pressure balanced and high temperature limit shower mixing valve with additional soft seated check valves on each of the water supplies.

7.4.4.12.5.(c).3 Staff showers will be a handheld style hand shower head assembly with a slide bar and locking mechanism.

7.4.4.12.5.(c).4 Slide bars provided for handheld showers will be designed and load rated to act as grab bars.

7.4.4.12(6) Provide tubs to meet the following requirements:

7.4.4.12(6)(a) Tubs will be deep, acrylic or high-density fibreglass. Tub access will be as described in Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.4.4.12(6)(b) Provide a fill spout and bathtub filler with cross handle style faucet.

7.4.4.12(6)(c) Provide water supply one pipe size larger than what is requested in the manufacturer installation manuals.

7.4.4.12(6)(d) The mixing valve assemble will be concealed within the adjacent walls with a stainless steel enclosure with a stainless steel front access panel. All water supply between the mixing valve assembly and the tub will be concealed.

7.4.4.12(6)(e) In the Maternity Centre Component, provide a hand shower adjacent to the tub. The hand shower hose assembly will be double the standard length for both the tub and the ensuite shower.

7.4.4.12(6)(f) Where Appendix 3A [Clinical Specifications and Functional Space Requirements] indicates a tub is required in the Maternity Centre, provide an oversize tub with high flow drain. Operation of the drain valve will be accessible above the tub's highest water level. Faucet will be integrated with the tub and located on the side.

7.4.4.12.6.(f).1 Provide a deep-soaker tub with a minimum length and width of 1.82 m x 913 mm and a minimum depth of 432 mm. The tub must include ergonomic back support for Patient recline. For bariatric use, comply with applicable standard for tubs. The tub will not have an overflow drain.

7.4.4.12(7) Provide rehabilitation whirlpool bath to meet the following requirements:

7.4.4.12(7)(a) Fixtures will give particular attention to performance relative to infection prevention and control.

7.4.4.12(7)(b) Whirlpool bath will have minimum dimension of 29” x 27” x 17.5“ and be constructed of double wall stainless steel.

7.4.4.12(7)(c) Provide water supply one pipe size larger than what is requested in the manufacturer installation manuals.

7.4.4.12(7)(d) Provide thermostatic mixing valve with digital readout and high temperature limit alarm which is connected to BMS in addition to a local alarm.

7.4.4.12(7)(e) The mixing valve assemble will be concealed within the adjacent walls with a stainless steel enclosure with a stainless steel front access panel. All water between the mixing valve assembly and the tub are

to be concealed within the building structure and the tub.

7.4.4.12(7)(f) Provide an oversized high flow drain from the tub to the connection located below the tub with an additional floor drain within the Extremity Whirlpool Room.

7.4.4.12(8) Provide foot wash fixtures to meet the following requirements:

7.4.4.12(8)(a) Select fixtures with particular attention to performance relative to infection prevention and control;

7.4.4.12(8)(b) The foot wash assembly will be a single floor mounted acrylic basin.

7.4.4.12(8)(c) The water outlet will be mounted to provide sufficient clearance and height to allow for a single foot wash to occur and will have a spray head that will provide no splash coverage during usage.

7.4.4.12(8)(d) Electronic hands-free type pressure balance mixing valve will be specific to the needs of a single person during foot washing procedures and will remain on as required by the user. Users will have means of manual temperature adjustment; initial temperature to be set for 42° Celsius.

7.4.4.12(8)(e) Electronic shower style valve will be hard-wired with concealed power boxes and transformers and connected to the base-building vital power source.

7.4.4.12(8)(f) All low voltage wiring, cables etc. will be mounted in junction boxes located within the wall below the fixture and will include stainless steel face plates with Tamper Resistant fasteners.

7.4.4.12(8)(g) All line voltage plugs to low voltage wiring connections will be concealed in access boxes that are not accessible to the public or in concealed ceiling locations that are not visible without removal of an access panel.

7.4.4.12(9) Provide emergency eyewash and shower stations to meet the following requirements:

7.4.4.12(9)(a) Select fixtures with particular attention to performance relative to infection prevention and control.

7.4.4.12(9)(b) Located and designed to supply tempered water within an acceptable time frame in accordance with the JOHSC. Provide all necessary signs identifying location and directions for their use.

7.4.4.12(9)(c) Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for additional locations within the Facility where emergency showers and eyewash stations are required to be located. In addition, provide emergency showers throughout Component J – Clinical Support Services to meet WorkSafe BC requirements.

7.4.4.12(9)(d) Where standalone emergency eyewash stations are required, the fixtures are to be a stainless steel wall hung assembly complete with a water receptor, two soft spray eyewash spray heads with caps, tempered water supply and drain piping.

7.4.4.12(9)(e) Eyewash stations will have a highly visible hand paddle that will operate the eyewash upon activation.

7.4.4.12(9)(f) Where emergency eyewash stations are located over a plumbing utility sink, the emergency eyewash station will be a highly visible, swing away assembly that contains two soft spray heads, caps, and tempered water service and will not interfere with the intended use and application of the utility sink.

7.4.4.12.9.(f).1 The eyewash station will be activated when pulled down into position over the sink.

7.4.4.12.9.(f).2 The selection of the emergency eyewash will require coordination of the size of the sink and location of the faucet and eyewash to ensure that all components can be safely operated in an emergency.

7.4.4.12(9)(g) The emergency shower / eyewash stations located within public areas of the Facility are to be an exposed highly visible shower head dropped below the ceiling to the appropriate height. Activation of the shower will be from a wall-mounted lever adjacent to the shower assembly.

7.4.4.12.9.(g).1 The eyewash component of the shower station will be a wall-mounted concealed assembly that will be pulled down out of the wall and will activate upon dropping down. The waste from the eyewash will be hard piped back into the wall and connected to the Sanitary Waste system.

7.4.4.12(9)(h) Provide floor drains in all rooms with emergency showers.

7.4.4.12(9)(i) Emergency shower and eyewash assemblies are to be supplied by an approved thermostatic mixing valve assembly that are specifically designed for safety Equipment installation. The mixing valve assembly will be certified to ANSI Z358.1 and will be sized to serve the demand of the fixtures served and will fail safe to cold water if there is a failure in the mixing valve.

7.4.4.12(9)(j) The hot water recirculation system will be installed as close as possible to the emergency shower / eyewash mixing valve assembly.

7.4.4.12(9)(k) Provide a test cone for every five (5) emergency showers installed in the Facility for monthly testing of the equipment.

7.4.4.12(10) Provide hot and cold water hose bibs to meet the following requirements:

7.4.4.12(10)(a) Exterior hose bibs and hydrants will be an encased non-freeze concealed type with lockable hinged doors. Heat trace is not an acceptable means of freeze protection for hose bibs.

7.4.4.12(10)(b) Will be Ligature Resistant and Vandal Resistant, except in mechanical spaces and roof spaces which are only accessible by Staff or other authorized personnel.

7.4.4.12(10)(c) Each hose bib and hydrant will require an individual shut-off on the branch line servicing the fixture. The shut-off is to be located in a non-freeze location within the building.

7.4.4.12(10)(d) The Facility interior and exterior water supply will be protected by an approved backflow prevention device on each hose bib.

7.4.4.12(10)(e) All interior hose bibs and hydrants will be exposed chrome plated ball valve with hose end fitting and cap securely anchored to the structure.

7.4.4.12(10)(f) All hose bibs located on all roofs will be spaced at intervals no greater than 10 m apart, non-freeze, with shut-off valves and drains located internal to the Facility. The drains will be run to a separate drain location within the floor below the roof. Heat trace is not an acceptable means of freeze protection for hose bibs.

7.4.4.12(10)(g) Provide hose bibs at the following locations, at minimum:

7.4.4.12.10.(g).1 around the perimeter of the Facility at intervals no greater than 15 m apart and throughout the underground parking at intervals of no greater than 45 m apart. Underground parking hose bibs will be winterized during cold weather;

7.4.4.12.10.(g).2 in all mechanical service rooms at intervals no greater than 10 m apart (hot and cold domestic water service);

7.4.4.12.10.(g).3 in both the clean and soiled loading docks provide one (1) domestic hot, and two (2) domestic cold, non-freeze type in recessed lockable boxes. Exact location to be determined by the Owner during design; and

7.4.4.12.10.(g).4 four (4) cold water hose bibs in the plaza to supply misters in extreme heat conditions.

7.4.4.12(10)(h) Provide an irrigation system for automatic, timed and condition controlled system for watering all garden plots. Refer to Section 8.2 for further requirements.

7.4.4.12(11) Provide Morgue plumbing systems to meet the following requirements:

7.4.4.12(11)(a) Within the Morgue, provide plumbing services to all plumbing fixtures; coordinate with Appendix 2E [Equipment and Furniture] where applicable. All connections will be complete with shut-off valves, PRV check valves and all necessary back flow prevention devices.

7.4.4.12(11)(b) Select fixtures with particular attention to performance relative to infection prevention and control;

7.4.4.12(11)(c) All water services supplying the Morgue plumbing fixtures will require a reduced pressure back flow preventer on the main service to the Morgue zone. The backflow stations will need to be located exterior of the Morgue in a location that allows for proper maintenance.

7.4.4.12(11)(d) Supply a ceiling drop high-pressure hose to the Autopsy Room.

7.4.4.12(11)(e) Sanitary waste piping, floor and trench drains will be constructed of stainless steel with mechanical couplings. Provide connection between the stainless steel piping and the main sanitary sewer system.

7.4.4.12(12) In the area of where the garbage bins and compactors are to be located, provide the following:

7.4.4.12(12)(a) Large heavy duty, H20 loading, trench drains are to be installed at the low points below the bins and compactors to allow for collection of all drainage and waste products.

7.4.4.12(12)(b) Install both hot (60 °C) and cold water hose bibs at each end of the garbage bin and compactor installation.

7.4.4.12(12)(c) Install a large solids interceptor with a removable perforated basket that can be removed and cleaned, on a daily basis, at the end of the trench drain assembly.

7.4.4.12(12)(d) Downstream of the solids interceptor install an oil interceptor complete with a draw off tank. The oil interceptor will be located outside of the areas where the garbage bins/ compactors are located.

7.4.4.12(13) The following requirements apply to the Elevators:

7.4.4.12(13)(a) Elevator and Escalator Drainage

7.4.4.12.13.(a).1 All drainage systems installed in conjunction with Elevators and escalators will be in conformance with CSA B44.

7.4.4.12.13.(a).2 Elevators which are operated with hydraulic components will be provided with a separated

drainage system sized to handle any potential water leakage and the flow from any fire suppression system within the elevator shafts. The drainage system will be complete with an oil interceptor, elevator pit drains and a separate check valve located outside of the elevator pit.

7.4.4.12.13.(a).3 Elevators which do not contain hydraulic components will be provided with a separated drainage system, sized to handle any potential water leakage and the flow from any fire suppression system within the elevator shafts. The drainage system will be complete with elevator pit drains and a separate check valve located outside of the elevator pit.

7.4.4.12.13.(a).4 When the depth of the elevator pit is lower than the adjacent sanitary sewer system, provide a full pumping system with duplex pumps operating on delayed vital emergency power.

7.4.4.12(14) The Disinfector / Washer - Wheelchairs / Gurneys room will meet the following requirements:

7.4.4.12(14)(a) Design the space for cleaning and disinfection of Equipment used throughout the Facility.

7.4.4.12(14)(b) To facilitate the cleaning of the Equipment, provide a hot and cold water hose bib in a recessed box installed near the entrance to the room.

7.4.4.12(14)(c) Provide a flushing rim floor drain in the centre of the room to facilitate disposal of debris that will be washed from the Equipment. The flush valve for the drain will be located near the entrance to the room.

7.4.4.12(15) The following requirements apply to the Medical Device Reprocessing Department (MDRD) plumbing system:

7.4.4.12(15)(a) The domestic water systems will require a full reduced pressure back flow preventer system to serve the entire zone. Provide individual back flow prevention for Equipment as required by VBBL. Locate these back flow devices in mechanical spaces.

7.4.4.12(15)(b) Plumbing fixtures within the MDRD will be custom built to suit the functional requirements of the Owner

within the Component. Refer to Section 6.5.7.2. Stainless steel sinks, counters and assemblies for additional information on custom made sink requirements serving MDRD area.

7.4.4.12(15)(c) Provide connections for all specialized cleaning and sterilizing devices to clean water systems such as RO water systems.

7.4.4.12(15)(d) Locate services such that each of the clean water systems will be produced and can be maintained adjacent to the MDRD.

7.4.4.12(15)(e) All RO water systems will be piped to the individual pieces of Equipment and will then be returned to a central storage tank. All special water systems will be supplied and produced from a packaged water system with redundancy for maintenance

7.4.4.12(15)(f) Provide laboratory air distributed throughout the Component. Laboratory air quality will meet the requirements of medical air quality as described in CSA Z7396.1-17. The laboratory air system will be designed, installed, tested and labeled in the same manner as an instrument air system, as described in CSA Z7396.1-17 and as required by final Equipment selection; refer to Appendix 2E [Equipment and Furniture]. Provide both wall and modular ceiling plate outlets to facilitate blowing and drying of Equipment.

7.4.4.12(15)(g) Where Owner supplied equipment requires drain filter installation, the filter will be supplied with equipment. This applies to equipment such as Probe-Reprocessors which have the drainage system configured to ensure that replacement of the filter is serviceable.

7.4.4.12(16) The following requirements apply to the Workroom-Biomedical Engineering:

7.4.4.12(16)(a) Provide workstations with medical gas services installed and functioning as provided at the POC.

7.4.4.12(16)(b) Medical gas outlets will be DISS-style outlets. .

7.4.4.12(16)(c) Provide utility sinks as noted in Appendix 3J [Sink Matrix].

7.4.4.12(16)(d) Provide two (2) large floor drains to accommodate the flow from rehabilitation whirlpool bath which are brought in for repairs.

7.4.4.12(16)(e) Provide two (2) hot and cold water hose bibs stations in the general area of the floor drains.

7.4.4.12(17) Provide plumbing system for the Central Food Production and distributed Food Services areas to meet the following requirements:

7.4.4.12(17)(a) A full list of Equipment to be provided by Project Co is available in Appendix 3F [Food Services Equipment List]. Service requirements in this list are for reference and planning purposes only. Project Co is responsible for all requirements and connections based on the final equipment selection.

7.4.4.12(17)(b) Project Co will be responsible for all service connections, including for domestic hot and cold water (including filters, and accessories as required), sanitary waste and vents, grease waste and vents, compressed air, and natural gas.

7.4.4.12(17)(c) The service connections to each component will include all shut-off valves, check valves, unions, back flow preventers, PRV and reducer fittings as needed and required.

7.4.4.12(17)(d) Grease interceptors are to be sized and supplied by Project Co to suit the Equipment requiring service and to meet the requirements of the Metro Vancouver guidelines and the VBBL.

7.4.4.12(17)(e) Refer to the information in Appendix 3F [Food Services Equipment List] for information on any sinks, floor drains, emergency showers and eyewash equipment and hand hygiene sinks that will need to be supplied and installed by Project Co.

7.4.4.12(18) The following requirements apply to plumbing system to be roughed-in to service the four (4) Food Court kiosks and two (2) proposed Coffee Shops:

7.4.4.12(18)(a) Each vendor/kiosk will be provided with a 50 mm domestic hot and cold water service and a 25 mm domestic hot water recirculation line.

7.4.4.12(18)(b) Each vendor/kiosk service will be terminated in the ceiling above with a shut-off valve and one meter of capped piping.

7.4.4.12(18)(c) Each vendor/kiosk will have a point-of-use water meter installed on the hot and cold water supply lines with an electronic readout that can be connected to the Facility BMS system.

7.4.4.12(18)(d) Each vendor/kiosk will be required to have a grease interceptor of sufficient size to meet the Metro Vancouver design guidelines.

7.4.4.12(18)(e) Provide a 50 gpm grease interceptor for each of the six (6) vendor/kiosk spaces for installation at a later date.

7.4.4.12(18)(f) Provide each vendor/kiosk with a 100 mm sanitary sewer connection and a 75 mm sanitary vent connection at or near the boundary of the vendor/kiosk space.

7.4.4.12(19) Provide compressed air systems to meet the following requirements:

7.4.4.12(19)(a) Medical Compressed Air

(a).1.1 Refer to medical gas Section 7.4.4.14.

7.4.4.12(19)(b) Instrument Compressed Air

(b).1.1 Refer to medical gas Section 7.4.4.14.

7.4.4.12(19)(c) Utility Compressed Air – Food Services

7.4.4.12.19.(c).1 Provide a compressed air system in food services areas.

7.4.4.12(19)(d) Utility Compressed Air

7.4.4.12.19.(d).1 Provide utility compressed air system to be used in mechanical rooms and FMO maintenance shops for pneumatic tool operation including reciprocating or rotary screw air compressors, air dryers and receiver tank.

(d).1.1 Provide minimum 2" diameter compressed air line for FMO workshops with outlet in the following areas and quantities at a minimum:

(d).1.1.1 Carpentry-4 (one retractable), Electrical-2 (one retractable), Mechanical -4 (one retractable)

Plumbing 2 (one retractable) Paint- 3 (one retractable, one for paint booth) Bed repair shop - one retractable, AGV shop - one retractable (Energy Centre- workbench/sink area - one), and other spaces as determined by the Owner.

(d).1.2 Provide minimum 1-1/2" diameter compressed air line for main mechanical rooms/Energy Centre spaces, with a minimum of eight (8) of the outlets per each main mechanical room/Energy Centre space, distributed to ensure even coverage. Location of outlets to be determined in consultation with the Owner.

7.4.4.12.19.(d).2 Point-of-use quick connect outlets will include upstream filters.

7.4.4.12.19.(d).3 Pressure requirements for the systems will depend on requirements of final devices and Equipment procured. Outlet pressures will be Owner adjustable.

7.4.4.12.19.(d).4 The utility compressed air system will be sized to accommodate all of the equipment provided by the Facility and will assume that 30% of the equipment will be operating at any given time.

7.4.4.12.19.(d).5 Provide for 20% increase in a capacity, including control panels for future.

7.4.4.12.19.(d).6 Piping for the utility air system will be galvanized schedule 40 black iron piping with ball valves installed on all main runs and on each branch line.

7.4.4.13 Plumbing Drainage and Venting Systems

7.4.4.13(1) Basic Requirements

7.4.4.13(1)(a) Provide sanitary, storm, specialty drainage, and venting systems to avoid disruption to the operation of the Facility or interference with other services during operation and maintenance activities. Design the systems so that, as much as possible, CSA Type I and CSA Type II rooms do not need to be entered when performing these functions. Refer to CSA Z317.2 for space Type definitions.

7.4.4.13(1)(b) Design all drainage systems such that the system connects to the site drainage services, utilizing gravity drainage wherever possible.

7.4.4.13(2) Storm Drainage System

7.4.4.13(2)(a) The storm drainage system will connect to all roof drains, patio drains, exterior planter drains and all other exterior drains which will collect storm water.

7.4.4.13(2)(b) All storm drains will be selected to accommodate the roof surface, insulation, and structural system in which they will be installed.

7.4.4.13(2)(c) All installation of roof drains will be in accordance with the requirements of the RCABC and will require inspection to ensure that all roofing guarantees can be issued at the completion of the Project.

7.4.4.13(2)(d) All storm drains which are installed in planter drains or on green roof planting material will be complete with screens and fabric protection that will prevent soil and debris from entering the storm drainage system.

7.4.4.13(2)(e) All storm drainage piping within the Facility will be insulated for the first four (4) meters downstream of the roof drain.

7.4.4.13(3) Storm and Sanitary Pumping Stations

7.4.4.13(3)(a) Provide pumping systems for subsurface, storm, or sanitary drainage with 100% redundancy (one redundant unit for each active unit) and supply related equipment with emergency power.

7.4.4.13(3)(b) Provide the sump with twin compartments (separate chambers for settling and pumping) and size the sump to prevent short cycling of the pump.

7.4.4.13(3)(c) Provide engineered packaged pumping system(s) complete with controls and alarms including pump alternation, high water level alarm, pump one on, pump two on (where applicable) and pumps failure alarms. Provide local alarms annunciation with audible and visible alarms indication and remote connection via the BMS.

7.4.4.13(3)(d) All pump chambers will have premanufactured access lids in either single or double configuration with hydraulic assist lift chambers. Design of the access lids will require consideration regarding the loads that will pass over the installation and be supplied accordingly.

7.4.4.13(3)(e) All pumping systems will be supplied with Delayed Vital Power.

7.4.4.13(4) Sanitary Drainage System

7.4.4.13(4)(a) Provide drainage and venting piping and fittings of a material suitable for the expected effluent.

7.4.4.13(4)(b) All pipe materials acceptable by the VBBL for drainage systems are acceptable, with the following exception:

7.4.4.13.4.(b).1 ABS or PVC pipe materials are not acceptable for oil waste systems.

7.4.4.13(4)(c) Consider using non-metallic sanitary drainage piping where permissible by the code and where practical for the fluid discharge.

7.4.4.13(4)(d) All vents will terminate outdoors; the use of air admittance valves will not be permitted.

7.4.4.13(4)(e) All piping will be installed parallel to Facility lines. Vertical piping will be installed plumb and horizontal piping level or graded as required by code for sanitary or storm systems. Provide support under all wyes located at ends of branches and all p-traps.

7.4.4.13(4)(f) Conceal all sanitary, waste, and water piping in walls. Only trap arms and water supply piping will be permitted to be exposed below fixtures.

7.4.4.13(4)(g) At a lowest level within the Facility install a sanitary sewer bypass / diverter complete with full port plug valves that will permit the sewer to be diverted to a sanitary sewage holding tank in a post-disaster condition.

7.4.4.13(4)(h) All diverter valves will be located to allow quick and easy access without having to remove equipment or having to dig up the location to operate the valves.

7.4.4.13(4)(i) Fixture outlet piping for adjustable height fixtures will be installed so that no water will collect in the piping at any fixture height.

7.4.4.13(4)(j) Drainage piping material for corrosive waste products may only be changed downstream at the following points:

- 7.4.4.13.4.(j).1 where the hazardous properties of the effluent are reduced such that a different piping material is suitable: e.g. the branch connects into a main drain line, such that the additional effluent flow dilutes the discharge; and
- 7.4.4.13.4.(j).2 where a device is placed in-stream to reduce the hazard of the discharge, such as an acid neutralizer.

7.4.4.13(4)(k) Drainage piping material for radioactive waste products will consist of the following material:

- 7.4.4.13.4.(k).1 Cast iron piping will be the only material permitted for radioactive waste systems.
- 7.4.4.13.4.(k).2 All radioactive waste systems will be run directly from the source to a location in the main building sewer where adequate dilution can be achieved.

7.4.4.13(4)(l) Insulate and heat trace storm water drainage, domestic and non-potable water piping, cooling water, condensate and exposed p-traps in unheated areas throughout as required by BCICA quality standards.

7.4.4.13(4)(m) Provide aluminum jacketing outside and on all exterior piping. In underground parking areas, provide PVC jacketing for services.

7.4.4.13(4)(n) Provide a non-corrosive drainage system suitable for discharge from dialysis Equipment and wall boxes where RO water connections are provided, including any locations designated for connection of portable dialysis machines. Additionally, provide the following:

- 7.4.4.13.4.(n).1 Each of the wall box standpipes are to be provided with an air gap between the box and the standpipe; and
- 7.4.4.13.4.(n).2 Each standpipe in Renal Hemodialysis will have a domestic water connection that will provide a flushing cycle of water to reduce protein build up in drain lines over time. Water

distribution for flushing will be fed from a single central location in Renal Hemodialysis complete with a two (2) position shut-off valve in a fully recessed, lockable box at 1.5 m AFF. Each flushing connection will have a throttling ball valve complete with fully recessed, lockable access panel for isolation and throttling purposes. Ball valve positions will be set to ensure that no standpipes overflow when the central shut-off valve is fully open and dialysis drainage occurs simultaneously.

7.4.4.13(4)(o)	Provide floor drains in all mechanical rooms, laboratory, kitchen, workshop, all wet areas or wet rooms, service spaces, food services areas, parking areas, emergency showers, and other rooms where water spillage from equipment or operations is reasonably expected to minimize maintenance and housekeeping issues.
7.4.4.13(4)(p)	Floor drains will be sized to handle the maximum anticipated flows including sprinkler test full flow and from back flow preventer relief ports at full flow rated as noted in the manufactures information.
7.4.4.13(4)(q)	Provide floor or hub drains for all devices that may discharge water including, emergency showers and backflow prevention devices.
7.4.4.13(4)(r)	Install floor drains in Patient Care Areas only as needed for the specific use of the room as per CSA-Z317.1 and CSA-Z8000. These rooms include tubs and laundry facilities.
7.4.4.13(4)(s)	Floor drains installed in all Mental Health Areas will have the gratings secured Vandal Resistant type with Tamper Resistant fasteners. The grating will be of a Ligature Resistant design.
7.4.4.13(4)(t)	Ensure all Equipment drain piping is terminated at floor drains with the proper air gap. Ensure that drains are properly selected and of adequate size to prevent spillover of the waste product into adjacent areas.
7.4.4.13(4)(u)	Provide electronic trap primers that are controlled by electronic time clocks, BMS or other equally effective means as approved by the Governmental

	Authorities at drains that are subject to losing the trap seal, including infrequently used fixtures and p-traps in negatively pressurized rooms, mechanical rooms, Housekeeping Closets or Soiled Utility rooms, floor drains for emergency showers, or floor drains without a dedicated load from Equipment or fixtures.
7.4.4.13(4)(v)	Locate trap primers in a location where they will easily be accessed, inspected, and repaired. Trap primers that rely on fixture use or pressure drop will not be accepted.
7.4.4.13(4)(w)	Any machinery/service rooms located below grade will be fitted with fast acting, free flowing drains to rapidly disperse flood waters arising from both outside the Facility (such as severe weather), and a from any internal fluid system breaches. Drainage flow capacity will exceed that of the calculated maximum flow from the worst case system breach. A means of cooling high-temperature heating water before it flows into public areas will also be included to minimize hazards of scalding. Drains will be configured such that water cannot back-flood up into machinery/service rooms (e.g. from overland flooding).
7.4.4.13(4)(x)	Provide accessible clean-outs for all sinks and lavatories above the flood-level of the sink in conformance with the VBBL and where bodily fluids may be encountered.
7.4.4.13(4)(y)	Provide neutralizers, interceptors and sediment traps to intercept corrosive liquids, oil, grease, dirt and solids where necessary and as required by the VBBL and Metro Vancouver guidelines.
7.4.4.13(4)(z)	Provide interceptors in accordance with the manufacturer’s specifications.
7.4.4.13(4)(aa)	Sizing of the interceptors/ neutralizer will be in accordance with the guidelines set out in the ASPE Design manuals, Metro Vancouver guidelines, Plumbing Drainage Institute (PDI) design guidelines or the local Governmental Authorities.

7.4.4.13(4)(bb) Provide and show all design sizing information on the excel spreadsheets, as requested, for each of the systems.

7.4.4.13(5) Plaster Interceptors

7.4.4.13(5)(a) Install plaster interceptors for all process sinks where cast / splint procedures are required; refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 3J [Sinks Matrix].

7.4.4.13(5)(b) Refer to Section 7.4.4.10(35) for plaster trap sinks requirements.

7.4.4.13(5)(c) Plaster interceptor installations are to be designed to allow for removal of the entire interceptor and taken to a maintenance location where the interceptor can be cleaned and returned to service.

7.4.4.13(5)(d) Plaster sinks are to be complete with a stainless steel solids interceptor with perforated removable stainless steel basket. The interceptor is to be mounted on a stainless steel dolly with ball caster and is to have valves and couplings on both inlet and outlet to allow for removal and cleaning.

7.4.4.13(6) Grease Interceptors

7.4.4.13(6)(a) Provide grease interceptors to serve all designated sinks, dishwashers and floor drains in the food preparation areas sized to accommodate the anticipated full design loads.

7.4.4.13(6)(b) Provide an independent grease waste drainage system, sloped at a minimum 2 %, from each of the fixtures to the grease Interceptor.

7.4.4.13(6)(c) All grease interceptors, except small under-counter units, will be located outside the actual food preparation area and floor mounted in mechanical spaces to allow for servicing and clean-out. Grease interceptors will not be installed in ceiling spaces or accessed through floor access hatches.

7.4.4.13(6)(d) Do not install the interceptor in a location where workers would be required to stand on or walk over the interceptor.

7.4.4.13(6)(e) Each large, central grease interceptor installation will be complete with 50 mm welded stainless steel vacuum suction line running from the grease interceptor to a designated location at the loading dock. The use of portable grease suction lines is not an acceptable means of grease interceptor maintenance.

7.4.4.13(6)(f) The location at the loading dock will be such that a grease vacuum truck can be parked in a dedicated location. Each end of the vacuum tubing will have a Kamlock fitting attached.

7.4.4.13(6)(g) Each grease interceptor installation will be complete with a 20 mm hot water hose bib on the wall near the grease interceptor that will be connected to the 60^{O}C hot water system.

7.4.4.13(6)(h) Grease interceptors located in food service areas throughout the Facility will be sized to accommodate the anticipated design loads. Each unit will be mounted on a wheeled platform to allow the equipment to be removed and relocated to the maintenance shops for cleaning. Each of the inlet / outlet connections on the interceptor will have union fittings that will allow for removal and replacement of the equipment. The use of portable grease suction lines is not an acceptable means of grease interceptor maintenance.

7.4.4.13(6)(i) Provide one (1) additional grease interceptor to allow for uninterrupted operation when any one of the interceptors needs to be taken out for service.

7.4.4.13(7) Acid / Corrosive Waste Neutralizers

7.4.4.13(7)(a) Provide an acid / corrosive waste neutralizer to serve all designated sinks, RO / Dialysis waste discharge, floor drains in the RO water production mechanical rooms, Laboratory, and in all other special services areas throughout the Facility.

7.4.4.13(7)(b) Provide an independent acid / corrosive waste drainage system, sloped at a minimum 2 %, from each of the fixtures to the acid / corrosive waste neutralizer.

7.4.4.13(7)(c) Locate the acid / corrosive waste neutralizer in a location where the maintenance department would be able to service the Equipment.

7.4.4.13(7)(d) Provide acid neutralizers at either the point of acid/ corrosive waste discharge to the drainage system or at the termination of the acid / corrosive waste drainage system before connection into the sanitary drainage system.

7.4.4.13(8) Fuel Oil Interceptors

7.4.4.13(8)(a) Provide appropriate fuel oil interceptors systems at all fuel storage tanks and filling stations to prevent fuel leakage beyond the designated containment area, and in accordance with all applicable standards.

7.4.4.13(9) Oil Interceptors

7.4.4.13(9)(a) Provide oil interceptors to serve all designated locations such as mechanical rooms, elevator pit drainage, parking area drains and garbage bin / compactor or all other special services areas throughout the Facility where oil may be used.

7.4.4.13(9)(b) Provide an independent oil waste drainage system, sloped at a minimum 2 %, from each of the fixtures to the oil interceptor.

7.4.4.13(9)(c) ABS or PVC piping material will not be accepted for this system.

7.4.4.13(9)(d) Locate the oil interceptors in locations where FMO will be able to service the equipment without disruption to Facility operation.

7.4.4.13(9)(e) Provide oil interceptors at either the point of oil waste discharge to the drainage system or at the termination of the oil waste drainage system before connection into the sanitary drainage system.

7.4.4.14 Medical Gas Systems

7.4.4.14(1) Basic Requirements

7.4.4.14(1)(a) All medical gas systems will be designed and constructed to CSA Z7396.1 Medical gas pipeline systems - Part 1 and CSA Z9170.1.

7.4.4.14(1)(b) Provide medical gas outlets as required. The minimum locations and minimum quantities of medical gases for Patient use are outlined in Appendix 3K [Medical Gas Matrix].

7.4.4.14(1)(c) Provide two (2) medical oxygen outlets on the building exterior for connection to the Mobile Medical Unit (MMU). Connections will be fed from the nearest riser and provide 35psi medical oxygen to outlets compatible with the MMU's snap-fit braided hose connections. Outlets will be clearly labelled, secured behind a lockable, waterproof access door, and located adjacent to the electrical connection for the MMU.

7.4.4.14(1)(d) Provide medical gas outlets with Ligature Resistant and Vandal Resistant medical gas outlet covers in Mental Health Areas.

7.4.4.14(1)(e) Medical gas systems will include the following:

- 7.4.4.14.1.(e).1 Oxygen;
- 7.4.4.14.1.(e).2 Medical Vacuum;
- 7.4.4.14.1.(e).3 Medical Air;
- 7.4.4.14.1.(e).4 Nitrous Oxide;
- 7.4.4.14.1.(e).5 Nitrogen;
- 7.4.4.14.1.(e).6 Carbon Dioxide;
- 7.4.4.14.1.(e).7 Laboratory Air; and
- 7.4.4.14.1.(e).8 AGSS.

7.4.4.14(1)(f) Provide manifold systems for:

- 7.4.4.14.1.(f).1 Medical oxygen system reserve;
- 7.4.4.14.1.(f).2 Medical air reserve;
- 7.4.4.14.1.(f).3 Nitrous oxide;
- 7.4.4.14.1.(f).4 Nitrogen; and
- 7.4.4.14.1.(f).5 Carbon dioxide gas systems.

7.4.4.14(1)(g) Provide an oil-free medical vacuum system.

7.4.4.14(1)(h) Provide an active AGSS to serve the entire Facility where anaesthetic gas systems or other volatile anaesthetic agents are used.

7.4.4.14(1)(i) Provide DISS-type outlets for all medical gases. Medical gas outlets within Mental Health Areas will have secure covers so they cannot be accessed by the Patients.

7.4.4.14(1)(j) Each medical gas outlet will have a permanently marked, colour-coded non-interchangeable index

system to prevent the connection of the wrong gases. Provide a secondary check valve to hold the line pressure if the primary valve is removed for maintenance.

7.4.4.14(1)(k) All medical gas outlets in Procedure and Patient rooms will be provided with a patient reference grounding system in conformance with the Canadian Electrical Code.

7.4.4.14(1)(l) Medical gas piping will be degreased type ‘L’ copper to ASTM B819 and in conformance with CSA Z7396.1.

7.4.4.14(2) Provide a compound for the designated bulk oxygen site to serve the Facility. Coordinate the compound and oxygen bulk tank requirements with the supplier, including dimensions, architectural screening, piping connections, electrical connections, alarm wiring, and safety measures. Locate the compound exterior to the Facility in a location in compliance with the requirements of NFPA that can be accessed by a standard oxygen refueling truck. Provide all piping between the designated bulk oxygen site and the Facility including flexible connection at the entry point to the Facility.

7.4.4.14(3) Provide a medical gas oxygen connection on the exterior of the Facility for supplying oxygen into the Facility from external bulk storage tanks or truck as described in the Post-disaster Design.

7.4.4.14(4) Provide medical gas cylinder manifold room(s) within the Facility for the following medical gases: oxygen, nitrogen, nitrous oxide, and carbon dioxide based on anticipated usage from Appendix 3A [Clinical Specification and Functional Space Requirements] and as determined with the Owner. Acceptable locations for the medical air reserve manifold system include either with the primary source equipment or adjacent to the other medical gases manifold rooms.

7.4.4.14(5) Manifolds for nitrogen, nitrous oxide, and carbon dioxide will be sized to hold medical gases as listed below, with an additional 20% spare capacity in manifold sizing:

7.4.4.14(5)(a) Nitrogen manifold system will have total capacity of two (2) weeks, one (1) week of capacity for each side of automatic change-over valve. Provide storage space for one (1) week spare capacity either within dedicated storage and exchange area or manifold space, as described in this schedule;

7.4.4.14(5)(b) Nitrous oxide manifold system will have total capacity of 144 hours, 72 hours of holding capacity for each side of automatic change-over valve. Provide storage space for 144 hours of spare capacity space either within dedicated storage and exchange area or manifold space, as described in this Schedule;

7.4.4.14(5)(c) Carbon dioxide manifold system will have total capacity of two (2) weeks, one (1) week of holding capacity for each side of automatic change-over valve. Provide storage space for one (1) week spare capacity space either within dedicated storage and exchange area or manifold space, as described in this Schedule; and

7.4.4.14(5)(d) Design the high pressure manifold systems, such that they will automatically switch to the spare bank of bottles and that switching to the spare bank is alarmed as required in this Schedule.

7.4.4.14(6) Storage and exchange area for spare medical gases and empty medical gases will be sized in accordance with capacity requirements of this Schedule.

7.4.4.14(7) Storage and exchange area will accommodate, in addition to all other capacities listed, storage and exchange space for medical gases such as helium, mixtures of gases such as oxygen/helium, oxygen/nitrous oxide, two (2) carts for small grab-and-go oxygen cylinders each approximately 72"Hx28"Wx36"D or other gases as may be required by the Owner. Provide all racks and appropriate seismic restraints to secure bottles. A piping system for these gases is not required. The grab-and-go area for the un-manifolded gases and portable cylinders gases will have adequate space for storing carts plus ten (10) specialty gas cylinders.

7.4.4.14(8) Provide a central medical air and medical vacuum systems. Medical air and medical vacuum systems will each consist of at least three (3) interconnected sources of supply. Systems will be capable of supplying the system flow with any two (2) sources of supply being out of service. Provide ‘fail-safe’ controls: all units will continue to run and maintain service in the event of failure of the electronic controls, without human intervention. Provide multi and/or variable speed systems to allow for varying conditions. Provide for 20% increase in capacity, including control panels, for future. Medical air system reserve manifolded cylinder based system is to be sized as per following:

7.4.4.14(8)(a) Medical air reserve will have total capacity of twelve (12) hours, six (6) hours of holding capacity for each side of the automatic change-over valve. Provide storage space for twelve (12) hours spare capacity within the manifold space, as described in this Schedule.

7.4.4.14(9) Connect new central medical air and medical vacuum systems to the essential system power supply in conformance with CSA Z32. Provide an essential system power supply from at least two (2) separate circuits such that these emergency services are maintained in the event a motor control centre is de-energized.

7.4.4.14(10) Medical air compressors will be equipped with a carbon monoxide alarm system to measure the level of carbon monoxide in parts per million by volume in the medical air. The system will initiate an alarm and provide a means to prevent gas from entering the piping system if the level exceeds 10 parts per million by volume. Alarm will notify the BMS.

7.4.4.14(11) Air intakes for medical air compressors will be provided with carbon filters with pressure drop alarm notifying the BMS.

7.4.4.14(12) Where laboratories or any other non-clinical area requires an air or a vacuum system, these systems will be independent from the medical air and medical vacuum systems. Non-medical compressed air systems will include the following:

7.4.4.14(12)(a) Laboratory air with N+1 redundancy for non-patient use will be medical air quality in accordance with CSA Z7396.1-17 and used in such areas as MDRD / Biomed / Pharmacy / Labs, braking systems on ceiling columns, and operating door open and door close on sterilizers. Connect to the emergency power system. Pressure requirements for the systems will depend on requirements of final devices and Equipment procured. Outlet pressures will be Owner adjustable.

7.4.4.14(12)(b) Provide a 1" laboratory air supply to the Labs. Location and quantity of outlets to be determined during design in consultation with Owner.

7.4.4.14(13) Provide a dedicated active AGSS for all points of anaesthetic gas use and locations where other volatile anaesthetic agents will be used. Gas scavenging systems will be designed to applicable standards including CSA-Z7396.1. AGSS will include at least three (3) vacuum producers and will be capable of supplying the

system design flow with any two (2) vacuum producers out of service. Vacuum producers will be connected to emergency power. System will have 20% spare capacity to permit future extension.

7.4.4.14(14) Service isolation valves will be valves of three piece bolted construction for medical gas service and will have ULC listing and CRN number. Valves will be labelled showing the appropriate gas service and pressure rating. All ball valves will have a quarter turn from closed to open and swing out during installation. Shut-off valves exceeding 65 mm used for medical vacuum systems may be butterfly valves. Provide degreased copper tube stubs with purge ports.

7.4.4.14(15) Area zone shut-off valves will be housed in a single steel box comprised of multiple shut-off valves with tube extensions, removable window incorporating a centre pull out ring. Provide pressure/vacuum gauges for each service. Provide label stating rooms served by valves. Boxes will be designed so that the shut-off valve handles prevent the closure of the box door or replacement of the cover when the valve is in the off position. The boxes will be large enough to permit the manual operation of the shut-off valves. The valves will be arranged such that the operation of one valve will not interfere with the proper operation of other valves located in the same box.

7.4.4.14(16) Floors will be served from a minimum of three (3) separate sets of medical gas risers. The mains serving these risers will be looped such that either set of risers can feed the floor if one (1) riser is out of service. The loop mains will be provided with service valves so sections of the floor can be isolated without affecting the remaining floor operation.

7.4.4.14(17) Provide nitrogen at the necessary supply pressure to Operating Rooms to accommodate the use of speciality tools and the Equipment procured.

7.4.4.14(18) Medical gas supply Equipment for patient care spaces will be sized to allow for 20% growth in capacity.

7.4.4.14(19) Decontamination/soiled medical device reprocessing areas, general laboratories, media preparation and tissue culture labs will require CO2, laboratory air and/or nitrogen. Project Co will provide the services required to meet the requirements of the final Equipment and devices procured.

7.4.4.14(20) Nitrogen generators with dedicated air compressors for use with the Facility mass spectrometers will be provided. Nitrogen

generators will be required to provide the quantity and purity of nitrogen required to suit the Equipment procured in the Facility laboratory. Refer to the Appendix 2E [Equipment and Furniture] for the number and location of the outlets/equipment which the nitrogen generator will service.

7.4.4.14(21) The nitrogen generators will be required to be located in a non-clinical area and exterior of the laboratory.

7.4.4.14(22) Performance Criteria

7.4.4.14(22)(a) Provide a zone control valve box complete with zone alarm panel and removable window with pull-out ring at each zone.

7.4.4.14(22)(b) Provide a main alarm panel to monitor all the medical gas systems installed in the Facility.

7.4.4.14(22)(c) Sensing devices will initiate audible and visual alarms on the control panels for the medical air compressor system, medical vacuum system, laboratory air system and the AGSS. All alarms will notify the BMS.

7.4.4.14(22)(d) Provide BMS alarm interface signal to the Facility central system for critical alarms such as high or low pressure. Auditory alarm signals will be clearly audible and produce a sound level of not less than 70 dBA at a distance of 2 metres and will require manual silencing.

7.4.4.14(22)(e) Provide medical gas systems which exceed the minimum valving requirements of CSA Z7396.1-17. This requirement applies to the following areas: Inpatient Care, Minor Procedures G2.5 - Anesthetic Care Unit bays, Outpatient Care Centre, G1.5 - Anesthetic Care Unit bays, Emergency Services, CCU and NICU. The isolation zones will be determined in collaboration with the Owner during detailed design.

7.4.4.14(22)(f) All piping and components of the pipeline distribution systems that come into contact with the medical gases will be supplied clean and free from oil, grease and particulate material and capped or sealed to prevent contamination. On site cleaning of medical gas piping will not be permitted.

7.4.4.14(22)(g) Provide a local alarm panel for each zone. Alarm panels will be connected to the emergency system power supply in conformance with CSA Z32. Remote alarm annunciation will be provided at a location with 24 hour continuous monitoring by personnel. Provide an interconnected status and alarm point and signal to the BMS.

7.4.4.14(22)(h) All local alarm panels will be individually connected to the BMS. Provide an alarm interface signal to the BMS for critical alarms such as low or high pressure. Local alarms will be connected to the emergency system power supply in conformance with CSA Z32.

7.4.4.14(22)(i) All medical gas systems will be certified in accordance with CSA standards by an independent and qualified testing agency. Supply the testing reports to the Owner.

7.4.4.14(22)(j) All systems components requiring electrical power will be connected to the emergency system power supply in conformance with CSA Z32.

7.4.4.14(22)(k) The medical gas supply system will be for Patient consumption only. If Equipment and/or procedure(s) require laboratory air, then provide separate dedicated source Equipment, piping, valving and monitoring to accommodate that application.

7.4.4.14(22)(l) Project Co will conduct all installation tests of the medical gas supply systems required by CSA Z7396.1-17 including leak tests and cross connection tests.

7.4.4.14(22)(m) Project Co will provide the Owner with documented evidence that the operational requirements of the medical gas supply systems have been met.

7.4.4.14(22)(n) Zone valves will be installed immediately outside each anaesthetizing location.

7.5 Heating, Ventilating and Air Conditioning (Division 23)

7.5.1.1 Basic Requirements

7.5.1.1(1) Heating hot water and steam will be produced in the Energy Centre.

7.5.1.1(2) The Energy Centre will be designed to meet the peak coincident load with the largest heating source unit out of operation (N+1 redundancy).

7.5.1.1(3) Pumps, heat exchangers and other ancillary equipment redundancy will match that of the main Equipment. Ensure that no failure of any single pump, fan, variable frequency drive (VFD), or central system control valve will be able to prevent heating of the Facility to the required design conditions.

7.5.1.1(4) Heating and steam boilers will be of dual fuel design and will be capable of operating on natural gas or No. 2 fuel oil by operation of valves and controls only.

7.5.1.1(5) The Facility heating boilers will be the initial source of heat to start-up the Facility and reach acceptable thermal comfort levels. Once the Facility is at operating temperature, recovered heat from the heat recovery system will be the primary source of energy, followed by supplemental heat provided by dedicated heating boilers. The intent is to use recovered heat for Facility heating whenever possible and minimize the use of supplemental energy sources such as Facility boilers and/or the NEU. Refer to Section 7.5.7.4 for requirements on Facility heat recovery chiller plant, as well as other heat recovery clauses in Section 7.5.

7.5.1.1(6) Apply energy heat recovery systems to offset plant heating requirements and supply clean energy to the NEU in the future. Provide analysis of energy savings, life-cycle costing, and maintenance concerns.

7.5.1.1(7) Provide treatment Equipment for introducing cleaners and/or corrosion inhibitors. Provide side stream filters for hydronic systems.

7.5.1.2 Performance Criteria

7.5.1.2(1) Design the heating Equipment to meet the maximum simultaneous Facility demand for all systems served by the Energy Centre plant.

7.5.1.2(2) Energy Centre plant will be capable of controlling and responding to periods of low usage. An acceptable strategy will include using multiple boilers with two of the boilers, each sized for 10% of overall required plant capacity.

7.5.1.2(3) In addition to meeting CSA Z32 and CSA Z317.2 requirements, the heating plant Equipment will be connected to the delayed vital electrical system, such that at least two-thirds of plant capacity is available at all times.

7.5.2 Heating Hot Water System

7.5.2.1 Hot water for heating will be provided from the Energy Centre in accordance with the following:

7.5.2.1(1) The Facility's heating water system will consist of two loops: the primary Facility low temperature heating water loop and the dedicated NEU high temperature heating water loop. The system will be structured to allow each heat recovery chiller, along with associated piping and pumps, to serve either loop to accommodate future replacement with high-lift chillers. The piping connections and valves will allow each heat recovery chiller to be fully decoupled from the others. Refer to Section 7.5.7.4 for heat recovery chiller sizing requirements.

7.5.2.1(2) The primary Facility heating water loop will be a low temperature/gradient heating supply loop running at 48.9°C to serve the following functions at minimum: radiation systems, heating/pre-heat coils within AHUs, reheat coils, and domestic water pre-heat. Other heating elements able to operate at lower supply heating water temperatures may also be served by the primary heating water loop.

7.5.2.1(3) The primary Facility heating water loop will be topped up with heat from gas fired boilers when there is a shortage of heat generated by the heat recovery chillers.

7.5.2.1(4) To facilitate the future heat supply to the NEU, Project Co will provide space for the future NEU heat exchangers sized for 13MW with N+1 redundancy. Project Co will provide space for the future NEU primary side pumps. For planning purposes, assume three (3) pumps with a total capacity of 13MW and a minimum of 150 ft of pump head. Pump head will be confirmed with the City during detailed design.

7.5.2.1(5) The NEU heating water loop will have a connection from the Facility heating water boilers, complete with dedicated piping and pumps, such that the full capacity of the heating water boilers can be injected into the NEU heating water loop if necessary. In addition, provide capped and valved connections in the NEU heating water loop for future connection to the Facility steam boilers. Provide space for future steam-to-water heat exchangers sized for 10MW with N+1 redundancy and as well as associated dedicated piping loops and pumps.

7.5.2.1(6) Provide redundancy in the Facility’s heating gas fired boiler(s) plant such that the initial Facility heating plant requirements will be met with one (1) boiler out of service.

7.5.2.2 Heating water boilers will be of dual fuel design, high efficiency, high mass boilers and configured for condensing operation when operated on natural gas. Provisions will be made to allow the boilers to operate safely on fuel oil; condensing mode is not required while on fuel oil.

7.5.2.3 Boilers will be forced draft type, fully modulating, low NOx, complete with variable speed burner fan, continuous oxygen trim and utilizing electronic ignition and flame sensing. Boilers will include a control package that will monitor all safety functions and will communicate with the overall process control system.

7.5.2.4 Provide primary hot water pumps with VFDs in a quantity that matches that of the boilers, plus one redundant, to distribute hot water throughout the primary loop. Primary pumps to be piped into common supply/return headers such that any pump can serve any boiler. Boiler system will operate on variable flow principles governed by secondary loop demands. Secondary Facility heating water pumping will be with N+1 configuration and ensuring that pumps can unload down to 10% of peak design flow of the smallest boiler. Provide minimum two (2) pairs of supply / return mains between the boilers and the Facility heating water loop.

7.5.2.5 Domestic hot water pre-heating system will be served primarily by recovered heat from the Facility with heat recovery chiller(s), while Facility steam or heating hot water boilers (or gas fired domestic high efficiency generators) will act only as boost-up heating for domestic water systems temperatures. Domestic hot water generation boost-up system will be dual fuel/energy source based system.

7.5.2.6 Sterilization loop and steam boiler feed water system pre-heat will be heated steam condensate, followed by heating boilers, steam boilers or other means of high-grade temperature heat

7.5.2.7 Provide dedicated secondary pumping systems to serve the required loads and to maximize the temperature differential before the water is returned to the Energy Centre.

7.5.2.8 Select heating and reheat coils based on low temperature distribution to maximize primary hot water loop temperature differential and to provide opportunity to use recovered heat. Secondary heating loop supply temperature will be scheduled to 48.9°C (120°F) maximum.

7.5.2.9 Provide automatic isolation valves on the inlet of each boiler.

7.5.2.10 Provide coalescing type dirt and air separator on the primary hot water supply main in the Energy Centre.

7.5.2.11 Provide energy metering to measure the heating load at the supply and return mains; refer to Appendix 3Q [Metering Matrix] for meter details.

7.5.2.12 Modular expansion tanks are to be provided in accordance with system volumes at Service Commencement as well as future system volume. The allowance for

future system volume is an additional 10% over volumes at Service Commencement. Make-up water will be measured via flow meter.

7.5.2.13 Provide for a connection from the NEU to the Energy Centre heating hot water system through NEU heat exchangers. In accordance with the CD-1 (-) Bylaw, Design and / or provide space and connections in the Energy Centre as follows:

7.5.2.13(1) City will provide NEU heat exchangers and supply and install NEU network piping to the property line. All work, downstream of property line, will be part of Project Co scope of work.

7.5.2.13(2) Design the system to the temperature and flow constraints of the City Neighbourhood Energy Connectivity Standards – Design Guidelines. The maximum building return water temperature requirement will be as set out in the standard.

7.5.2.13(3) The system capacity including NEU plant, NEU pumps, and NEU supply and return line from the plant to the Facility, will meet the Facility heating requirements.

7.5.2.13(4) The connections to the future Facility heat exchangers (energy to the NEU) and the City heat exchangers (energy from the NEU) will be configured such that the Facility can supply and receive to and from the heating plant and the heat recovery plant. Provide a dedicated piping loop complete with pumps, valves, energy meters and other associated equipment for heat rejection to the NEU. This loop will be installed as part of the initial Facility requirements to accommodate future Facility heat exchangers and high-lift heat recovery chillers provided by others. This dedicated loop will be connected to the Facility's gas fired heating boilers, with allowance for connection to steam boilers in future, to allow for future heat supply to the NEU from the Facility's boilers in accordance with Section 7.5.8.1

7.5.2.13(5) Provide space within the Energy Centre for the future Facility heat exchangers that will supply heat from the Facility to the NEU, as well as space for City heat exchangers serving the Facility from the NEU as per rezoning conditions and CD-1 (-) Bylaw. Space for all heat exchangers associated with the NEU will be co-located. Refer to Section 7.5.2.1(4) for heat exchanger sizing requirements. All NEU piping on the primary, City side of Facility and City heat exchangers will be fully welded and provided by Project Co. Refer to "Neighbourhood Energy Connectivity Standards – Design Guidelines", and coordinate with City NEU department for detailed additional requirements pertaining to NEU heat exchangers and piping network installation.

7.5.2.13(6) All NEU heating water piping will be installed in accordance with the requirements of this Schedule and applicable standards. All NEU piping external to the Facility will be insulated, protected and direct-buried as per European Standard EN253 and applicable standards. Refer to Appendix 3T [NEU Piping] for additional requirements.

7.5.2.13(7) Space provided for City heat exchangers and the future Facility heat exchangers to supply the NEU will incorporate redundancy to maintain uninterrupted Facility operation while cleaning, repairing, or replacing devices.

7.5.2.14 Provide humidification for the Facility such that all spaces meet the requirements of the standards listed in Section 2.4.

7.5.2.15 Provide centralized steam generation equipment for all humidification and process steam requirements within the Facility.

7.5.2.16 Ensure the feed water quality to steam generators is within the required conditions of the applicable codes, standards, and manufacturer's recommendations for both the generator and the downstream Equipment. Steam quality will be condensate free and minimum 97 % saturated vapour. Refer also to Section 7.4.4 for RO system make-up water requirements feeding steam boilers.

7.5.2.17 Provide connections in the steam system near the point-of-use, which can be used to access the steam for quality measurement.

7.5.2.18 The Project's heating systems will be designed to exceed the energy efficiency requirements of ASHRAE 90.1 as required by the CD-1 (-) Bylaw.

7.5.2.19 In addition, the Project's heating systems will be designed to meet or exceed the Project's energy use target as indicated in Appendix 2D [Energy], including additional requirements set in this Section 7.5 and Schedule 2 [Design and Construction Protocols].

7.5.2.20 The Facility's heat recovery systems, including heat recovery chillers and heat recovery network/sources, are key to ensuring energy efficiency is maximized, lowering operational costs and GHG's and providing opportunity for energy revenue.

7.5.2.21 Maximize future heat recovery supply to the NEU by optimizing use of renewable sources (facility exhaust, process cooling, etc.) within Facility.

7.5.2.22 Refer to Section 7.5.7 for more detailed information on Facility heat recovery.

7.5.2.23 Use of geo-exchange systems is not acceptable.

7.5.3 Steam System

7.5.3.1 Design the steam boiler plant to meet the maximum simultaneous Facility demand for all systems served by the steam boiler plant, as well as being capable of controlling and responding to periods of low usage. The steam plant will be sized assuming no diversity in MDRD steam loads. Redundancy will be based on meeting the final plant capacity with one boiler out of service. All systems will meet the requirements of the standards referenced in Section 2.5. The steam boilers will operate between 80 psi and 100 psi. A minimum pressure of 80 psi will be fed to the MDRD PRV.

7.5.3.2 Steam distribution will be configured to serve the Facility and future loads from a supply header located in the boiler room. Provide two (2) 100 mm (4") valved and capped connections for future loads. Route condensate return piping from each of the aforementioned loads separately to the main condensate tank.

7.5.3.3 Steam boilers will be high mass fire tube-type.

7.5.3.4 Burners will be high efficiency, forced draft type, fully modulating, low NOx, complete with variable speed burner fan, continuous oxygen trim and utilizing electronic ignition and flame sensing. Boilers will include a control package that will monitor all safety functions and will communicate with the overall process control system. Provide both surface and drum blowdown systems and all safety features.

7.5.3.5 Provide stack heat recovery economizers for each steam boiler.

7.5.3.6 Provide steam separators to achieve ideal dryness on outlet of each boiler.

7.5.3.7 Blowdown collection tank will be capable of recovering heat back into the boiler feed water.

7.5.3.8 Provide a main condensate tank with capacity to suit the installed boiler capacity.

7.5.3.9 Condensate transfer pumps will be configured with at least one pump per boiler plus redundancy.

7.5.3.10 Provide a main deaerator with a capacity to suit the installed boiler capacity.

7.5.3.11 Boiler feed pumps will be configured with at least one pump per boiler plus redundancy.

7.5.3.12 Pipe the condensate return system such that boiler operation can be maintained if the deaerator is out of service.

7.5.3.13 Where high pressure condensate accumulates in the plant space, provide flash tank with operating pressure of 35 kPa (5 psi) and recover steam to deaerator.

7.5.3.14 Include steam flow meter on plant main outlet to measure production.

7.5.3.15 Include water flow meter to measure Steam Plant make-up water demand.

7.5.3.16 Provide fully redundant PRV stations in a 1/3, 2/3 arrangement when load exceeds 700 kg/hr (1500 pph). For loads below 700 kg/hr (1500 pph), provide full size, redundant PRVs and globe valve bypass. All PRVs will have isolation valves up and down stream as well as strainers, relief valves, drip-pan elbows and vents to outdoors. Vents of different pressure reliefs will not be combined.

7.5.3.17 PRVs for humidifier operation will be redundant, installed locally, and provide steam at 70 kPa (10 psi). Steam supply to the MDRD will have PRVs with redundancy and partial load sizing per 7.5.3.16.

7.5.3.18 Blowdown tank size will be in accordance with recommendations of National Board of Boiler and Pressure Vessel Inspectors.

7.5.3.19 Provide moisture separators, one (1) for MDRD department, and one (1) moisture separator and steam filter at each sterilizer. Filters will have minimum efficiency of 98 % at 0.1 micron. Provide a bypass around the filter complete with associated valving. Coordinate with Owner selection of steam separators and filters. Use stainless steel piping 316L downstream of the filters to the sterilizers.

7.5.3.20 Plate and frame heat exchangers are not acceptable for steam systems.

7.5.3.21 For steam traps, provide two (2) isolation valves in series upstream of the trap. At minimum, the first isolation valve will have welded connections. For MDRD steam traps, use F&T type steam traps.

7.5.3.22 For steam systems operating at 50 lbs or greater, all piping, fittings, and connected components will be rated for 300 lbs at minimum.

7.5.4 Stack

7.5.4.1 Provide a structural stack for the boilers and emergency generators.

7.5.4.2 Provide individual flues for each hot water heating boiler, steam boiler and generator. Flues will be guided within the outer shell of the stack to allow for expansion. Flues will be individually insulated.

7.5.4.3 Flues will terminate at a height that complies with applicable codes, standards, regulations and will not permit entrainment into Facility air intakes and openings. Stack will be freestanding above the height of the Energy Centre.

7.5.4.4 Stack material will be of a uniform colour and finish, and not require ongoing maintenance.

7.5.4.5 Wind loading, seismic zone, exposure factor and deflection will be in accordance with the VBBL.

7.5.4.6 Provide lighting and markings in accordance with Transport Canada standards.

7.5.4.7 Provide external access ladders with safety rail system and platform(s).

7.5.5 Fuel Systems - Boilers

7.5.5.1 Provide protected tanks, in capacities not exceeding 45,000L each for the boiler systems backup. All fuel tanks to be in individual 2-hour fire rated rooms.

7.5.5.2 Primary storage fuel tank(s) capacity will be sufficient for 72 hours of operation at the combined design nameplate MBH (input) prime rating of all boilers. Boilers primary storage fuel tanks are to be interconnected with generator primary fuel tank(s), complete with manual locked valve.

7.5.5.3 Provide duplex fuel pump package to supply 2.5X the flow of aggregate boiler demand. Duplex set to be run/ standby with dedicated pump control panels for true redundancy.

7.5.5.4 Provide anti syphon valve on the supply line from the storage tanks to the fuel supply header.

7.5.5.5 All storage tank fuel supply lines to be piped into a common header with individual automatic solenoid or electronic valves acting as tank selectors. Header to be provided with drain and priming connection.

7.5.5.6 Duplex pump set to send fuel oil through supply loop disseminating fuel to all boilers in parallel. Provide an oil de-aerator complete with oil filter for each boiler.

7.5.5.7 Supply back pressure valve at end of supply main to maintain an upstream pressure on the suction of each burner of no more than 20 kPa or the pressure required by the Equipment for proper operation.

7.5.5.8 All excess fuel pumped and returned from boilers will be piped into a common header with individual return lines along with automatic solenoid valves returning fuel to each tank.

7.5.5.9 Provide fully automated fuel management system, integrated with the BMS.

7.5.5.10 Individual fuel fill wall-mounted cabinets with overfill alarm and vents will be provided in accessible location for a fuel tanker, yet as discreet as possible.

7.5.5.11 Provide new intermediary, let-down pressure station for natural gas to Energy Centre sized to supply all boilers at peak demand. Location to be architecturally screened such that it’s obstructed from view, secured and protected with bollards.

7.5.5.12 Provide fuel polishing system as per Section 7.2.

7.5.5.13 Provide propane bottles with regulators and protective cage to feed pilots and facilitate fuel oil ignition; plumb to respective appliances as per manufacturer’s requirements. Provide additional bottles or capacity, if required. Volume and capacity of propane bottles installed within Energy Centre/mechanical room is to meet the maximum limits defined in BC Fire Code.

7.5.5.14 Fuel oil pumps, power feed, controls, and associated monitoring and management system will be located above the Flood Construction Level.

7.5.6 Fuel Systems - Generators

7.5.6.1 Provide protected fuel storage tanks, in capacities not exceeding 45,000L each for the backup emergency generators. All fuel storage tanks to be in individual 2-hour fire rated rooms. Alternatively, the main fuel storage tanks may be installed outdoors underground in which case larger tanks are permitted by the applicable standards.

7.5.6.2 Final storage capacity in main tanks will be sufficient for 72 hours of operation at full nameplate prime kW rating of all emergency generators combined.

7.5.6.3 Provide dedicated fuel oil day tanks for each emergency generator along with all safeties, protections and valves to meet CSA B139. Day tanks to be sized based on a minimum of eight (8) hours of runtime at nameplate prime kW rating of the associated generator, or 5 000L, whichever is smaller. Provide means to transfer fuel between day tanks so that if one generator is offline and the main tanks are unavailable, all of the fuel within day tanks can be used.

7.5.6.4 Provide duplex fuel pump package supplying 2.5X the aggregate flow of generators' demand. Duplex set to be run/ standby with dedicated pump control panels for true redundancy.

7.5.6.5 Provide anti-syphon valve on supply line from the main storage tanks to the fuel supply header.

7.5.6.6 All storage tank fuel supply lines to be piped into a common header with individual automatic solenoid or electronic valves acting as tank selectors. Header to be provided with drain and priming connection.

7.5.6.6(1) Fuel supply loops and risers supplying generators will be fully redundant.

7.5.6.7 All day tank overflows will be returned by gravity and piped into a common header. Thereafter, individual gravity return lines along with automatic solenoid valves, return fuel to each main storage tank.

7.5.6.8 Provide fully automated fuel management system, integrated with the BMS.

7.5.6.9 Individual wall-mounted fuel fill cabinets with overfill alarm and vents will be provided in accessible location for a fuel tanker yet as discreet as possible.

7.5.6.10 Provide fuel polishing system as per Section 7.2.

7.5.6.11 Fuel oil pumps, power feed, controls, and associated monitoring and management system will be located above the Flood Construction Level.

7.5.6.12 Mechanical filters upstream of each generator will be fully redundant.

7.5.7 Cooling

7.5.7.1 Basic Requirements

7.5.7.1(1) Chilled water will be produced in the Energy Centre. The design and operation of the Energy Centre will be optimized to allow energy recovery for heating purposes and to minimize the cost of operation.

7.5.7.1(2) In addition to meeting CSA Z32 and CSA Z317.2 requirements, cooling plant Equipment will be connected to the delayed vital electrical system such that critical cooling and 24/7 cooling loads are served at all times.

7.5.7.2 Main Chilled Water and Facility Heat Recovery Chiller System Common Requirements include:

7.5.7.2(1) All chillers will be selected with low water side pressure drop through evaporator and condenser sections and performance/efficiency in mind. Single and two-pass heat exchangers are acceptable. Three-pass and higher are not acceptable.

7.5.7.2(2) Each chiller plant will be configured in a parallel arrangement with means of automatic isolation of each chiller prevent flow through inactive units.

7.5.7.2(3) Each chiller plant will be designed with minimum 8.5°C [15°F] temperature differential to minimize pumping power.

7.5.7.2(4) Design each chilled water system with a fully variable flow strategy through chillers and Facility chilled water loop, to reduce system pumping power.

7.5.7.3 Main Chilled Water System

7.5.7.3(1) Design the cooling plant to meet the maximum simultaneous Facility demand for all systems served by the cooling plant, as well as being capable of controlling and responding to periods of low usage. Systems include air handling units, fan-coil units, and heat recovery coils. All chillers will unload down to 15 % of rated capacity, to accommodate Facility part load conditions. All systems will meet the requirements of the standards referenced in Section 2.4.

7.5.7.3(2) All chillers are to be institutional grade with magnetic bearing technology. A modular chiller system is not acceptable.

7.5.7.3(3) Chilled water distribution will be configured to serve the Facility and future loads from supply and return headers located in the chiller room. Provide valved connections for the Facility and two (2) 100 mm diameter connections for future loads.

7.5.7.3(4) Energy Centre main chillers will be water cooled, high efficiency, electrical centrifugal chillers utilizing magnetic bearings, rated in accordance with AHRI 550/590. No absorption chillers may be used. Chillers will utilize non-CFC refrigerant and will meet LEED requirements.

7.5.7.3(5) Chillers will have minimum 10% higher efficiency than called for by ASHRAE 90.1-2016 standard at AHRI testing conditions. The 10% higher efficiency is to be achieved at ASHRAE design conditions for 25 %, 50%, 75 % and 100% loading. The IPLV rating of each chiller will be minimum 10% better than required by ASHRAE 90.1.

7.5.7.3(6) Chiller control sequences will include chiller staging to maximize the overall plant efficiency at all loading conditions.

7.5.7.3(7) Chiller control sequences will also include chilled water temperature and system differential pressure reset and variable water flow. Base chilled water temperature and differential pressure reset on tracking position of all control valves (positive feedback).

7.5.7.3(8) Provide continuously available 24/7 cooling for all areas containing specialized Equipment such as Diagnostic Imaging and continuous internal heat gains such as elevator machine rooms, server rooms, electrical, UPS and Communications Rooms via a process chilled water loop that can operate either independently or interconnected with the main chilled water system.

7.5.7.4 Facility Heat Recovery Chiller System:

7.5.7.4(1) Design the heat recovery chiller plant that will minimize need for additional facility heating, supplemented by heating boilers or NEU. Maximize potential revenue from future supply to the NEU.

7.5.7.4(2) Recover all heat from heat recovery coils installed in locations as described in Section 7.5.

7.5.7.4(3) Recover all heat from any other sources such as process cooling via chilled water and similar.

7.5.7.4(4) Design the heat recovery chiller plant to meet the maximum simultaneous Facility heating and cooling demand including heat extracted by all other heat recovery coils. To respond to periods

of low usage, the chiller plant will be capable of controlling and unloading down to 17% of the combined rated plant capacity while maintaining performance as set out in Section 7.5.7.4. All systems will meet the requirements of the standards referenced in Section 2.4.

7.5.7.4(5) All chillers will be custom, industrial grade and accommodate the Facility heating system temperature requirements. Modular chiller systems are not acceptable.

7.5.7.4(6) Chillers will be water cooled, high efficiency, electrical screw chillers rated in accordance with AHRI 550/590-15. Chillers will utilize non-CFC refrigerant and will meet LEED requirements.

7.5.7.4(7) Chillers will have minimum 10% higher efficiency than is required by ASHRAE 90.1 at AHRI testing conditions.

7.5.7.4(8) Heat recovery chillers will be sized for 8 MW of heat production and located within the Energy Centre. Chillers provided by Project Co will be sized to meet the temperature requirements of 7.5.7.4; however, space will be provided to accommodate future replacement with high-lift heat recovery chillers capable of producing 65°C on the NEU primary side, with leaving source water temperatures as low as 4°C. Spare power capacity in the transformers and switchgear serving the chillers will be sufficient to accommodate future replacement with high-lift chillers. Heat recovery chillers will be arranged to extract heat from the main chilled water system. The configuration will be such that heat recovery chillers will serve as additional main chillers, providing additional back-up or additional capacity during extreme heat cooling loads including catastrophic event cooling loads, supporting the main chiller plant.

7.5.7.4(9) Provide redundancy such that at least 50% of the plant's capacity is maintained with the largest chiller out of service. The plant will be configured such that 50% of the capacity will be fed from one (1) electrical feeder and 50% from a second feeder. Provide chiller redundancy such that a failed chiller can be repaired, removed or replaced while maintaining continuous Facility operations.

7.5.7.4(10) Heat recovery to be provided by separate, multiple-compressor chillers capable of heat recovery operation.

7.5.7.4(11) Optimize heat recovery from the chiller system such that all heat extracted from the main chilled water system/condenser water can be recovered to provide heat to the Facility and the Energy Centre, in accordance with Section 7.5.9.1(18). Recovered heat uses include all Facility heating, reheat, domestic hot water

preheating and domestic hot water heating. Full or partial heat rejection to the cooling towers will be enabled when the ability to use the recovered heat is reduced or not available.

7.5.7.4(12) Extract heat that is in excess of Facility's heating needs from the Facility's chilled/condenser water loop and reject to the atmosphere through the Facility cooling towers. The system design will accommodate future excess heat rejection to the NEU network.

7.5.7.4(13) The heat recovery chillers and associated plant systems will be capable of producing Facility heating water supply temperatures.

7.5.7.4(14) Allow for valved and capped condenser/chilled water piping connections and space for pumps, chiller(s), transfer station, and other associated equipment required for installation of a future high-lift heat recovery chiller plant meeting the performance criteria of Section 7.5.7.4 to generate up to 5MW of heat supplied to the NEU from the Facility. Spare power capacity in the transformers and switchgear serving the chillers will be sufficient to accommodate these future high-lift chillers. This space will be co-located with the Facility heat recovery plant. The Design will allow for future equipment/system(s) to be easily integrated and:

7.5.7.4(14)(a) Include for all work, controls and infrastructure, to accommodate system installation in the future. Coordinate with other trades including Section 7.8 Division 26.

7.5.7.4(15) In primary-secondary chilled water loop configuration, provide dedicated primary chilled water pumps with VFDs in a quantity equivalent to the number of the chillers, sized to be capable to unload down to 25% of peak design flow of the smallest chiller. Interconnect the supply/return mains with isolation valves such that any pump can serve any chiller. Secondary Facility chilled water pumping will be with N+1 configuration and ensuring that pumps can unload down to 25% of peak design flow of the smallest chiller. Provide minimum two (2) pairs of supply / return mains between the chillers and the Facility chilled water loop.

7.5.7.4(16) Provide condenser water pumps with VFDs in a quantity that matches that of the chillers, sized to be capable to unload down to 25% of peak design flow of the smallest chiller. Interconnect the supply/return mains with isolation valves such that any pump can serve any chiller or cooling tower. Provide two (2) pairs of condenser water supply / return mains between the chillers and the cooling towers. The piping arrangement will permit

replacement of condenser water mains while allowing the plant to continue delivering design cooling capacity.

7.5.7.4(17) The Energy Centre will be designed with sufficient back-up capacity and redundancy in accordance with CSA Z317.2, in addition the following will be provided:

7.5.7.4(17)(a) Ensure that no failure of any single pump, fan, variable frequency drive (VFD), or central system control valve will be able to prevent cooling of the Facility to the required design conditions.

7.5.7.4(17)(b) The chilled water system will be configured to avoid use of pressure break heat exchangers.

7.5.7.4(17)(c) Provide multi-cell induced draft cooling towers, with condenser water to cells valved to isolate individual cells while keeping the remainder of the cooling tower operational at full design capacity. Locate the cooling towers to ensure cooling tower discharge does not enter the Facility or any other buildings through air intakes or other openings. Provide each tower wet basin as all stainless steel construction, a galvanized tower housing, and copper coil construction. Provide towers with a ladder and maintenance access platform to service all sides of each tower. Provide high-level anti-slip walkway complete with guardrails for maintenance to the top of cooling towers. Provide walking platform inside the basin and provide discharge isolation dampers. Provide a cooling tower sweeper system. Provide a gantry crane with fixed supporting structure or davit arm supplied with cooling tower manufacturer, to facilitate servicing each cooling tower. Make-up water to the cooling towers will be measured via flow meter and the capacity of the makeup water system will meet the flow requirements anticipated in year 2080.

7.5.7.4(18) Provide energy meters on the main chilled water loop and condenser water loop; refer to Appendix 3Q [Metering Matrix].

7.5.7.4(19) Provide energy meters on the heat recovery chiller condenser loop to measure the heat recovered from the chillers; refer to Appendix 3Q [Metering Matrix]. Chilled water plant is to operate on variable primary flow principles governed by Facility demands. Chillers are to be selected to operate on variable flows through both the evaporator and condenser.

7.5.7.4(20) For winter operation of chillers, sufficient cooling tower capacity in an N+1 arrangement will be winterized, and heat traced. The winterized cooling tower section will be easily isolated from the rest of the array when seasonal equipment is drained.

7.5.7.4(21) Provide automatic isolation valves on the inlet side of each chiller and cooling tower.

7.5.7.4(22) Provide coalescing type dirt and air separator on chilled water supply main leaving the Energy Centre. Provide side stream cartridge filters, chemical pot feeders, and corrosion coupons for all chilled water systems.

7.5.7.4(23) Provide water treatment packages for the condenser water systems. Provide treatment Equipment for introducing corrosion inhibitors and biocides into the cooling towers. Provide packaged high efficiency solids separators.

7.5.7.4(24) Modular expansion tanks are to be provided in accordance with designed system volumes. Make-up water to the chilled water system will be measured via flow meter.

7.5.7.5 Performance Criteria

7.5.7.5(1) Provide Equipment for all necessary cooling, including the required redundancy in the cooling systems and cooling required by Facility systems in a post-disaster event.

7.5.7.5(2) Provide AHU's capable of 100% outdoor air for free cooling despite the heat recovery strategies described in this Schedule. Apply sensible and latent energy recovery systems to offset plant cooling requirements.

7.5.7.5(3) Cooling towers will be provided with variable speed controllers on all motors. Provide sump heaters for cooling towers designed to operate in winter. Sump heaters and sump water level will be integrated into the BMS.

7.5.7.5(4) Chilled water plant to be controlled to optimize operation based on outdoor temperature and cooling demand.

7.5.7.5(5) Cooling tower performance will be certified in accordance with Cooling Tower Institute Standard STD-201. No open-type cooling towers are allowed except spray coil (closed circuit evaporative fluid cooler) type cooling towers. Install cooling towers such that they:

7.5.7.5(5)(a) are located away from fresh air intakes; and

7.5.7.5(5)(b) do not emit water vapours that interfere or could interfere with helicopter operations.

7.5.7.5(6) Chillers and cooling towers will be designed and located so as not to have an adverse effect on the mechanical systems for this Facility or any adjacent building.

7.5.7.5(7) Provide chillers and cooling towers for ease of operation, accessibility for maintenance, safety and appearance.

7.5.7.5(8) Installation will comply with Legionella Mitigation Plan described in Section 2.5.6.

7.5.7.5(9) The cooling systems will be designed to exceed the Project's energy target.

7.5.8 Space Heating and Cooling

7.5.8.1 Basic Requirements

7.5.8.1(1) HVAC system will provide a comfortable internal environment for the Patients and Staff and will meet the required environmental conditions for the equipment.

7.5.8.1(2) Provide all necessary space, ventilation and process heating for the Facility.

7.5.8.1(3) Space heating and cooling capacity will be sufficient to meet the required indoor design temperature and relative humidity to comply with the Standards referenced herein including CSA-Z8000 and CSA Z317.2.

7.5.8.1(4) Space heating capacity will be sufficient to meet the required indoor design temperatures to comply with the standards referenced in Section 2.4 while using the January 1% outside design temperature for the City as outlined in the VBBL.

7.5.8.1(5) Space cooling capacity will be sufficient to meet the required indoor design temperatures to comply with the standards referenced in Section 2.5 while using the July 2.5% outside design wet and dry bulb temperatures for the City as outlined in the VBBL.

7.5.8.1(6) Connect sources of heating that serve CSA Type I and Type II spaces to electrical power in accordance with CSA Z32; refer to Section 7.8.4.2(20).

7.5.8.1(7) Provide air curtains at regularly used entrances as described in Section 5.6.3.1 which will prevent cold drafts from entering the adjacent occupied space.

7.5.8.1(8) Design pumps to:

7.5.8.1(8)(a) Operate at the system fluid temperature without vapour binding and cavitation with a minimum 1 m net positive suction head (NPSH) curve, at design flow;

7.5.8.1(8)(b) Be non- overloading in parallel or individual operation;

7.5.8.1(8)(c) Operate within 25% of the midpoint of published maximum efficiency curve; and

7.5.8.1(8)(d) Incorporate a variable frequency drive (VFD) for pumps with 3HP or higher motors for energy savings under part-load conditions.

7.5.8.1(9) Ensure pump construction and installation will permit complete pump servicing without disrupting piping or motor connections. Close coupled pumps will only be permitted on motor sizes less than 3hp.

7.5.8.1(10) Insulate all piping subject to condensation, freezing, heat tracing, heat losses (heating piping) or heat gains (chilled water piping), as well as all heat recovery loop piping and other commonly insulated piping, equipment and accessories in accordance with all applicable standards as a minimum.

7.5.8.1(11) Provide seismic mitigation and Facility separation devices for all piping that crosses Facilities and/or utility corridors.

7.5.8.1(12) Ensure that no air within the air conditioning system, outside of the central air handling equipment, drops below its dew point temperature.

7.5.8.1(13) All refrigerants used will be environment friendly and will comply with the Project’s LEED rating target and all current Standards.

7.5.8.1(14) Once through cooling with domestic water is not permitted for any process or service within the Facility, except as an emergency back-up for chilled water terminal units serving critical cooling loads as reviewed by the Owner.

7.5.8.1(15) Provide continuously available chilled water or condenser water systems for all areas containing specialized medical equipment, Communications Rooms, elevator machines, server systems and Electrical Rooms for managing continuous internal heat gains. Cooling and heat rejection for these critical loads may be served by the central cooling plant provided the system incorporates

redundancy per CSA Z317.2 requirements and is connected to the delayed vital electrical system. Design HVAC terminal components in conjunction with equipment location in order to mitigate unnecessary heat gain into the space.

7.5.8.1(16) Provide back-up cooling for medical imaging Equipment and other specialized medical Equipment with critical cooling loads as determined by the Owner as follows:

7.5.8.1(16)(a) For water cooled Equipment, provide a domestic cold water connection and drain line piped to a nearby hub drain for connection to the Equipment chilled water inlet and outlet in a switchover arrangement. This system will be enabled automatically during a failure of the chilled water distribution and provide once-through-cooling for emergency use only; and

7.5.8.1(16)(b) For air cooled Equipment, provide N+1 redundant terminal units serving rooms housing Equipment with critical cooling loads. Additionally, if these terminal units are supplied with chilled water, provide back up once-through-cooling for emergency use during a failure of the chilled water distribution as described in Section 7.5.8.1(16)(a).

7.5.8.1(17) Diagnostic imaging machines including MRI, CT, PET/CT utilizing liquid cooling will incorporate special filtration of water sources or utilize a closed-loop system, in accordance with the manufacturer's requirements. Coordinate with Appendix 2E [Equipment and Furniture].

7.5.8.1(18) Provide continuously available chilled water for the water cooled condensing units for the Food Services and all other walk-in refrigerators, freezers, and cold rooms. Make final connections to the condensers and provide back-up once-through-cooling as per Section 7.5.8.1(16)(a) for emergency use only. Provide refrigerant piping between the condensers and the respective refrigerator, freezer or cooler, charge with refrigerant and oil and fully commission. Refer to Appendix 3F [Food Services Equipment List].

7.5.8.1(19) Provide chilled water to walk in refrigerators and provide with dual condensers connected for redundancy. Additionally provide back-up once-through-cooling as per Section 7.5.8.1(16)(a) for emergency use only. Review the Equipment Summary located in Appendix 2E [Equipment and Furniture] and Appendix 3F [Food Services Equipment List].

7.5.8.1(20) Space heating for the decontamination suite will be by radiant means to ensure minimal air velocity within the space.

7.5.8.1(21) Provide N+1 redundant HVAC terminal component units for cooling of the following spaces at minimum: Communications Rooms, server rooms, main Electrical Rooms, Unit Substation rooms, UPS rooms, and other spaces where continuously available cooling is required for critical Facility operations as determined by the Owner. Where Electrical and Communication Rooms share the same cooling equipment and ductwork, provide ducted return with balance dampers. Where chilled water fancoil units are used to serve Electrical or Communication Rooms, include reasonable means to shield any electrical equipment and to redirect and drain piping leaks away from the electrical equipment, including future electrical equipment in the same space.

7.5.8.1(22) If terminal units for spaces listed in Section 7.5.8.1(21) require pressurized pipes containing liquid of any kind, design the system to minimize the risk of leakage and provide leak detection systems integrated with the BMS.

7.5.8.1(23) Provide minimum three (3) sets each of heating and chilled water risers and minimum two (2) steam risers through the Facility. Interconnect the risers on each floor with isolation valves. Arrange the piping and provide sufficient isolation valves on risers and interconnecting pipes such that portions of the risers may be isolated to facilitate repair or future renovations, while not impacting operation of occupied areas.

7.5.8.1(24) Provide a glycol snow melt system at all exterior ramps where sloped at 6% or greater. Provide 100% redundancy in source components.

7.5.8.1(25) The Bed Bug Sauna room contains a sauna used to kill bed bugs and cockroaches. If pre-fabricated sauna equipment is not provided by Project Co, provide specialized heating and ventilation meeting the following performance criteria at minimum:

7.5.8.1(25)(a) Heating systems will be sized to maintain the room at 65C for 60 minutes, and will reach 65C within 10 minutes of heating cycle activation.

7.5.8.1(25)(b) Room air will be exhausted and not returned to Facility air handlers. Ventilation equipment operation will be interlocked with sauna operation such that airflow automatically stops when the heat

cycle is activated and resumes when the heat cycle concludes.

7.5.8.1(26) Air from Patient Rooms with tubs in the Maternity Centre Component will be connected to the general exhaust system and not returned to Facility air handling units.

7.5.8.2 Performance Criteria

7.5.8.2(1) Install piping in an orderly manner aligned with structural elements and at right angles. Slope piping to permit complete drainage of the system. Make allowances in all pipe sizing to provide flexibility for Future Expansion.

7.5.8.2(2) Install equipment and piping with adequate service space, access panels and the ability to remove equipment for servicing or replacement. Locate services that require access for regular maintenance above non-critical spaces, such as corridors, to minimize or eliminate disruptions to the delivery of health care services. Coordinate placement of ceiling devices to ensure sufficient access to ceiling spaces.

7.5.8.2(3) Equip all high points in piping with air removal devices such as air collection chambers and air vents. Do not locate automatic air vents above the ceilings of occupied spaces.

7.5.8.2(4) Provide isolation valves, unions, and bypass piping to allow for equipment isolation and removal without unduly affecting the system operation or major drain down.

7.5.8.2(5) Provide auto flow balancing valves, flow-measuring devices, and temperature and pressure sensors throughout the system to facilitate system balancing.

7.5.8.2(6) Ensure all piping is accessible. No in-slab or under-slab piping is permitted.

7.5.8.2(7) Room return air in specific spaces indicated in CSA Z317.2 will not recirculate within the terminal units serving the space.

7.5.8.2(8) Any ventilation and/or radiant heating sources serving Type I and Type II areas will be connected to the Facility's emergency power supply.

7.5.8.2(9) Insulate all chilled water and condenser water piping, equipment and accessories in accordance with the most stringent of applicable Standards, including BCICA and ASHRAE standards. Provide a canvas or PVC service jacket on all exposed piping

inside; exterior piping will have aluminum jacketing. Provide PVC jacketing for services in underground parking areas.

7.5.8.2(10) Chilled water, heating water, and condenser water piping will be Schedule 40 Steel or Type L copper. Copper piping for run outs and coil connections will be soldered with lead free or 95/5 solder.

7.5.8.2(11) Utilize screw fittings for 50 mm piping and smaller and welded fittings for 65 mm piping and larger for steel piping.

7.5.8.2(12) Grooved joint fittings for piping of 65 mm and larger can be used only in accessible areas inside the Facility where access can be achieved without removal of equipment or other materials such as ductwork. Grooved joint fittings use is acceptable only in crawl spaces, interstitial spaces, fan and mechanical rooms, and for low temperature hot water (lower than 60°C), chilled water and condenser water piping. Grooved joints fittings will be supported by the manufacturer and backed up with a minimum of 25 years warranty inclusive of parts and labour, with proven use in hospitals.

7.5.8.2(13) CFC and HCFC based refrigerants will not be used in the refrigeration equipment.

7.5.9 Ventilation

7.5.9.1 Basic Requirements

7.5.9.1(1) Provide all necessary ventilation for all spaces to comply with the Standards referenced in Section 2.4, including CSA Z8000 and CSA Z317.2. Submit calculations for review by the Owner. Include SMACNA recommended duct leakage rates for sizing air systems.

7.5.9.1(2) Design the air handling equipment for the Facility to provide 100% outdoor air capability at all times of the year. Requirement for 100% outside air includes operation during fire mode smoke control sequences and an internal catastrophic event. In addition, with regards to AHU's structure, zoning and ductwork network, and control strategy, Project Co will be required to achieve, at a minimum, the following requirements:

7.5.9.1(2)(a) Compliance with VBBL Division B, Part 3, clauses such as 3.3.3.5, 3.3.3.6, 3.3.3.7 and clause 3.1.8.7;

7.5.9.1(2)(b) Compliance with CSA Z317.2-2015 applicable clauses concerning smoke control management; and

7.5.9.1(2)(c) In addition to VBBL Division B, Part 3, clause 3.3.3.5, provide all these areas (similarly to areas covered by clauses 3.3.3.6 and 3.3.3.7) with a mechanical supply air so that during a period of two (2) hours, after the start of a fire in another space, compartments will not contain more than 1% by volume of contaminated air from the fire area.

7.5.9.1(3) The Education and Leaning spaces, administration spaces, meeting spaces, and Energy Centre ventilation systems may be designed to ASHRAE Standard 170 for Healthcare Facilities provided these spaces are not served from a common ventilation system serving the Facility.

7.5.9.1(4) Design all rooms in the Surgical and Interventional Services to support invasive procedures in accordance with applicable CSA Z317.2 guidelines. .

7.5.9.1(4)(a) Two (2) Operating Rooms and one (1) Operating Room – Hybrid will be designed with the ability to switch into airborne isolation (AI) mode. Provide HVAC infrastructure, HMI's, and BMS sequences to support the switch between normal and AI modes. Ante-rooms will be provided; the Owner is considering both temporary and permanent ante-rooms. Provide UV and HEPA filtration on return air ductwork from each room and associated ante-room.

7.5.9.1(5) In addition to the requirements of CSA Z317.2, design the ventilation systems such that all areas designated as Outbreak Control Zones can operate to mitigate the spread of infections during an outbreak. The ventilation system will be:

7.5.9.1(5)(a) Easily converted by the Facility operator into a negative pressure condition with respect to adjacent floor areas by proportionally changing the supply, return, and exhaust air ratio for all rooms within the zone. A set of corridor doors at the entrance to each Outbreak Control Zone will be closed to create an anteroom and a room differential pressure monitor will be enabled;

7.5.9.1(5)(b) Programmed into the BMS system with the required settings such that the Outbreak Control Zone settings for each zone can be implemented with a single command;

7.5.9.1(5)(c) Easily configured to ensure that no airborne infection can be re-circulated into any ventilation system from any Outbreak Control Zone. HVAC system will be able to maintain CSA Z317.2 Table 1 requirements while in outbreak control mode;

7.5.9.1(5)(d) Commissioned, balanced and demonstrated to the Owner in real time as part of the verification process prior to Service Commencement. Refer to Section 5.5 for additional requirements; and

7.5.9.1(5)(e) Sized to accommodate the following nine (9) spaces operating as Outbreak Control Zones simultaneously: A1.8 – Clinical Decision Unit, B1 – Critical Care Complex Unit 01, B2 – Critical Care Complex Unit 02, and one of two zones in each IPU 64-Bed Group (C1 through C6).

7.5.9.1(6) Provide HVAC systems that maintain appropriate pressure relationships between various areas of the Facility and provide necessary outdoor air quantity, air filtration, cleansing and exhaust to control the transmission of infection. Refer to applicable infection control standards and CSA Z317.2- for the relative pressurization and other minimum indoor air quality requirements for the Facility.

7.5.9.1(7) Provide HVAC systems with adequate backup capacity and equipment redundancy to ensure continuous Facility operations at all times.

7.5.9.1(8) Ventilate compartments containing inpatients, areas of refuge and Contained Use Areas as per Part 3 of the VBBL. Ventilate the Facility to also comply with the additional requirements for high buildings as per Part 3 of the VBBL. Arrange duct shafts and duct mains to minimize or eliminate use of fire wrap on ducts.

7.5.9.1(9) Provide air handling units with sectional changeover coils and manual isolation valves that will enable isolation and repairs to the damaged sections of coils without stoppage of the system. Provide air handling units with freeze/burst proof switchover coils.

7.5.9.1(10) Design and construct the Facility to comply with the requirements of CSA Z317.2 for a Class A-1 HCF (Healthcare Facility), except as follows:

7.5.9.1(10)(a) Air handling systems (supply, return, and exhaust) will be provided with sufficient redundancy such that in the event of a failure or scheduled shutdown of one (1) unit there will be no disruptions in Facility

operation. CSA Type I spaces will maintain 100% redundancy. CSA Type II and III spaces will maintain 70% redundancy.

7.5.9.1(11) HVAC systems for Communications Rooms will condition the spaces to meet temperature and relative humidity requirements as per the most restrictive of ASHRAE 2015 Environmental Guidelines for Datacom Equipment, TIA-942-A-2012, or the following:

7.5.9.1(11)(a) Temperature: 18-27 °C [64-81 °F] dry bulb;

7.5.9.1(11)(b) Maximum relative humidity: 60 %;

7.5.9.1(11)(c) Maximum dew point: 15 °C [59 °F]; and

7.5.9.1(11)(d) Maximum rate of temperature change: 5 °C [9 °F] per hour.

7.5.9.1(12) Coordinate with electrical and IM/IT equipment requirements to determine the cooling loads in Communications Rooms.

7.5.9.1(13) For clusters of Airborne Isolation Rooms, inpatient units and floors for infection control, provide dampers of sufficient quality to ensure minimal leakage of airflow. Provide pressure sensors and end switches for dampers to ensure isolation has been achieved.

7.5.9.1(14) Provide air filtration in accordance with all applicable standards. Provide a minimum filtration level of MERV 8 on all outdoor air intakes with the exception of generator radiator cooling air intakes. Ensure all HVAC systems will perform such that any indoor contaminants are maintained at less than 50% of their occupational exposure limits (OELs).

7.5.9.1(15) Provide dedicated supply air with HEPA filters for spaces as required by applicable standards. In addition to the HEPA filters required by CSA Z317.2 and the required primary HEPA filters at the air handling units, provide each Operating Room, Operating Room-Hybrid and Interventional Suite with dedicated duct-mounted HEPA filter sections/racks. These filter racks will be in addition to HEPA filters located in air handling units and installed downstream of reheat coils. Dedicated duct-mounted HEPA racks described will not require filters provided as part of this contact. Air handling unit fans will be sized for both HEPA filters being in operation. All equipment serving Surgical and Intervention Services Component, such as VAV terminal units, reheat coils, HEPA filters (complete with test ports before and after HEPA filters), control valves, isolation valves on various other piped systems (plumbing, medical gases, etc.) will be accessible for

replacement and testing from mechanical spaces to avoid the need for any maintenance/servicing within the above-mentioned spaces.

7.5.9.1(16) Provide the ventilation system and all components in accordance with all applicable standards, including ASHRAE and CSA standards.

7.5.9.1(17) Provide fans with Variable Frequency Drives (VFDs) for energy savings under part-load conditions. Select motor starters in accordance with Section 7.8.7.2. Motor loads of 100 hp or greater will be provided with reduced voltage motor starter acceptable to BC Hydro.

7.5.9.1(18) Provide a heat recovery system with heat recovery hydronic coils on all Facility exhaust and relief air systems except highly contaminated exhaust. Air to air heat recovery including heat wheels are not permitted. Chilled water heat extraction coils, protected by filters, will be selected for minimum 15°F water side temperature differential to minimize pumping power. Each heat recovery coil will be selected to extract both sensible and latent heat to 48°F WB. Heat recovery systems will include a bypass for heat recovery coils and air filters for use when there is no demand for heat to avoid inefficient fan use. In addition to bypass motorized dampers, provide motorized isolation dampers upstream and downstream of the heat recovery coils for servicing purposes, to ensure that servicing personnel are not exposed to exhaust stream during maintenance/servicing. Where heat recovery coils are part of exhaust systems serving AIR rooms and Outbreak Control Zones equipped with HEPA and UV, provide means of additional controls/ monitoring to be able to control sensible cooling only.

7.5.9.1(18)(a) All heat recovery coils on Air Handling Unit relief air will be sized for air handling unit maximum air flow to enable maximum heat recovery during 100% economizing conditions. The intent is to operate in economizing mode whenever possible to promote over ventilation and improved indoor air quality without reducing heat recovery capacity.

7.5.9.1(18)(b) Heat recovery coils are not required on exhaust or relief air from underground parking areas and mechanical spaces.

7.5.9.1(18)(c) Heat recovery coils are not required in exhaust or relief air streams where the flow rate is under 710L/s (1500CFM).

7.5.9.1(19) Provide factory-fabricated air handling equipment to ensure the highest construction standard. The controls contractor will provide the associated monitoring and controls for connection to the BMS.

7.5.9.1(19)(a) Air handling units will have double-walled construction with minimum 50 mm thick insulation, galvanized steel exterior, stainless steel or painted aluminum interior.

7.5.9.1(19)(b) Air handling unit floors will be reinforced minimum 3 mm aluminum or 14 ga stainless steel checker plate with continuously welded seams. Base will be structural steel minimum 150 mm C-channel around perimeter.

7.5.9.1(19)(c) Interior surfaces of air handling units will be light in colour, washable, smooth, non-porous and free of obstructions that may impede airflow or the ability to thoroughly clean the unit.

7.5.9.1(19)(d) Provide changeover coils for heating and cooling rather than dedicated heating and cooling coils to minimize fan energy.

7.5.9.1(19)(e) There will be no standing water in air handling units. Install leak-proof drain pans with continuously welded seams and corners. Drain pans will be 16 ga type 304 stainless steel, double sloped to drain. Drain size minimum 32 mm (1-1/4”).

7.5.9.1(19)(f) The air handling unit will have a 40 mm perimeter collar around the entire unit and around each floor opening to ensure the unit is internally watertight. Each section of the air handling unit will have a capped and threaded drain connection.

7.5.9.1(19)(g) In addition to the air filtration required by CSA Z317.2, provide air handling units with a 100 mm carbon filter rack and filters. Carbon filters will not shed dust and in turn will require no post filter. Carbon filter pressure drop will not exceed 125Pa at 2 m/s.

7.5.9.1(19)(h) Provide pressure sensors and pressure switches to monitor and shut-off fans in over-pressure conditions to prevent damage to air handler casings or ductwork.

7.5.9.1(20) For medical gas storage rooms, provide ventilation systems in compliance with the greater requirements of the BC Fire Code, CSA Z7396.1 and NFPA-99.

7.5.9.1(21) Provide an exhaust air system suitable for the Laboratory requirements and any other special venting requirements as per CSA standards. These systems will be interlocked through the BMS, with the supply air systems. If system serves more than one (1) piece of equipment, provide N+1 redundancy in fans. Laboratory ventilation systems will supply sufficient make-up air for exhaust systems to maintain required pressurization.

7.5.9.1(22) For PCR rooms (molecular laboratories) provide controls and room differential pressure monitors complete with door switches to maintain and monitor positive room pressurization.

7.5.9.1(23) Provide Vandal Resistant and Ligature Resistant HVAC equipment and devices in all Mental Health Areas and in accordance with Appendix 3N [Safety and Risk Reduction Matrix].

7.5.9.1(24) Provide dedicated room temperature control for the Secure Rooms. The temperature controller is to be installed outside of the Secure Room for control by Staff.

7.5.9.1(25) AIR and AIR-Hybrid rooms will be designed to function as typical Patient rooms when not in use for airborne isolation. Provide heat recovery for all AIR exhaust systems.

7.5.9.1(26) The ventilation system will be designed to isolate a cluster of Inpatient pods and convert them to an Outbreak Control Zone should an internal or external pandemic and/or disaster occur; refer to Section 5.11.1.9.

7.5.9.1(27) All spaces designated as infectious control or isolation will be connected to emergency power for ventilation and pressurization control.

7.5.9.1(28) CSA Type I spaces will have separate supply, return, and exhaust systems from CSA Type II and CSA Type III spaces. Where a zone is predominately Type II and/or Type III, with a small percentage of isolated Type I spaces within it, the supply may be combined. Return and/or exhaust sharing is dependent on space uses and whether or not recirculation is permitted, per CSA Z317.2.

7.5.9.1(29) At a minimum, provide HEPA and UV filters on Facility exhaust air systems for the following spaces: Airborne Isolation Rooms (AIR's), Airborne Isolation Hybrid(s), Decontamination Room, Outbreak Control Zones, CL2+ Labs, and other critical spaces as

determined by the Owner to be highly contaminated and unsuitable for direct exhaust to the outdoors. HEPA and UV filter for Outbreak Control Zone exhaust can be removed provided Project Co adequately demonstrates to the Owner, the mitigation of contaminated air re-entrainment in the Facility.

7.5.9.1(30) Ventilation, cooling, and heating for Commercial Opportunity and Retail spaces, including make-up air and NFPA-96 commercial exhaust hoods, will be provided by future tenants during their TI fit outs. Cooling and heating for these spaces will be electrically driven with no supply of natural gas, chilled water, or heating water from the Facility. Provide exterior exhaust and air intake louvers and unobstructed ceiling space to accommodate the installation of tenant equipment and ductwork. Allocate suitable nearby roof areas for the installation of tenant condensing units.

7.5.9.1(31) Ensure the ventilation of domestic dryers and range hoods exhaust air is ducted to the exterior. If the ducting exceeds the dryer's maximum allowable distance, provide an interlocked booster fan.

7.5.9.1(32) Provide all ventilation for Component O3 - Central Food Production and for other Equipment as required by Appendix 3F [Food Services Equipment List] and Appendix 2E [Equipment and Furniture], including VAV NFPA exhaust hoods for the cooking equipment and condensate canopies over the dishwashers.

7.5.9.1(33) Provide ventilation and mechanical cooling systems for the Electrical Room(s) within the Energy Centre.

7.5.9.1(34) Apply CSA-Z317.2and ASHRAE Standard 170 for space pressurization and minimum air change rates. If the standards differ apply the most stringent requirement.

7.5.9.1(34)(a) Provide capability of a minimum of two (2) air changes per hour of outdoor air to ventilate main Mechanical and Electrical spaces.

7.5.9.1(34)(b) The Procedure/Recovery Room-ECT will be considered equivalent to the General Minor Surgical Procedure function as listed in Table 1 of CSA Z317.2 with a minimum of five (5) outdoor air changes and 15 total air changes.

7.5.9.1(35) Ductwork velocity not to exceed 1500 feet per minute. For future flexibility, allowance will be made up to 1800 fpm to accommodate future air handling growth. Air handling units will also have static requirements built in to accommodate increase. Project Co will

provide an Air Balancing Report confirming this requirement has been met.

7.5.9.1(36) Provide a HVAC system for the Ambulance Garage as follows:

7.5.9.1(36)(a) Heating will be provided by direct vent natural gas radiant heaters;

7.5.9.1(36)(b) Each door to the exterior of the Garage will have an air curtain;

7.5.9.1(36)(c) A continuous general exhaust ventilation system will provide exhaust air from the Ambulance Garage to the outdoors at a rate of 2.5 l/s per m2;

7.5.9.1(36)(d) An intermittent exhaust ventilation system will be provided to exhaust air from the Ambulance Garage to the outdoors at a rate of ten air changes per hour. Air will be exhausted from both high and low level at the back of the Garage through a fan to the outside. Provide a motorized damper where the air is exhausted;

7.5.9.1(36)(e) Provide a variable air volume makeup air unit to heat the makeup air exhausted by the fans. Incorporate a chilled water cooling coil to cool the space, only during an emergency response event. Provide an offset between supply and exhaust to keep the Garage negatively pressurized relative to the rest of the Facility; and

7.5.9.1(36)(f) The intermittent exhaust fan and dampers will be controlled by the BMS through:

7.5.9.1.36.(f).1 Door switches for each overhead door, to operate the fan system for a period of six minutes;

7.5.9.1.36.(f).2 CO, NOx and propane gas detection sensors;

7.5.9.1.36.(f).3 A humidistat set to switch at a maximum of 55 % RH; and

7.5.9.1.36.(f).4 Gas detection sensors will activate the intermittent fan at: CO sensor – 25 ppm, NOx sensor – 1ppm.

7.5.9.1(37) Ventilation for Grease Trap Truck parking area

7.5.9.1(37)(a) Provide ventilation for Grease Trap Truck servicing area to ensure odours are not entrained in the following:

7.5.9.1.37.(a).1 Facility air intakes;

7.5.9.1.37.(a).2 Operable windows;
7.5.9.1.37.(a).3 Any other Facility opening; and
7.5.9.1.37.(a).4 Openings in adjacent buildings.

7.5.9.1(37)(b) If the Grease Trap Truck parking space for clean out is located underground near the Loading Dock, provide a full, secure enclosure accessible by the Owner through access gates, with dedicated exhaust so that foul odours do not enter the Facility.

7.5.9.1(38) Provide ventilation for smudging as follows:

7.5.9.1(38)(a) Smudging will be permitted in Patient rooms and the Design will accommodate this requirement. At each Care Team Station, provide a call button for use when smudging is requested. A signal will be sent to the BMS to indicate a call for smudging. The Facility operator will have the option of setting the associated ventilation system to 100% outside air while smudging is underway. HVAC systems will be designed to accommodate simultaneous smudging in one (1) of two (2) zones in each IPU 64-Bed Group (C1 through C6) in alignment with the IPU Outbreak Control Zones per Section 7.5.9.1(5)(e); and

7.5.9.1(38)(b) For rooms where smudging is likely to occur on a more regular basis including the All Nations Sacred Space, the Conference/Meeting Room-XXLarge-Dividable designated for Yuwipi Ceremonies, and Consult/Interview Rooms in the Critical Care Complex Component, provide a dedicated exhaust system for use during smudging and for a period of time after the smudge has ended to ensure that the room has been purged of smoke. When these rooms are being used for smudging, the air will not be returned to the central HVAC system. When the rooms are not being used for smudging, the air supplied may be returned. The rooms will be negatively pressurized relative to the rest of the Facility.

7.5.9.1(39) Ventilation systems serving pharmacy spaces will be designed to comply with the most current version of USP 797 Model Standards for Pharmacy Compounding of Non-Hazardous Sterile Preparations and NAPRA guidelines. Where a conflict exists between the standards, the most stringent will govern. Provide a dedicated air handling unit (100% redundancy) to serve the

Pharmacy Component and provide all required testing and certification. Provide cleanroom air terminals with air filter access from the ceiling space. Filters will not be accessed from the room side.

7.5.9.1(40) Provide ventilation for audiometry booths. Provide a 200 mm diameter supply branch duct to both the control room side and exam room side. Final connection to the booth will be via flexible duct. Provide supply air up to 94 l/s, 38 Pa pressure and at 13°C. Provide duct the return air from each side of the booth through 200 mm diameter branches to the room's general exhaust branch duct.

7.5.9.1(41) Provide ventilation for the Cryogenic Freezer Room. The room will also incorporate an audible and visual oxygen deprivation alarm with the display mounted outside the room to warn users not to enter should the oxygen level be inadequate. Each FM Service elevator lobby, along the vertical route of travel to the Cryogenic Freezer Room, requires the same monitoring/annunciation equipment; link the BMS to all alarms. Comply with WorkSafe BC requirements for spaces that may experience oxygen deficiency.

7.5.9.1(42) Provide ventilation, such as supply, exhaust, close capture systems (such as dust collectors, exhaust hoods, etc.) and make-up air, as required, for the FMO workshops to suit woodworking, spray painting, solvent tanks, flammable paint storages, acetylene torch cutting and brazing and welding, and other similar processes driven by operation and equipment indicated in Appendix 2E [Equipment and Furniture] and Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.5.9.1(42)(a) The design will accommodate 3 workers using the dust control system at the same time.

7.5.9.1(42)(b) Mechanical systems will enable work on the following types of materials used in Shop-Carpentry; wood, plastic, aluminum, stainless steel, glue, paint, and stains.

7.5.9.1(42)(c) Acetylene torch usage will occur in the Shop-Plumbing, Shop-Mechanical, and Shop-Welding.

7.5.9.1(43) Ventilation systems for MRI suites will meet applicable standards and MRI Equipment manufacturer's requirements. Provide non-ferrous materials for the systems including ducts, diffusers, grilles, heating and cooling pipes and hangers.

7.5.9.1(44) Provide all mechanical services required for the MRI suite including ventilation systems, pressure relief and cryogen vent pipes installed at Service Commencement, in addition:

7.5.9.1(44)(a) provide the mechanical services for the future MRIs; refer to Appendix 3A [Clinical Specifications and Functional Space Requirements]. Rough-in the mechanical services from point of discharge to the future MRI location, ready for connection by the Owner.

7.5.9.1(45) Provide ventilation including humidity control from rooms with a whirlpool and hydrotherapy rooms.

7.5.9.1(46) In addition to providing ventilation systems for the MDRD to meet CSA Z317.2 requirements, provide a stainless steel bench style exhaust system for each utility/process sink. The exhaust inlet will extend the entire width of the sink. Provide condensate canopies at sterilizing Equipment including autoclaves and cart washer. Arrange the return and exhaust points as applicable such that they assist with removal of both sensible and latent heat from the various sterilizing Equipment.

7.5.9.1(46)(a) Provide means of monitoring pressure differential between MDRD and OR's relative to MDRD elevator shaft. Ensure that the ventilation system is designed to maintain positive pressurization of MDRD and OR's relative to MDRD elevator shaft. MDRD elevator shaft will be negatively pressurized by providing means of exhaust from MDRD elevator shaft.

7.5.9.1(47) Portions of the lab spaces will be constructed to meet Containment Level CL2+ laboratory requirements including the ventilation system. Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for a description of the spaces. Refer to Government of Canada’s publication, Canadian Biosafety Standard, 2nd Edition, 2015 for Design and Construction requirements. All entries to CL2+ lab, including anterooms will be monitored locally and through the BMS. Provide high level supply and low level return exhaust in all rooms of CL2+ spaces/rooms. No recirculation of air from these spaces is allowed. Air coming from these rooms is to be considered as contaminated exhaust air, requiring UV and HEPA filtration treatment prior to outside discharge.

7.5.9.1(48) Provide ventilation systems for bronchoscopy procedure rooms to meet CSA Z317.2 requirements. In addition, provide the users

with the ability to make the room positively pressurized via local controls interface.

7.5.9.1(49) For patients requiring airborne precautions, provide procedure rooms and associated anteroom with air change rate and relative pressurization to meet CSA Z317.2 requirements.

7.5.9.2 Performance Criteria

7.5.9.2(1) Incorporate a strategy to allow the installation and removal of major HVAC equipment such as fans without disrupting Facility operations.

7.5.9.2(2) Consolidate the location of fans, common filters (e.g. HEPA), and other Equipment in major mechanical rooms. Allow for adequate clearance for service access. Do not place this Equipment in confined spaces and avoid small doors and hatch access.

7.5.9.2(3) Provide bag in – bag out HEPA filters with bubble tight dampers as per CSA Z317.2 and N+1 redundancy for exhaust systems serving Airborne Isolation Rooms, their associated washrooms and Outbreak Control Zones. Filter system will be designed such that filters can be replaced without impacting the operation of the rooms served by the system.

7.5.9.2(4) All supply air, return air and general exhaust air systems will be located in interior mechanical rooms free from exposure to the elements.

7.5.9.2(5) Where unavoidable, Equipment for supply air, return air and general exhaust systems may be located exterior to the Facility provided it is designed and constructed to withstand exposure to outdoor conditions and concealed with an architectural screen.

7.5.9.2(6) Make allowances in supply, return and exhaust duct sizing and Equipment selections to provide flexibility for future changes in spaces. Allow for a future increase in capacity of duct mains and the capability of the air handling units in accordance with the requirements set out in Section 7.1 Mechanical Systems Design Principles.

7.5.9.2(7) Provide fresh air intakes, cooling coil drain pans, air handling units, 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. Avoid using duct mounted humidifiers.

7.5.9.2(8) Locate fresh air intakes so as not to entrain contaminants from outdoor sources, including existing exhaust points of adjacent buildings, Facility exhaust points, the railway and parking areas.

7.5.9.2(9) Fresh air intakes will be located such that they are not accessible or adjacent to public areas and are separated from exhaust air outlets. Ensure that fumes from the generator exhaust are not introduced into the Facility or adjacent buildings' fresh air intakes.

7.5.9.2(10) For the purpose of the 3rd Party Dispersion Study Analysis and Report Utilize advanced calculations and/or modeling, such as wind tunnel analyses with scale models, computer simulations, or CFD analyses. The wind model will demonstrate the airflow effects around the Facility due to local wind conditions, establishing separation distances that will confirm that the location of Facility air intakes, pollutant sources, and exhaust design are designed per ASHRAE Handbooks (Chapter 24 of the 2017 ASHRAE Handbook — Fundamentals, Chapter 45 of the 2015 ASHRAE Handbook — HVAC Applications and CSA Z317.2). The model will evaluate all Site specific conditions and variables, the proposed Project Co design and the normal operation, emergency smoke operation and post-disaster operation of the Facility. The model will fully evaluate the Facility and system design to satisfy the Owner that there are no adverse effects on the operation of the Facility.

7.5.9.2(10)(a) Take into account the location of the Future Heliport and ensure that fumes from the Heliport are not introduced into the Facility or adjacent buildings' fresh air intakes. Provide extra filtration on any intakes that may entrain contaminants from the Heliport and demonstrate the filtration is sufficient for this purpose. Switchable outdoor air intakes may be utilized if necessary to achieve this requirement.

7.5.9.2(11) Ensure all supply, return, and exhaust air is fully ducted to the space being served. Ceiling area will not be used as return air plenums. Door grilles are only permitted for non-medical storage and service rooms. Utilizing door undercuts or door leakage to transfer air for rooms with greater than 45 l/s (95 cfm) air change requirements not permitted.

7.5.9.2(12) Insulate all ductwork in accordance with applicable standards. Insulate all air exhaust ducts which are exposed to exterior from the connection to the exhaust Equipment up to termination point on roof or exterior walls. Provide canvas service jacket on all exposed ductwork insulation inside and up to 3 m AFF in mechanical rooms.

7.5.9.2(13) Provide seismic mitigation and building separation devices for all ductwork that crosses buildings and/or Utility corridors.

7.5.9.2(14) No in-slab or under slab ductwork is permitted.

7.5.9.2(15) Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for a description of the different types of Airborne Isolation Rooms and their locations. Provide the following:

7.5.9.2(15)(a) For all Airborne Isolation Rooms (negatively pressurized), locate supply air diffusers and exhaust air grilles to reduce the exposure of uninfected occupants in the space. Utilize directional and dilution airflow principles: supply air from high-level non-aspirating diffusers located away from the Patient bed, and exhaust air from low-level grilles located next to the Patient's head. Provide differential pressure monitors at Airborne Isolation Rooms, as per CSA Z317.2, to monitor and to ensure proper pressurization has been achieved as required. Provide door contact switches for all differential pressure monitors to prevent nuisance alarming;

7.5.9.2(15)(b) For Airborne Isolation Rooms with an AIR Anteroom, provide the AIR Anteroom with both supply and exhaust air. Differential pressure monitors will measure pressure between the isolation room and adjacent corridor, between the Airborne Isolation Room and the AIR Anteroom, and between the AIR Anteroom and adjacent corridor;

7.5.9.2(15)(c) VHF Airborne Isolation Rooms are Airborne Isolation Rooms, but with an additional VHF Patient room or Exam/Treatment Room-VHF that will act as a second Anteroom. This additional VHF Patient Room will meet requirements of an AIR Anteroom, including differential pressure monitoring

7.5.9.2(15)(d) Airborne Isolation-Hybrid will be the most unique with respect to ventilation and will resemble the ventilation approach for an Outbreak Control Zone. Provide ventilation for each Airborne Isolation-Hybrid as described above. Provide a differential pressure monitor to measure pressure differential between the Airborne Isolation-Hybrid and the adjacent corridor/Care Team Station area. There

will be no anteroom for each Airborne Isolation-Hybrid as part of the monitoring. Similar to the Outbreak Control Zones, provide a differential pressure monitor at each entrance to the corridor and Care Team Station area, with all door contact switches wired in series, as the area will serve as the anteroom for the surrounding Facility.

7.5.9.2(16) Provide differential pressure monitors at smoke-controlled zones including areas of refuge and Contained Use Areas. The monitors will:

7.5.9.2(16)(a) Be used to facilitate commissioning; and

7.5.9.2(16)(b) Alarm if pressurization is not at set point when a differential is required.

7.5.9.2(17) In the ECT Treatment Room provide means for additional exhaust to quickly remove unwanted odours.

7.5.9.2(18) Ensure all ductwork that provides humid air using duct-mounted humidifiers is constructed of welded stainless steel of a suitable alloy or of a material equally resilient to corrosion. Ensure all ducts are sloped to drain points and are accessible for inspection and cleaning.

7.5.10 Exhaust Systems

7.5.10.1 Basic Requirements

7.5.10.1(1) Design exhaust air discharges to ensure that there is no cross contamination with outdoor air intakes on the Site.

7.5.10.1(2) 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 contain other mechanical equipment. Provide welded pressure ductwork after isolation and other contaminated exhaust fans to the Facility exterior.

7.5.10.1(3) Integrate control of the exhaust systems with the ventilation supply air systems for spaces with differential pressure requirements from adjacent spaces.

7.5.10.1(4) Provide smoke removal exhaust systems to permit fire fighters to vent each floor area within the meaning of Part 3 of the VBBL.

7.5.10.1(5) Provide exhaust air systems suitable for special venting requirements as per CSA standards. Interlock these systems, through the BMS, with associated supply air systems. Provide an

exhaust air system suitable for the laboratory requirements, surgery rooms, morgue wall-mounted autopsy station and any other special venting requirements as per CSA standards or program specific requirements. These systems will be interlocked with the supply air systems.

7.5.10.1(6) Provide commercial-grade NFPA-96 exhaust hood systems where commercial cooking operations will occur. Make allowance within the base-building Facility design for the installation of future commercial exhaust hood systems; refer to Appendix 3F [Food Services Equipment List]. Interlock the hood(s) with a make-up air system, either by hard wiring or through BMS, to ensure proper pressurization within the Facility is maintained.

7.5.10.1(7) Provide exhaust systems at the emergency generators for radiator cooling and engine exhaust. Ensure exhaust termination points are located so flue gases are not entrained in:

7.5.10.1(7)(a) Facility air intakes;

7.5.10.1(7)(b) Operable windows;

7.5.10.1(7)(c) Any other Facility opening; or

7.5.10.1(7)(d) Openings in adjacent buildings.

7.5.10.1(8) All exhaust systems will be on emergency power as required by CSA Z32 and accounted for in the emergency generator sizing without diversity. All diesel gen set exhaust will exhaust through the roof.

7.5.10.1(9) Provide refrigerant detection and exhaust system in accordance with CSA B52.

7.5.10.1(10) Provide exhaust systems for enclosed parking areas controlled by carbon monoxide-monitors connected to BMS.

7.5.10.1(11) Make provisions in the Facility exterior building envelope, such that the Owner can easily install and connect portable negative pressurization ventilation units for future Facility renovations; refer to Section 5.1.1.1(15). These connection points will be available for use without adversely affecting the Facility envelope or health care operations. Provide sufficient connection points at the Facility exterior such that all internal areas can be served by negative pressurization ventilation units.

7.5.10.1(12) Provide exhaust for elevator machine rooms and/or elevator shafts as required to meet CSA B44, Technical Safety BC and elevator manufacturer requirements. Any required cooling for

these spaces will be in addition to exhaust required by CSA B44, Technical Safety BC and elevator manufacturer requirements.

7.5.10.2 Performance Criteria

7.5.10.2(1) The following spaces will be provided with a dedicated exhaust system and 100% redundancy; refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for quantity and locations:

7.5.10.2(1)(a) Airborne Isolation Rooms,

7.5.10.2(1)(b) Airborne Isolation Rooms ensuite washrooms;

7.5.10.2(1)(c) Decontamination Room including associated spaces; and

7.5.10.2(1)(d) CL2+ Labs.

7.5.10.2(2) In addition, HEPA filters will be provided in the Airborne Isolation Room exhaust ductwork in readily accessible locations for servicing.

7.5.10.2(3) Biosafety cabinets, laminar flow cabinets, fume hoods, grossing tables, specimen mounting tables, dissecting tables, autopsy tables, and downdraft tables will be provided with dedicated exhaust systems that are appropriate for their CSA Class and Type. Provide canopies connected to the general exhaust system for ovens, autoclaves and other heat emitting Owner Equipment. Where multiple cabinets are tied into a common system, a 100% redundant central exhaust system will be provided. Specimen mounting tables and grossing tables will be equipped with counter top-level exhaust. Provide a close capture exhaust arm for the biomedical workbench. Review the Equipment summary located in Appendix 2E [Equipment List] and Appendix 3A [Clinical Specifications and Functional Space Requirements] to ensure that all Equipment, rough in for Equipment and support systems have been accounted for and provided. Allow for ducting, commissioning, testing, and balancing the exhaust from all biosafety cabinets, fume hoods, grossing workstations and laminar flow cabinets. Include face velocity, containment and any other testing for fume hoods as required by WorkSafe BC.

7.5.10.2(4) Provide vents to outdoors for flammable storage cabinets. Installation to meet BC Fire Code and WorkSafe BC requirements.

7.5.10.2(5) Fume hoods and other smoke/fume generating process booths/spaces will be provided with dedicated exhaust systems that are corrosion/ chemical resistant to the exhaust media.

7.5.10.2(6) Ensure all exhaust systems serving modular cleanrooms, or the Equipment within, are designed to comply with the most current version of USP 797.

7.5.10.2(7) Provide dedicated exhaust systems as required for medical Equipment; refer to Appendix 2E [Equipment and Furniture]. Do not use portable systems.

7.5.10.2(8) Ensure all ductwork that exhausts humid air at or near saturation is constructed of welded stainless steel of a suitable alloy or of a material equally resilient to corrosion. Ensure all ducts are sloped to drain points and are accessible for inspection and cleaning. Provide all recovery coils with drain pans and properly sloped drains.

7.5.11 Metering Requirements for Energy Measurement and Verification

7.5.11.1 Provide meters on all services connecting to the Facility from an external infrastructure including: NEU supply and return, natural gas service, domestic water and electrical services.

7.5.11.2 Provide all required meters, sensors, and trend logging Equipment at end uses within the Facility to meet the energy monitoring requirements set out in Appendix 2D [Energy]. For additional funding pursue the incentive programs as per Section 7.1.23; refer also to Appendix 3Q [Metering Matrix].

7.5.11.3 Connect all meters to the BMS to monitor, record, report and analyze energy consumption. Coordinate electrical metering and the energy management system with the applicable requirements noted in this Schedule.

7.5.11.4 Design metering intervals to be 10 minutes or less with all points trended and data logged for a minimum of 18 months for all points associated with LEED or energy model verification.

7.5.12 Sound Attenuation and Vibration Isolation

7.5.12.1 Design all mechanical systems to prevent sound and vibration transmission between spaces, to prevent transmission from mechanical equipment to the spaces, and to minimize sound and vibration transmission to the outside of the Facility and Ancillary Buildings. Provide sound attenuation to limit sound levels in accordance with Appendix 3C [Acoustic and Noise Control Measures].

7.5.12.2 All flexible rubber connections and isolators will have been manufactured no more than one year prior to installation to ensure maximum service life. Date of manufacture is to be clearly indicated on each device.

7.5.12.3 Systems will be provided with noise attenuation screening if the equipment or their exterior openings are located facing and within 200 m of residential areas.

7.5.12.4 Provide vibration isolation devices on all equipment with rotating components.

7.5.12.5 Ensure all suspended equipment utilize spring isolators designed for the weight and vibration characteristics of the equipment.

7.5.12.6 Provide flexible connections to isolate mechanical equipment sound and vibration from ducting, piping and electrical wiring systems.

7.5.12.7 Ensure duct silencers meet or exceed the requirements of the ductwork for cleanliness and inspection and comply with CSA standards for infection control.

7.5.12.8 Utilize fibre free internal insulation.

7.5.12.9 For structural vibration limits due to the operation of Facility mechanical and electrical systems; refer to Section 5.9.6.

7.5.12.10 Avoid installation of volume dampers in close proximity to the air terminals, while meeting sound level requirements in Appendix 3C [Acoustic and Noise Control Measures].

7.5.13 Testing, Adjusting, Balancing (TAB) and Commissioning (Cx)

7.5.13.1 Project Co will:

7.5.13.1(1) Perform TAB and Cx of all mechanical equipment and systems in accordance with the Standards referenced in Section 2.4 and procedures described in Section 5.5.

7.5.13.1(2) Demonstrate to the Owner that the mechanical and electrical systems are substantially operational by testing, adjusting, balancing, and Commissioning the systems. Demonstration to the Owner will include redundancy in the case of equipment failure and spare capacity.

7.6 Reserved for Future Expansion (Division 24)

7.7 Integrated Automation (Division 25)

7.7.1 Overview

7.7.1.1 Principles, Guidelines and Requirements

7.7.1.1(1) Project Co will provide an integrated automation system to converge all Facility Building Systems and select Owner Equipment into an open, adaptable and interoperable hardware and software platform for centralized monitoring and control.

7.7.1.1(2) All Facility sub-systems intended to be interfaced into the integrated automation system will employ standardized object-oriented data formats and protocols for accurate representation of all system data points for instant and seamless integration.

7.7.1.1(3) All components and controllers supplied will be true “peer-to-peer” communicating devices. Components or controllers requiring “polling” by a host to pass data will not be acceptable.

7.7.1.1(4) All ethernet-networked devices within the integrated automation system will connect to a single, converged FMO network. There will be no silo vendor networks/switches permitted except as required to meet the Owner’s functional and operational requirements.

7.7.1.1(4)(a) Software for all Facility systems will reside on Owner provided FMO servers and computers. All Integrated Automation software applications will be required to operate within a virtualized server environment. There will be no silo vendor servers and/or computers except as required to meet the Owner’s functional and operational requirements.

7.7.1.1(4)(b) Ensure that all integrated automation technology, systems, and Owner equipment are compatible and seamlessly interfaced using open-standards and protocols;

7.7.1.1(4)(c) Ensure that the Facility's integrated automation system and sub-systems are not encumbered with proprietary hardware and software limitations;

7.7.1.1(4)(d) Project Co will assist the Owner in defining the FMO Network and virtualized server requirements.

7.7.1.1(4)(e) Utilize the integrated automation system for Smart Commissioning applications and reporting (refer to Section 5.5 for more detailed commissioning/ training requirements); and

7.7.1.1(4)(f) Train the Owner's FMO Network specialist(s) on the configuration, setup, Commissioning and continuous optimization of the integrated automation framework in the Facility; refer to Section 5.5 for more detailed commissioning/training requirements.

7.7.1.1(5) Adherence of all Facility systems to industry standard protocol ANSI / ASHRAE STD 135-2016 BACnet/IP is required to assure protocol and data object interoperability between all system

components. Minimum BACnet protocol revision compliance is Level 4 or greater, with the ability to support data read and write functionality.

7.7.1.1(6) All devices to use BACnet\IP and physical connection will be via Ethernet. If BACnet\IP is not available for a device connection, other protocols may be used on a case-by-case basis as reviewed by the Owner if they can seamlessly integrate into the integrated automation framework.

7.7.1.1(7) All control point naming and tagging conventions will be standardized using the ASHRAE 223P (Project Haystack) standard to be customized for the Facility.

7.7.1.1(8) All Facility integrated automation systems and sub-systems will be engineered to operate independently in a stand-alone mode, such that if they lose ethernet network and/or server connectivity they continue to function without loss of local controller services.

7.7.1.1(9) Project Co will provide a virtual software environment for the integrated automation systems simulating the user interface and demonstrating the integration of the Facility Division 25 systems and sub-systems prior to physical installation of these systems. Project Co will:

7.7.1.1(9)(a) simulate the real-time management of all interfaced sub-systems; and

7.7.1.1(9)(b) facilitate the optimization of the integrated automation systems by a system expert provided by Project Co.

7.7.1.1(10) Refer to Section 7.7.3.37 for additional requirements.

7.7.2 Integrated Building Management Platform

7.7.2.1 Basic Requirements

7.7.2.1(1) System Overview

7.7.2.1(1)(a) The integrated building management platform (IBMP) will consist of a software platform to automatically pull and analyze data from Building Systems. It will be composed of a folio database, analytic function library and all custom applications needed to deliver the integrated automaton objectives for the Facility.

7.7.2.1(1)(b) The IBMP will be integrated to the mechanical BMS platform to pull point data, analytics information and Facility alarm information seamlessly from the BMS. The IBMP will be used for monitoring and reporting and will not initiate control requests to the BMS unless a specific control sequence has been defined and reviewed with the Owner.

7.7.2.1(1)(c) The IBMP will be integrated to electrical systems and Owner Equipment to pull point data, analytics information, and alarm information from these systems. The IBMP will be used for monitoring and reporting and will not initiate control requests to electrical and/or Owner Equipment.

7.7.2.1(2) Applicable Area

7.7.2.1(2)(a) Applies to the Facility.

7.7.2.1(3) System Responsibilities

7.7.2.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope overviews.

7.7.2.1(3)(b) Owner will:

7.7.2.1.3.(b).1 Provide design feedback to Project Co.

7.7.2.1(3)(c) Project Co will:

7.7.2.1.3.(c).1 Select the system in consultation with the Owner;

7.7.2.1.3.(c).2 Provide all system infrastructure;

7.7.2.1.3.(c).3 Provide all system equipment;

7.7.2.1.3.(c).4 Provide all system software;

7.7.2.1.3.(c).5 Train the Owner's Staff on the use of the system; and

7.7.2.1.3.(c).6 Integrate the IBMP to the following sub-systems and Owner Equipment:

(c).6.1 The BMS;

(c).6.2 Electrical systems;

(c).6.2.1 Generators;

(c).6.2.2 Lighting controls;

(c).6.2.3 Load management system;

(c).6.2.4 Metering;

(c).6.2.5 Switchgear;

(c).6.2.6 ATS / HVATS;

(c).6.2.7 EVSE;

(c).6.2.8 UPS;

(c).6.2.9 Isolated power systems;

(c).6.2.10 Fire alarm system; and
(c).6.2.11 Clock system
(c).6.3 Facility Building System data and alarms;
(c).6.4 Pneumatic tube system;
(c).6.5 Elevators;
(c).6.6 Equipment data and alarms;
(c).6.7 Sterilizers;
(c).6.8 Washer/disinfectors
(c).6.9 Cart washers
(c).6.10 Bedpan disinfectors;
(c).6.11 Beds;
(c).6.12 Ceiling lifts; and
(c).6.13 All fridges and freezers, excluding those listed in 7.7.2.3.2.(a).7.

7.7.2.2 Performance Criteria

7.7.2.2(1) The IBMP will analyze real-time data produced by energy and equipment systems in order to identify faults, trends, anomalies and opportunities for improved performance and reduced energy use in the operation of Facility mechanical, electrical, and equipment systems

7.7.2.2(2) The IBMP will utilize a folio database technology designed for the efficient storage and analysis of large volumes of time series data. Time stamps will support millisecond resolution and be synchronized to the wireless clock system time. The software will not employ a relational database structure but will instead use tagging to model and describe data and will support the use of the open source data modeling/tagging standards developed by Project-Haystack (ASHRAE 223P). In addition to supporting all Project-Haystack tags, the system will support the creation of any custom tags required by the Owner.

7.7.2.2(3) Provide a folio database within the IBMP that organizes data into a three-tier hierarchy:

7.7.2.2(3)(a) Tier 1: Projects are the top-level unit of organization used to group records together (typically corresponds to a real-life project). Projects encapsulate a flat list of records, there are no pre-defined tree structures or tables in folio;

7.7.2.2(3)(b) Tier 2: Records are the basic unit of data modeling. Records are essentially associative arrays defined by a flat map of tags; and

7.7.2.2(3)(c) Tier 3: Tags are the leaf level of the model. A tag is a name/value pair.

7.7.2.2(4) Project Co will use name and tagging conventions developed by Project Haystack to develop a consistent, standardized methodology for naming and describing data points associated with the networked devices and integrated automation systems throughout the Facility. This includes the base-building systems, equipment systems, energy metering systems, other smart devices including mobile assets, and associated descriptive information known as metadata.

7.7.2.2(5) The IBMP is to provide verification that energy optimization measures are operating as expected through the analysis of energy usage at the point-of-use, identification of faults showing where control sequences are not functioning as prescribed, and identification of opportunities for improved performance in the operation of Facility systems.

7.7.2.2(6) In consultation with the Owner, Project Co will create energy optimization measures and analytical rules to verify all mechanical and electrical sequences of operations as specified for each Facility system for use during commissioning and on-going Facility operations.

7.7.2.2(7) The analytic software application will operate on the latest versions of Microsoft Windows, Linux and Apple OSX operating systems available at Service Commencement.

7.7.2.2(8) The IBMP will accept and normalize data from a variety of sources via connectors for BACnet\IP, oBix Modbus TCP, Sedona, OPC, MQTT and the web services protocol defined by Project-Haystack. It will also support data access via SQL compatible databases, CSV format files, XML format files, web services, JSON, and other electronic data interchange techniques. Once data has been imported, the software will provide a unified data format to enable analytics algorithms to identify patterns across the different data sets independent of original format.

7.7.2.2(9) The IBMP will provide open, REST-based API’s to enable integration with third party software applications. The open APIs will enable data to be entered/imported into the database, exported from the database, posting of analytic queries from external applications and output of analytic results to external applications, and integration with third party software applications such as maintenance management and work order processing. APIs will be fully documented and available as part of the

standard product. All data and analytic results will be available via the REST API.

7.7.2.2(10) Project Co will coordinate all custom applications developed for the IBMP in consultation with the Owner such that the applications are tailored to the Owner's operations.

7.7.2.2(11) The IBMP will be deployed locally in the Facility (on-premise). Deployment will not be limited to a SaaS (Software as a Service) deployment model. Cloud-based operation will be supported on Microsoft Azure and Amazon Web Services as a minimum. Cloud-based operation will be reviewed with the Owner.

7.7.2.2(12) The IBMP will include a built-in subscription to a worldwide weather service providing weather data for all major metropolitan areas. Weather service will provide an update frequency of at minimum every three (3) hours. Weather data will include:

- 7.7.2.2(12)(a) Current temperature;
- 7.7.2.2(12)(b) High temperature for the day;
- 7.7.2.2(12)(c) Low temperature for the day;
- 7.7.2.2(12)(d) Sunrise and sunset times;
- 7.7.2.2(12)(e) Relative Humidity; and
- 7.7.2.2(12)(f) Degree days (heating and cooling with adjustable balance point value).

7.7.2.2(13) The weather service will include a three-day forecast and provide historical weather data extending back at least 1 year. The IBMP software will be capable of integrating to other weather services and locally connected sensors via a documented weather data API.

7.7.2.2(14) The IBMP will provide automatic notification of detected issues via email as well as automated emailing of reports. The rules and conditions that trigger automated notification will be created in consultation with the Owner.

7.7.2.2(15) Email notification services will as a minimum provide:

- 7.7.2.2(15)(a) immediate notification of detected issues;
- 7.7.2.2(15)(b) daily digest or summary of detected issues; and
- 7.7.2.2(15)(c) the ability to delineate which issue notifications are sent to which recipients down to the level of

specifying that specific issues or categories of issues are sent to individual recipients.

7.7.2.2(16) Email notifications will include hyperlinks which when selected will take the user directly to the visualization of the issue in the software application. Users will be required to authenticate for access to the visualizations.

7.7.2.2(17) Email of reports will be formatted as PDF, HTML, PNG, or Excel documents.

7.7.2.2(18) The IBMP will provide the ability to develop customized rules and algorithms tailored to the operational needs and characteristics of individual departments within the Health Campus, monitoring and verification of any data points in the Health Campus, and the fault detection requirements of the Project without dependence on the manufacturer for rule development. Tools for user development of customized rules will be provided as a standard part of the product and fully documented.

7.7.2.2(19) The IBMP will provide an extensive library of standard analytic functions. In consultation with the Owner, Project Co will use standard and customized analytic functions as elements to build custom analytic rules and visualizations for the specific needs of individual user groups. Source code for the standard and custom analytic functions will be provided as part of the standard product and the Owner will have the option to make modifications.

7.7.2.2(20) The IBMP will present all views and data visualizations in a standard web browser using HTML5 technology. The use of plug-ins or Java in the browser will not be permitted. The system will support the use of the current version of industry leading browsers as a minimum.

7.7.2.2(21) The IBMP will include standard views to present analytic results, which will be automatically generated when issues are found by analytic rules. No programming or development will be required to create these views. These views will include as a minimum:

7.7.2.2(21)(a) All rule violations across a portfolio of sites, all rule violations per site, and rule violations per equipment system, including time, date and duration of all violations;

7.7.2.2(21)(b) Cost relationships assigned to rules to provide cost calculations. Cost calculations will be selectable on a minimum of 3 factors including: duration of violation, occurrence of violation, per day that a violation is detected. In addition, the system will

support development of custom formula-based cost calculations;

7.7.2.2(21)(c) Standard filters to enable the user to easily look at rule violations by site, data, exception type for any selected date or date range;

7.7.2.2(21)(d) Automatic calculation and presentation of Key Performance Indicators (KPIs) including the following features;

7.7.2.2.21.(d).1 It will be possible to define custom KPIs as needed. It will be possible to filter KPI results based on: Department, building, KPI type, and date range as a minimum;

7.7.2.2.21.(d).2 Carbon emission reporting metrics based upon ISO 16745-1 and automatic verification based upon ISO 16745-2; and

7.7.2.2.21.(d).3 Custom KPIs are to be developed in consultation with the Owner.

7.7.2.2(22) The IBMP will allow for any standard view to be saved as a report for easy access by the Owner and will allow all reports to be emailed as PDF, HTML, PNG, or Excel documents. Any standard system view will be able to be saved as a custom report including its configuration criteria, e.g., time range, targets (sites or equipment), rule violations or other configuration options as applicable to the standard system view.

7.7.2.2(23) Project Co will use the IBMP to create custom reports and data views, in consultation with the Owner. Custom reports will be able to be created by making queries against the database and saving the query as a saved report. Saved reports will be able to be executed by typical system users with a single mouse click. Data views will be customizable to display different metrics in real-time to Staff based on user credentials.

7.7.2.2(24) The IBMP will allow for the export of any and all report views and will support export in CSV, Excel, XML, HTML PNG, SVG and text format. Export of report views will be a feature available to the typical operator and be able to be accomplished with 2-3 mouse clicks and include the ability for operators to send the report as an email when selecting the export format.

7.7.2.2(25) The IBMP will automatically create 2-axis charts for all-time series data once it has been entered into the database. Examples of data that will be presented in auto-generated charts include: sensor values, control point status, setpoints and other numeric, time stamped data values. An application to enable navigation of

the data charts will be provided and will organize data into groups related to equipment systems.

7.7.2.2(26) The IBMP will support the presentation of analytic results on mobile and handheld devices providing the following capabilities as a minimum:

7.7.2.2(26)(a) Presentation of analytic information in a text-based format with drill down hierarchy including: site level summary, equipment level summary, and detailed listing of detected issues on individual equipment.

7.7.2.2(26)(b) Ability to view graphic representations data and analytic visualizations in a standard PDF file format.

7.7.2.2(26)(c) Handheld user interface will not require the download or installation of an application. Rather, the handheld user interface will utilize native web interfaces for presentation of information to the user.

7.7.2.3 Integration

7.7.2.3(1) Facility System Data and Alarms

7.7.2.3(1)(a) The IBMP will record, analyze data and annunciate events and alarms of all base-building electrical, mechanical and conveyance systems in the Facility. Event and alarm data will include the location of the device causing the alarm.

7.7.2.3(1)(b) Project Co will integrate the IBMP to the following systems such that the IBMP is capable of pulling and analyzing data from all components of each system:

7.7.2.3.1.(b).1 BMS:

(b).1.1 Refer to Section 7.7.3 Building Management System.

7.7.2.3.1.(b).2 Electrical systems;

(b).2.1 Refer to Section 7.8 Electrical.

7.7.2.3.1.(b).3 Pneumatic Tube System; and

7.7.2.3.1.(b).4 Elevators.

7.7.2.3(2) Equipment Data and Alarms

7.7.2.3(2)(a) The IBMP will record and annunciate equipment data and alarms including the status, location, temperature, humidity, and Asset data for equipment including walk-in freezers and coolers, laboratory equipment, medical equipment, and:

7.7.2.3.2.(a).1 sterilizers;
7.7.2.3.2.(a).2 washer/disinfectors
7.7.2.3.2.(a).3 cart washers
7.7.2.3.2.(a).4 bedpan disinfectors;
7.7.2.3.2.(a).5 beds;
7.7.2.3.2.(a).6 ceiling lifts; and
7.7.2.3.2.(a).7 standalone fridges and freezers except in the following spaces:
(a).7.1 On-Call Room-Large;
(a).7.2 Gift Shop;
(a).7.3 Nourishment Rooms;
(a).7.4 Multipurpose Rooms;
(a).7.5 Offices;
(a).7.6 ADL Kitchen;
(a).7.7 Lounge-Staff;
(a).7.8 Lounge-Learner;
(a).7.9 Lounge-Volunteer;
(a).7.10 Dining/Activity Area;
(a).7.11 Physician Workroom; and
(a).7.12 other non-critical fridges and freezers as reviewed by the Owner.

7.7.2.3(2)(b) If a device does not natively integrate to the IBMP, Project Co will provide all gateways, data loggers, and temperature probes for each device to interface with the IBMP.

7.7.2.3(2)(c) Refer to Section 7.7.3 BMS for additional information on alarm requirements.

7.7.2.3(2)(d) All laboratory area refrigerators, coolers, and freezers will have trend logs for temperature and status and alarms integrated into the IBMP with a graphic interface dedicated for access and monitoring by lab users.

7.7.3 Building Management System

7.7.3.1 System Overview

7.7.3.1(1) The BMS network is a virtual local area network (VLAN), residing on FMO network.

7.7.3.1(2) All BMS software will reside on Owner provided FMO servers and computers per Section 7.7.5.1(1)(c).

7.7.3.1(3) The BMS includes the following sub-systems as minimum:

7.7.3.1(3)(a) DDC and PLC controls network systems;

7.7.3.1(3)(b)	Energy metering and other Sub-Metering (as per Metering matrix);
7.7.3.1(3)(c)	HVAC and Environmental Controls;
7.7.3.1(3)(d)	Any other Mechanical systems Controls;
7.7.3.1(3)(e)	Steam and condensate related systems controls;
7.7.3.1(3)(f)	Plumbing system controls (sewer and storm drainage pumping and other system stations controls);
7.7.3.1(3)(g)	Plumbing system controls (Domestic hot, cold, tempered and other associated potable water systems controls);
7.7.3.1(3)(h)	Any other plumbing systems controls;
7.7.3.1(3)(i)	RO system(s) controls;
7.7.3.1(3)(j)	Medical gases and other Facility gases system controls including the designated bulk oxygen site, (this applies to generated, bottled or any other sources of supply);
7.7.3.1(3)(k)	Laboratory and utility compressed air system controls;
7.7.3.1(3)(l)	Instrument air systems;
7.7.3.1(3)(m)	MDRD sterilization and other associated Equipment;
7.7.3.1(3)(n)	Kitchen systems controls, including make-up air system, kitchen exhaust air and general exhaust system, space thermal and other controls, coolers and freezers systems;
7.7.3.1(3)(o)	Parking ventilation/exhaust system, CO monitoring and associated exhaust control;
7.7.3.1(3)(p)	Pneumatic tube systems control;
7.7.3.1(3)(q)	Other specific medical or other unique equipment (in consultation with Owner) to be monitored for alarms or other parameters such as: freezers, coolers;
7.7.3.1(3)(r)	Fire suppression system, including fire alarm panel integration;

7.7.3.1(3)(s) Smoke evacuation system controls;

7.7.3.1(3)(t) Smoke management system controls;

7.7.3.1(3)(u) Stairs pressurization systems controls;

7.7.3.1(3)(v) Outbreak control zone system controls;

7.7.3.1(3)(w) Electrical systems monitoring, including:

- 7.7.3.1.3.(w).1 Generators;
- 7.7.3.1.3.(w).2 Boiler and generator fuel management systems;
- 7.7.3.1.3.(w).3 Lighting controls;
- 7.7.3.1.3.(w).4 Load management system;
- 7.7.3.1.3.(w).5 Electrical metering;
- 7.7.3.1.3.(w).6 Switchgear;
- 7.7.3.1.3.(w).7 ATS/HVATS;
- 7.7.3.1.3.(w).8 EVSE;
- 7.7.3.1.3.(w).9 UPS;
- 7.7.3.1.3.(w).10 Isolated Power Systems;
- 7.7.3.1.3.(w).11 Fire alarm system;
- 7.7.3.1.3.(w).12 Clock systems; and
- 7.7.3.1.3.(w).13 Other systems identified in Section 7.8 Division 26.

7.7.3.1(3)(x) Post-disaster unique systems pertaining to mechanical, plumbing, fire protection, and other associated Building Systems;

7.7.3.1(3)(y) Back-up systems pertaining to mechanical, plumbing, fire protection, and other associated Building Systems;

7.7.3.1(3)(z) Other specific medical or other unique Facility equipment in consultation with Owner to be monitored for alarms or other parameters such as: “closed loop sanitizers”, ceiling lifts, freezers, coolers; and

7.7.3.1(3)(aa) Other systems as described in this Schedule to be integrated with the BMS.

7.7.3.1(4) The Owner will:

7.7.3.1(4)(a) Provide design feedback to Project Co.

7.7.3.1(5) The Project Co will:

7.7.3.1(5)(a) Select the system in consultation with the Owner.

7.7.3.1(5)(b) Provide all system infrastructure.

7.7.3.1(5)(c) Provide all system equipment.

7.7.3.1(5)(d) Provide all system software.

7.7.3.1(5)(e) Commission all system infrastructure, equipment and software.

7.7.3.1(5)(f) Integrate the system to the following systems/network levels:

7.7.3.1.5.(f).1 All sub-systems described in this section;
7.7.3.1.5.(f).2 FMO Network; and
7.7.3.1.5.(f).3 Integrated building management platform.

7.7.3.2 Basic Requirements

7.7.3.2(1) Provide a complete and fully functional integrated BMS complete with systems as described in Section 7.7, which resides on dedicated network with static IP address (integrated with FMO Network and integrated building management platform) for the Health Campus that performs the following functions:

7.7.3.2(2) Automatically operates, monitors and manages the Facility's mechanical and other systems to provide a high level of occupant comfort and maintains a healthy and productive environment without disruption to the delivery of clinical and Patient treatment services.

7.7.3.2(3) Provides an internet-based means of external monitoring by the Owner, including all associated hardware and software. Change or control rights by external access will not be allowed.

7.7.3.2(4) Interfaces with the Facility's mechanical, electrical and communication systems and controls.

7.7.3.2(5) Meters, trends and archives all data related to the flow of services into and out of the Facility, including domestic water, steam, condensate, medical oxygen, electricity, gas, and hot water and considers seasonal variations in flow rate. Refer to Appendix 3Q [Metering Matrix].

7.7.3.2(6) Annunciates Facility and equipment alarms, including fire alarm, security alarms, freezer alarms, lab alarms, medical Equipment indicated in Appendix 2E [Equipment and Furniture] alarms, medical gas alarms, space pressure alarms, lighting, UPS, generator, switchgear alarms, temperature and humidity setpoint alarm. Coordinate with Owner for any additional alarm monitoring requirements.

7.7.3.2(7) Monitors and tracks the status, temperature, humidity and alarms for equipment identified in consultation with the Owner.

7.7.3.2(8) Acquires, collates and archives all data associated with energy measurement and verification.

7.7.3.2(9) Contains safeguards to prevent unauthorized external access and follows vendor best practices for security handling.

7.7.3.2(10) Design the controls system to allow monitoring and operation of the Facility from a BMS location in the Facility, from the Energy Centre Control Room, or from any location with appropriate security controls in place via an integrated BMS over IP. BMS to operate on a dedicated network.

7.7.3.2(11) The BMS will be non-proprietary and designed with open protocol.

7.7.3.2(12) The BMS platform will be completely integrated (front-end and back-end) Native BACnet/IP system and can facilitate integration of a wide range of Building Systems via BACnet or protocol gateways to convert the data into BACnet.

7.7.3.2(13) All equipment and point naming conventions for all BMS points will follow the ASHRAE 223P (Project Haystack) standard for seamless integration with the IBMP via open protocol BacNet/IP.

7.7.3.2(14) The BMS will be provided as a complete package from one supplier, who will ensure that all BMS devices and equipment are compatible.

7.7.3.2(15) All BMS devices and equipment will communicate with the IBMP via open protocol communications.

7.7.3.2(16) The BMS will optimize the system performance under all operating conditions to minimize Facility energy usage.

7.7.3.2(17) The BMS will accommodate future technological changes and the architecture of the BMS will permit expansion of the system for future renovations.

7.7.3.2(18) The BMS will be an independent system separate from the fire alarm and other control systems.

7.7.3.2(19) Provide BMS complete with automated fault detection, diagnosis and reporting (AFDDR) software. The system will be able to set an optimized baseline of Facility operation for future re-commissioning. Configure and operate the AFDDR Software to ensure the Facility remains continuously optimized, and the need for fault diagnosis by the Facility operator is minimized. AFDDR

Software will provide customizable web-accessible reports available to the Owner, with rules and dashboard customized in consultation with the Owner. AFDDR will also be utilized as a Commissioning as described in Section 5.5.

7.7.3.2(20) Data archiving, measurement and verification and continuous commissioning requirements include:

7.7.3.2(20)(a) provide a data collection and data archiving and analytics package to facilitate Measurement and Verification, Continuous Commissioning and AFDDR.

7.7.3.2(21) BMS system to include all necessary devices and programming to provide automatic changeover to all backup systems with no unnecessary delays.

7.7.3.2(22) The BMS will monitor, control, indicate alarms, and provide trending where applicable for all connected sensors and control points.

7.7.3.2(23) User interface will be graphical in nature with animated graphics to indicate equipment operation. Graphics will be grouped in systems and in Components and/or departments.

7.7.3.2(24) The BMS documentation will include a detailed narrative description of the sequence of operation of each system.

7.7.3.2(25) Install equipment to provide access and ease of maintenance.

7.7.3.2(26) Connect to equipment specified in other sections and to equipment supplied and installed by other Divisions or by the Owner.

7.7.3.2(27) Provide a separate, dedicated VLAN on the FMO Network for the BMS.

7.7.3.2(28) Provide integration of setpoint control for all major equipment, zone setpoints and energy dashboard with FMO Network level interface.

7.7.3.2(29) For all large AHU’s where the supply fan installed nameplate power is 50hp or greater, provide industrial grade control valves with extended rangeability of 200:1, turndown ratio of 100:1 and close off pressure of 1.5 times the dead head of system pump. In addition, all actuators will be waterproof.

7.7.3.2(30) Zoning

7.7.3.2(30)(a) Zoning for HVAC systems will be based on occupancy, room location within the Facility, CSA Z371.2 space classification, room orientation, room relative pressurization, and room heating and cooling loads. Configure zoning to minimize reheat/re-cool.

7.7.3.2(30)(b) Provide independent zones for the following spaces at minimum: Patient care rooms, procedure rooms, consult rooms, and other rooms as determined by the Owner where independent zoning is required to support the space's clinical functionality.

7.7.3.2(30)(c) For non-Patient Care Areas, a maximum of three (3) rooms will be on one (1) zone.

7.7.3.2(30)(d) Open area interior control zones will not exceed 180 square metres.

7.7.3.2(30)(e) Perimeter zones will be no more than 4.7 m from an outside wall along a common exposure. Perimeter zones will not exceed 30 square metres.

7.7.3.2(30)(f) Provide zone level display on zone sensor of all sensed parameters required by CSA Z317.2, Table 5.

7.7.3.2(30)(g) Zone floor areas to provide control of smoke in a fire situation to align with the fire and smoke zones.

7.7.3.2(30)(h) Measure supply air temperature delivered to each zone. Where zone heating or cooling coils are utilized, modulate coil output to based on room temperature.

7.7.3.2(31) Design all components to default to a safe position upon failure and install all components to ensure reliable operation at any failure situation. Fail safe components will be hard-wired to provide reliable operation in all circumstances.

7.7.3.2(32) Monitor critical alarms for essential Building Systems and Life Safety Systems at the BMS. Critical alarms include:

7.7.3.2(32)(a) Fire alarm system for alarm, supervisory and trouble;

7.7.3.2(32)(b) All temperature alarms resulting from setpoint deviations;

7.7.3.2(32)(c) Failure of any HVAC or plumbing equipment including zone level equipment;

7.7.3.2(32)(d) Medical gas system high- and low-pressure alarms;

7.7.3.2(32)(e) All alarms relating to the fire protection system; and

7.7.3.2(32)(f) All alarms relating to the generators, transfer switches, switchgear, UPS, isolated power, or associated control systems.

7.7.3.3 BMS Performance

7.7.3.3(1) System will conform to the following minimum standards:

7.7.3.3(1)(a) Graphic Display:

7.7.3.3.1.(a).1 A graphic with 20 dynamic points will display with current data within 10 sec.

7.7.3.3(1)(b) Graphic Refresh:

7.7.3.3.1.(b).1 A graphic with 20 dynamic points will update with current data within 8 sec. and will automatically refresh every 15 sec.

7.7.3.3(1)(c) Configuration and Tuning Screens:

7.7.3.3.1.(c).1 Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic will automatically refresh within 6 sec.

7.7.3.3(1)(d) Object Command:

7.7.3.3.1.(d).1 Devices will react to command of a binary object within 2 sec. Devices will begin reacting to command of an analog object within 2 sec.

7.7.3.3(1)(e) Alarm Response Time:

7.7.3.3.1.(e).1 An object that goes into alarm will be annunciated at the workstation within 45 sec.

7.7.3.3(1)(f) Program Execution Frequency:

7.7.3.3.1.(f).1 Custom and standard applications will be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.

7.7.3.3(1)(g) Performance:

7.7.3.3.1.(g).1 Programmable controllers will be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec.

Select execution times consistent with the mechanical process under control.

7.7.3.3(1)(h) Multiple Alarm Annunciation:

7.7.3.3.1.(h).1 Each workstation on the network will receive alarms within 5 sec of other workstations.

7.7.3.3(1)(i) Reporting Accuracy:

7.7.3.3.1.(i).1 System will report values with minimum end-to-end accuracy listed in Table 1.

7.7.3.3(1)(j) Control Stability and Accuracy:

7.7.3.3.1.(j).1 Control loops will maintain measured variable at setpoint within tolerances listed in Table 1.

7.7.3.3(2) Table 1: Sensors, Meters, Calculated Values and Required Accuracies

Table 1

#	Object Description and Location if Applicable	Sensor or Value Type	Sensor Type or Calculation Method	Expected Range	Required End-to-End Accuracy	Display Resolution	Refresh Interval (min)	Trend Interval (min)	Accuracy Required for Control
S1	Ambient Dry-Bulb Temperature	AI	Locate in weather station or ventilated enclosure in fully shaded location away from thermal mass bodies	-29°C to 40°C (-20°F to 120°F)	±0.5°C (±0.1°F)	±0.25°C (±0.5°F)	1	10	±1.0°C (±2°F)
S2	Ambient Wet-Bulb Temperature	AI	Locate in weather station or ventilated enclosure in fully shaded location away from thermal mass bodies	–29°C to 40°C (-20°F to 120°F)	±1.5°C (±3.0°F)	±0.25°C (±0.5°F)	1	10	±1.5°C (±3°F)
S6	Building Main Meter Power	AI/BI (pulse)	True RMS (Remote Monitoring Station) Refer to Electrical Sections						
S8	Zone (Space) Temperatures	AI	10000 ohm Thermistor or 1000 ohm RTD	–1°C to 38°C (30°F to 100°F)	±0.5°C (±0.1°F)	±0.25°C (±0.1°F)	1	1	±0.5°C (±1°F)
S9	Carbon Dioxide	AI	Nondispersive Infrared Sensor Technology	0 to 2000 ppm	±50 ppm	50 ppm	1	1	50 ppm
S10	Carbon Monoxide	AI	Electrochemical Sensor	0 to 100 ppm	±5 ppm	50 ppm	1	1	50 ppm

Table 1									
#	**Object Description and Location if Applicable**	**Sensor or Value Type**	**Sensor Type or Calculation Method**	**Expected Range**	**Required End-to-End Accuracy**	**Display Resolution**	**Refresh Interval (min)**	**Trend Interval (min)**	**Accuracy Required for Control**
S11	Air Pressure (Ducts)	AI	Variable Capacitance	0 to 2 kPa (0 to 8 in. w.g.)	±25 Pa (±0.1 in. w.g.)	125 Pa (±0.5 in. w.g.)	1	1	25 Pa (0.1 in. w.g.)
S12	Air Pressure (Space)	AI	Variable Capacitance	-25 to 25 Pa (-0.1 to 0.1 in wg)'	3 Pa (±0.01 in. w.g.)	3 Pa (±0.01 in. w.g.)	1	1	1.3 Pa (0.005in. w.g.)
S13	Water Pressure	AI		0 to 1034 kPa (0 to 150 psi)	±2% of Full Scale	7 kPa (1 psi)	1	1	3.5 kPa (0.5 psi)
S14	Water Temperature	AI		(0°C to 107°C) (32°F to 225°F)	±0.5°C (±1°F)	±0.5°C (±1°F)	1	1	±0.5°C (±1°F)
S15	Delta-T	AI	10000 ohm Thermistor or 1000 ohm RTD Matched Pair		±0.15°C (±0.25°F)	±0.25°C (±0.5°F)	1	1	±0.15°C (±0.25°F)
S16	Relative Humidity	AI		0% to 100%	±5% RH	5%	1	1	±5% RH
S17	Water Flow	AI			±2% of Reading	1000 L/s	1	1	
S18	Ducted Air Temperature	AI	10000 ohm Thermistor or 1000 ohm RTD	7°C to 60°C (45°F to 140°F)	±0.5°C (±1°F)	±0.5°C (±1°F)	1	1	±0.5°C (±1°F)
S19	Electrical Meters	AI/BI (Pulse)	Pulse Output Refer to Electrical Sections						
S28	Airflow Rate (Measuring Stations)	AI	Electronic or Differential Pressure		±5% of Reading Down to 0.75 m/s (150 fpm)	0.05 L/s (0.1 cfm)	1	1	±5% of Reading Down to 0.75 m/s (150 fpm)
S30	Airflow (Terminal)	AI	Electronic or Differential Pressure		±10% of Reading	47 L/s (100 cfm)	1	1	±10% of Reading
S31	Airflow (Pressurized Spaces)	AI	Electronic or Differential Pressure		±3% of Reading	24 L/s (50 cfm)	1	1	±3% of Reading
Table 1									

#	Object Description and Location if Applicable	Sensor or Value Type	Sensor Type or Calculation Method	Expected Range	Required End-to-End Accuracy	Display Resolution	Refresh Interval min	Trend Interval min	Accuracy Required for Control
S1	Ambient Dry-Bulb Temperature	AI	Locate in weather station or ventilated enclosure in fully shaded location away from thermal mass bodies	-29°C to 40°C (-20°F to 120°F)	±0.5°C (±0.1°F)	±0.25°C (±0.5°F)	1	10	±1.0°C (±2°F)
S2	Ambient Wet-Bulb Temperature	AI	Locate in weather station or ventilated enclosure in fully shaded location away from thermal mass bodies	–29°C to 40°C (-20°F to 120°F)	±1.5°C (±3.0°F)	±0.25°C (±0.5°F)	1	10	±1.5°C (±3°F)
S6	Building Main Meter Power	AI/BI (pulse)	True RMS Refer to Electrical Sections						
S8	Zone (Space) Temperatures	AI	10000 ohm Thermistor or 1000 ohm RTD	–1°C to 38°C (30°F to 100°F)	±0.5°C (±0.1°F)	±0.25°C (±0.1°F)	1	1	±0.5°C (±1°F)
S9	Carbon Dioxide	AI	Nondispersive Infrared Sensor Technology	0 to 2000 ppm	±50 ppm	50 ppm	1	1	50 ppm
S10	Carbon Monoxide	AI	Electrochemical Sensor	0 to 100 ppm	±5 ppm	50 ppm	1	1	50 ppm
S11	Air Pressure (Ducts)	AI	Variable Capacitance	0 to 2 kPa (0 to 8 in. w.g.)	±25 Pa (±0.1 in. w.g.)	125 Pa (±0.5 in. w.g.)	1	1	25 Pa (0.1 in. w.g.)
S12	Air Pressure (Space)	AI	Variable Capacitance	-25 to 25 Pa (-0.1 to 0.1 in wg)'	3 Pa (±0.01 in. w.g.)	3 Pa (±0.01 in. w.g.)	1	1	1.3 Pa (0.005in. w.g.)
S13	Water Pressure	AI		0 to 1034 kPa (0 to 150 psi)	±2% of Full Scale	7 kPa (1 psi)	1	1	3.5 kPa (0.5 psi)
S14	Water Temperature	AI		(0°C to 107°C) (32°F to 225°F)	±0.5°C (±1°F)	±0.5°C (±1°F)	1	1	±0.5°C (±1°F)
S15	Delta-T	AI	10000 ohm Thermistor or 1000 ohm RTD Matched Pair		±0.15°C (±0.25°F)	±0.25°C (±0.5°F)	1	1	±0.15°C (±0.25°F)
S16	Relative Humidity	AI		0% to 100%	±5% RH	5%	1	1	±5% RH
S17	Water Flow	AI			±2% of Reading	1000 L/s	1	1	

Table 1									
#	**Object Description and Location if Applicable**	**Sensor or Value Type**	**Sensor Type or Calculation Method**	**Expected Range**	**Required End-to-End Accuracy**	**Display Resolution**	**Refresh Interval (min)**	**Trend Interval (min)**	**Accuracy Required for Control**
S18	Ducted Air Temperature	AI	10000 ohm Thermistor or 1000 ohm RTD	7°C to 60°C (45°F to 140°F)	±0.5°C (±1°F)	±0.5°C (±1°F)	1	1	±0.5°C (±1°F)
S19	Electrical Meters	AI/BI (Pulse)	Pulse Output Refer to Electrical Sections						
S28	Airflow Rate (Measuring Stations)	AI	Electronic or Differential Pressure		±5% of Reading Down to 0.75 m/s (150 fpm)	0.05 L/s (0.1 cfm)	1	1	±5% of Reading Down to 0.75 m/s (150 fpm)
S30	Airflow (Terminal)	AI	Electronic or Differential Pressure		±10% of Reading	47 L/s (100 cfm)	1	1	±10% of Reading
S31	Airflow (Pressurized Spaces)	AI	Electronic or Differential Pressure		±3% of Reading	24 L/s (50 cfm)	1	1	±3% of Reading

AI = analog input; BI = binary input; calculated = value calculated by the BAS hardware or BAS software

7.7.3.4 Interface with Other Systems

7.7.3.4(1) Control/monitor and interface with systems as per 7.7.3.

7.7.3.4(2) Work, materials, and equipment will comply with the most restrictive of local, provincial, and federal authorities' codes and ordinances or as specified herein.

7.7.3.5 Materials

7.7.3.5(1) Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts will be available for at least five years after completion of this Project Agreement.

7.7.3.6 Communication and System Architecture

7.7.3.6(1) All networked control products will be comprised of an industry standard open protocol BACnet/IP internetwork. Communication involving control components (i.e. all types of controllers and operator interfaces) will conform to ASHRAE Standard 135.

Networks and protocols proprietary to one company or distributed by one company are prohibited.

7.7.3.6(2) Provide new wiring and network devices as required to provide a complete and workable control network.

7.7.3.6(3) Each controller will have an ethernet communication port.

7.7.3.6(4) Network operator interface and value passing will be transparent to internetwork architecture.

7.7.3.6(5) An operator interface connected to the BMS will allow the operator to interface with each networked controller as if directly connected. BMS information such as data, status, reports, system software, and custom programs will be viewable and editable.

7.7.3.6(6) Inputs, outputs, and control variables used to integrate control strategies across multiple controllers will be available on the network.

7.7.3.6(7) Systems will be expandable to at least twice the required data points with additional controllers, associated devices, and wiring. Expansion will not require operator interface hardware additions or software revisions. Provide spare points on panels and/or controllers installed in mechanical and Electrical Rooms for future growth.

7.7.3.6(8) Workstations, building control panels, and controllers with real-time clocks will use the BACnet time synchronization service. System will automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system will automatically adjust for daylight saving and standard time as applicable.

7.7.3.6(9) Provide at a minimum three (3) operator interface(s) to be designated at the BMS server with server application software. Additional operator interfaces will use operator workstation licensees or connect via a thin-client application.

7.7.3.6(10) BMS server will be capable of simultaneous direct connection and communication with BACnet/IP, OPC and TCP/IP corporate level networks without the use of interposing devices.

7.7.3.6(11) Any break in ethernet communication between the standard client and server workstations on the network will result in a notification at each workstation.

7.7.3.6(12) The building controllers (BCs) will be capable to support subnetwork MS/TP communication with terminal unit controllers.

7.7.3.6(13) The network architecture will consist of two levels of networks as follows:

7.7.3.6(13)(a) The automation and floor level network will be BACnet/IP. It will network all the building controllers (BCs), advanced application controllers (AACs), the automation server, and operator workstations. All ethernet controllers will interface with FMO Network; and

7.7.3.6(13)(b) Sub-network: Subnetworks will be BACnet MS/TP LAN. These subnetworks will network Advanced Application Controllers (ASCs), Custom Application Controllers (CACs) and Application Specific Controllers (ASCs). Each MS/TP subnetwork will be limited to a maximum of 70 connected devices. Each MS/TP subnetwork will be limited to one floor level.

7.7.3.6(14) The following devices will reside on the automation level BACnet/IP over ethernet network:

7.7.3.6(14)(a) All systems and their controllers (other than ones indicated below to be on MS/TP) indicated in 7.7.3 will be on BACnet/IP network

7.7.3.6(15) The following devices can reside on MS/TP sub-networks:

7.7.3.6(15)(a) Terminal units such as VAV units or fan coils;

7.7.3.6(15)(b) Other minor terminal equipment;

7.7.3.6(15)(c) Advanced application controllers for AHUs less than 2,500 L/s;

7.7.3.6(15)(d) Controllers for air moving equipment less than 2,500 L/s; and

7.7.3.6(15)(e) Local hydronic circulating equipment not part of the Energy centre and less than 5 hp.

7.7.3.6(16) Zone and floor level controllers, terminal units, packaged AC units, auxiliary equipment will reside on either BACnet/IP over ethernet network of a MS/TP sub-network.

7.7.3.6(17) The system will meet peer-to-peer communication services such that the values in any one controller can be read or changed from all other controllers. The software will provide transparent transfer of all data, control programs, schedules, trends, and alarms from

any one controller through the internetwork to any other controller, regardless of subnetwork routers.

7.7.3.6(18) Energy Centre Network

7.7.3.6(18)(a) All central plant equipment associated with the Energy Centre will utilize programmable logic controllers (PLC) for increased reliability. Provide dual PLC central processing units for redundancy complete with built-in UPS. Energy Centre controllers will communicate on a dedicated sub-network to all I/O interfaces (hard-wired points).

7.7.3.6(18)(b) Provide a dedicated supervisory control and data acquisition (SCADA) system interface for control, trending, archiving. Provide interface from Energy Centre Network to BMS BACnet/IP network. Provide graphics, dedicated server, on-site trend logging, and storage (historian).

7.7.3.6(18)(c) All Heating plant, cooling plant, heat recovery plant, steam plant and other central plant systems in the Energy Centre will be controlled by this system.

7.7.3.6(18)(d) Provide serial port network to pick up all network cards within all packaged equipment within energy centre, including VFDs, chillers, boilers, etc. for any points that are not required to be hard-wired.

7.7.3.7 Distributed Control Requirements

7.7.3.7(1) The loss of any one controller will not affect the operation of other systems, only for the points connected to the controller.

7.7.3.7(2) The system will be scalable in nature and will permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers, and operator devices.

7.7.3.7(3) System architecture will eliminate dependence upon any single device for alarm reporting and control execution. Each controller will operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection will not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

7.7.3.7(4) Controllers will be able to access any data from or send control commands and alarm reports directly to any other controller on the network without dependence upon a central processing

device. Controllers will also be able to send alarms to multiple operator workstations without dependence upon a central or intermediate processing device.

7.7.3.7(5) Control panels will be mounted in the same mechanical room as the equipment being controlled, or an adjacent utility room.

7.7.3.7(6) Remote sensors will be wired to the control panel of the equipment it is controlling, not across the network.

7.7.3.7(7) Signals to remote motor control centres will be hard wired to the control panel, not across the network.

7.7.3.8 Operator Interface

7.7.3.8(1) Operator workstations will be provided by the Owner. Project Co to design all BMS workstation requirements and provide these technical requirements to the Owner.

7.7.3.8(2) For other applications, Project Co will at a minimum:

7.7.3.8(2)(a) Provide five (5) dedicated operator interface stations for the Energy Centre;

7.7.3.8(2)(b) Provide a dedicated operator interface for the Energy Centre PLC-based control system;

7.7.3.8(2)(c) Provide two (2) dedicated operator interface stations for each mechanical room;

7.7.3.8(2)(d) Provide an additional ten (10) laptop or tablet with full operator interface capability; and

7.7.3.8(2)(e) Provide additional operator interface stations for purchase as requested by the Owner.

7.7.3.8(3) Hardware

7.7.3.8(3)(a) Each operator workstation or web server will consist of the following:

7.7.3.8.3.(a).1 Computer. Hardware will meet or exceed BMS manufacturer's recommended specifications and will meet response times specified elsewhere in this Division. The following hardware requirements also apply:

(a).1.1 The hard disc will have enough memory to store all required operator workstation software; A BMS database at least four-times the size of the delivered system data-based; and two

years of trend data based on all points being trended at a trend interval of 5-minutes; and

(a).1.2 Provide additional hardware (communication ports, video drivers, network interface cards, cabling, etc.) to facilitate all control functions and software requirements specified for the BMS.

7.7.3.8(4) Software

7.7.3.8(4)(a) The Owner will provide an operating system within a virtualized server environment for installation of BMS software. Project Co to design all BMS server requirements and provide these technical requirements to the Owner.

7.7.3.8(4)(b) All BMS software (not residing on system controllers) such as operator workstation software, BMS database and trend data will reside on Owner provided FMO servers and computers as per Section 7.7.1.1. There will be no silo vendor servers and/or computers except as reviewed by the Owner.

7.7.3.8(4)(c) System Graphics. The operator workstation software will be graphically oriented. The system will allow display of up to 10 graphic screens at once for comparison and monitoring of system status. Provide a method for the operator to easily move between graphic displays and change the size and location of graphic displays on the screen. The system graphics will be able to be modified while online. An operator with the proper password level will be able to add, delete, or change dynamic objects on a graphic. Dynamic objects will include analog and binary values, dynamic text, static text, and animation files. Graphics will have the ability to show animation by shifting image files based on the status of the object.

7.7.3.8(4)(d) Custom Graphics. Custom graphic files will be created with the use of a graphics generation package furnished with the system. The graphics generation package will be a graphically based system that uses the mouse to create and modify graphics that are saved in industry standard formats. The graphics generation package also will

provide the capability of capturing or converting graphics from other programs such as Revit or AutoCAD.

7.7.3.8(4)(e) Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators, and others are required for this Project. This library also will include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library will be furnished in a file format compatible with the graphics generation package program.

7.7.3.8(5) System applications. Each workstation will provide operator interface and off-line storage of system information. Provide the following applications at each workstation:

7.7.3.8(5)(a) Automatic system database save and restore. Each workstation will store on the hard disk a copy of the current database of each building controller. This database will be updated whenever a change is made in any system panel. The storage of these data will be automatic and not require operator intervention. In the event of a database loss in a building management panel, the first workstation to detect the loss will automatically restore the database for that panel. This capability may be disabled by the operator.

7.7.3.8(5)(b) Manual database save and restore. A system operator with the proper password clearance will be able to save the database from any system panel. The operator also will be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.

7.7.3.8(5)(c) System configuration. The workstation software will provide a method of configuring the system. This will allow for future system changes or additions by users under proper password protection.

7.7.3.8(5)(d) Online help. Provide a context-sensitive online help system to assist the operator in operating and editing the system. Online help will be available for all applications and will provide the relevant data for that particular screen. Additional help information will be available through the use of hypertext.

7.7.3.8(5)(e)	Security. Each operator will be required to log on to the system with a username and password in order to view, edit, add, or delete data. System security will be selectable for each operator. The system supervisor will have the ability to set passwords and security levels for all other operators. Each operator password will be able to restrict the functions accessible to viewing and/or changing each system application, editor, and object. Each operator will automatically be logged off of the system if no keyboard or mouse activity is detected. This auto logoff time period will be user adjustable. All system security data will be stored in an encrypted format.
7.7.3.8(5)(f)	System diagnostics. The system will automatically monitor the operation of all workstations, printers, network connections, building management panels, and controllers. The failure of any device will be annunciated to the operator.
7.7.3.8(5)(g)	Alarm processing. Any object in the system will be configurable to alarm in and out of normal state. The operator will be able to configure the alarm limits, alarm limit differentials, states, and reactions for each object in the system.
7.7.3.8(5)(h)	Alarm messages. Alarm messages will use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying upon acronyms or other mnemonics.
7.7.3.8(5)(i)	Alarm reactions. The operator will be able to determine (by object) what, if any, actions are to be taken during an alarm. Actions will include logging, printing, starting programs, displaying messages, dialing out to remote stations, paging, providing audible annunciation, or displaying specific system graphics. Each of these actions will be configurable by workstation and time of day.
7.7.3.8(5)(j)	Trend logs. The operator will be able to define a custom trend log for any data object in the system. This definition will include interval, start time, and stop time. Trend data will be sampled and stored on the building controller panel, be archived on the hard disk, and be retrievable for use in

spreadsheets and standard database programs. Trend data will be exportable in a standard electronic format (e.g., .xls, .csv, .xml) for analysis external to the BMS.

7.7.3.8(5)(k) Alarm and event log. The operator will be able to view all system alarms and change of states from any location in the system. Events will be listed chronologically. An operator with the proper security level may acknowledge and clear alarms. All that have not been cleared by the operator will be archived to the hard disk on the workstation.

7.7.3.8(5)(l) Group trend time series plots.

- 7.7.3.8.5.(l).1 Provide user-selectable Y points.
- 7.7.3.8.5.(l).2 Provide user-editable titles, point names, and Y axis titles.
- 7.7.3.8.5.(l).3 Individual trended points will be able to be grouped in groups of up to five points per plot with up to four plots per page.

7.7.3.8(5)(m) X-Y Trend Plots

- 7.7.3.8.5.(m).1 User-selectable X and Y trend inputs
- 7.7.3.8.5.(m).2 User-editable titles, point names, and X and Y axis titles.
- 7.7.3.8.5.(m).3 User-selectable time period. The user will be able to select the beginning and ending period for each X-Y chart, within the time domain of the database being used.
- 7.7.3.8.5.(m).4 User-selectable display of up to 6 plots per screen in 2 columns.

7.7.3.8(5)(n) Object and property status and control. Provide a method for the operator to view and edit if applicable, the status of any object and property in the system. The status will be available by menu, on graphics, or through custom programs.

7.7.3.8(5)(o) Reports and logs. Provide a reporting package that allows the operator to select, modify, or create reports. Each report will be definable as to data content, format, interval, and date. Report data will be archivable on the hard disk for historical reporting. Provide the ability for the operator to obtain real-time logs of all objects by type or status (e.g., alarm, lockout, normal). Reports and logs will be stored on the hard disk in a format that is readily accessible by other standard software applications,

including spreadsheets and word processing. Reports and logs will be readily printed to the system printer and will be set to be printed either on operator command or at a specific time each day.

7.7.3.8(5)(p) Standard reports. The following standard BMS reports will be provided for the Facility. Provide ability for the Owner to readily customize these reports for the Project:

- 7.7.3.8.5.(p).1 All objects/points/variables: all system (or subsystem) objects, points, variables, configuration properties, and their current values;
- 7.7.3.8.5.(p).2 Alarm summary: all current alarms (except those in alarm lockout);
- 7.7.3.8.5.(p).3 Disabled objects/points: all objects/points that are disabled;
- 7.7.3.8.5.(p).4 Alarm lockout objects/points: all objects/points in alarm lockout (whether manual or automatic);
- 7.7.3.8.5.(p).5 Alarm lockout objects/points in alarm: all objects/points in alarm lockout that are currently in alarm; and
- 7.7.3.8.5.(p).6 Logs:
  - (p).6.1 Alarm history
  - (p).6.2 System messages
  - (p).6.3 System events
  - (p).6.4 Trends
  - (p).6.5 Operator Activity. At a minimum, system will log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System will date and time stamp logged activity.

7.7.3.8(5)(q) Custom reports. Provide the capability for the operator to easily define any system data into a daily, weekly, monthly, or annual report. The customized reports formats will be as reviewed by the Owner.

7.7.3.8(5)(r) Workstation applications editors. Each workstation will support editing of all system applications. Provide editors for each application at the workstation. The applications will be downloaded

and executed at one or more of the controller panels.

7.7.3.8(5)(s) Controller. Provide a full-screen editor for each type of application that will allow the operator to view and change the configuration, name, control parameters, and set points for all controllers.

7.7.3.8(5)(t) Scheduling. An editor for the scheduling application will be provided at each workstation. Provide a method of selecting the desired schedule and schedule type. Exception schedules and holidays will be shown clearly on the calendar. Provide a method for allowing several related objects to follow a schedule. The start and stop times for each object will be adjustable from this master schedule. Schedules will be easy to copy to other objects and/or dates.

7.7.3.8(5)(u) Custom Application Programming. Provide the tools to create, modify, debug, and download custom programs. The operator will be able to create, edit, and download custom programs at the same time that all other system applications are operating. The BMS will be fully operable while custom routines are edited, compiled, and downloaded.

7.7.3.8(6) Provide software updates on all operator workstations at Service Commencement to the most current commercially available software version.

7.7.3.9 Graphics

7.7.3.9(1) Provide graphics for all systems interfaced, controlled and monitored by the BMS as indicated in Section 7.7.3. Show on each graphic all input and output points for the system and relevant calculated points such as setpoints.

7.7.3.9(2) Provide an overall Facility graphic.

7.7.3.9(3) Provide separate floor plan graphics of the Facility for each integrated, controlled, and monitored systems, and locate the graphics on the floor plan according to the devices physical location within the Facility.

7.7.3.9(4) Provide dedicated graphics for fire alarm system monitoring and smoke control management.

7.7.3.9(5) Provide dedicated graphics for Outbreak Control Zone control and monitoring.

7.7.3.9(6) Provide dedicated graphics for each system and sub-system with graphically representation of all equipment including all input and output points and relevant calculated points.

7.7.3.9(7) Provide graphic summary tables for all demand-based reset parameters.

7.7.3.9(8) Show terminal equipment information on a graphic summary table. Provide dynamic information for each point shown.

7.7.3.10 Alarms

7.7.3.10(1) Provide full integration of all alarms with the FMO level network and IM/IT system for monitoring and acknowledgement of alarms.

7.7.3.10(2) All alarms will include a time/date stamp using real-time and date.

7.7.3.10(3) Each alarm will be configured in terms on level, latching (requires acknowledgement of a return to normal), non-latching (does not require acknowledgement of a return to normal), entry delay, exit deadband, and post-suppression period.

7.7.3.10(4) Operators will be able to sort alarms based on level, time and date, and current status.

7.7.3.10(5) Alarms will be reported with the following information:

7.7.3.10(5)(a) Date and time of the alarm;

7.7.3.10(5)(b) Level of the alarm;

7.7.3.10(5)(c) Description of the alarm;

7.7.3.10(5)(d) Equipment tags for the units in alarm;

7.7.3.10(5)(e) Possible causes of the alarm provided by the fault detection routines; and

7.7.3.10(5)(f) The source that serves the equipment in alarm.

7.7.3.10(6) Provide the following levels of alarm:

7.7.3.10(6)(a) Level 1: Life safety message;

7.7.3.10(6)(b) Level 2: Critical equipment message;

7.7.3.10(6)(c) Level 3: Urgent message; and

7.7.3.10(6)(d) Level 4: Normal message.

7.7.3.10(7) Maintenance mode. Operators will have the ability to put any device in/out of maintenance mode. All alarms associated with a device in maintenance mode will be suppressed except for life safety alarms. A daily Level 3 alarm will be issued at a scheduled time indicating that the device is still in maintenance mode.

7.7.3.10(8) Entry delays. All alarms will have an adjustable delay time such that the alarm is not triggered unless the alarm condition is true for the delay time. Default entry delays are as follows:

7.7.3.10(8)(a) Level 1 alarms: 1 second;

7.7.3.10(8)(b) Level 2 alarms: 10 seconds;

7.7.3.10(8)(c) Level 3 alarms: 1 minute; and

7.7.3.10(8)(d) Level 4 alarms: 5 minutes.

7.7.3.10(9) Exit Hysteresis

7.7.3.10(9)(a) Each alarm will have an adjustable time-based hysteresis to exit the alarm. Once set, the alarm does not return to normal until the alarm conditions have ceased for the duration of the hysteresis. Default hysteresis is 5 seconds.

7.7.3.10(9)(b) Each analog alarm will have an adjustable percent-of-limit-based hysteresis the alarmed variable required to exit the alarm. Alarm conditions have ceased when the alarmed variable is below the triggering threshold by the amount of the hysteresis.

7.7.3.10(10) Latching. Each alarm can be configured as latching or non-latching. A latching alarm requires acknowledgment from the operators before it can return to normal, even if the exit deadband has been met. A non-latching alarm does not require acknowledgment. Default latching status is as follows:

7.7.3.10(10)(a) Level 1 alarms: latching;

7.7.3.10(10)(b) Level 2 alarms: latching;

7.7.3.10(10)(c) Level 3 alarms: non-latching; and

7.7.3.10(10)(d) Level 4 alarms: non-latching.

7.7.3.10(11) Post-exit suppression period. To limit alarms, each alarm will have an adjustable suppression period such that, if the alarm is

triggered, its post-suppression timer is triggered and the alarm will not trigger again until the post suppression timer has expired. Post-suppression only applies to a particular instance of an alarm. Default suppression periods are as follows:

7.7.3.10(11)(a) Level 1 alarms: 0 minutes;

7.7.3.10(11)(b) Level 2 alarms: 5 minutes;

7.7.3.10(11)(c) Level 3 alarms: 8 hours; and

7.7.3.10(11)(d) Level 4 alarms: 2 days.

7.7.3.10(12) For both latching and non-latching alarms, the operator will be able to acknowledge the alarm. Acknowledging an alarm clears the alarm, the exit deadband, and suppression period. A device can go right back into alarm as soon as the entry delay elapses.

7.7.3.10(13) Hierarchical Alarm Suppression

7.7.3.10(13)(a) For each piece of equipment and zone, define its relationship (if any) to other equipment in terms of “source”, “load” or “system”.

7.7.3.10(13)(b) A component is a “source” if it provides resources to a downstream component.

7.7.3.10(13)(c) A component is a “load” if it receives resources from an upstream component.

7.7.3.10(13)(d) The same component can be both a load (receiving resources from an upstream source) and a source (providing resources to a downstream load).

7.7.3.10(13)(e) A set of components is a “system” if they share a load in common.

7.7.3.10(13)(f) For each system, there will be a System OK flag, which is either true or false.

7.7.3.10(13)(g) System OK will be true when all of the following are true:

7.7.3.10.13.(g).1 The system is proven on;

7.7.3.10.13.(g).2 The system is achieving its temperature and/or pressure set point(s) for at least 5 minutes; and

7.7.3.10.13.(g).3 The system is ready and able to serve its load.

7.7.3.10(13)(h) SystemOK will be false while the system is starting up or when enough of the system’s components are

unavailable to disrupt the ability of the system to serve its load. This threshold will be proposed for each system by the Project Co and reviewed for acceptance by the Owner.

7.7.3.10(13)(i) By default, Level 1 through Level 3 component alarms will inhibit SystemOK. Level 4 component alarms will not affect SystemOK.

7.7.3.10(13)(j) The operator will have the ability to individually determine which component alarms will and will not inhibit SystemOK.

7.7.3.10(13)(k) The BMS will selectively suppress alarms for load components if SystemOK is false for the source system that serves that load.

7.7.3.10(13)(l) If SystemOK is false for a cooling water system, then only high-temperature alarms from loads will be suppressed.

7.7.3.10(13)(m) If SystemOK is false for a heating water system, then only low-temperature alarms from loads will be suppressed.

7.7.3.10(13)(n) If SystemOK is false for an air-side system, then all alarms from the loads will be suppressed.

7.7.3.10(13)(o) Hierarchical suppression will cascade through multiple levels of load-source relationship such that alarms at downstream loads will also be suppressed.

7.7.3.10(13)(p) The following types of alarms will never be suppressed by this logic:

- 7.7.3.10.13.(p).1 Life safety and Level 1 alarms;
- 7.7.3.10.13.(p).2 Failure-to-start alarms;
- 7.7.3.10.13.(p).3 Failure-to-stop alarms; and
- 7.7.3.10.13.(p).4 All alarms associated with critical environment areas including: Planned OR(s), Airborne Isolation Rooms, AIR Anterooms, Airborne Isolation-Hybrid(s), VHF Rooms, Pharmacy, cleanrooms and CL2+ lab rooms.

7.7.3.10(14) Time-based suppression. Calculate a time-delay period after any change in setpoint based on the difference between the controlled variable and the time of the change and the new setpoint. The default time delay period will be as follows:

7.7.3.10(14)(a) For thermal zone temperature alarms: 10 minutes per °C of difference but no longer than 120 minutes;

7.7.3.10(14)(b) For thermal zone temperature cooling requests: 5 minutes per °C of difference but no longer than 30 minutes; and

7.7.3.10(14)(c) For thermal zone temperature heating requests: 5 minutes per °C of difference but no longer than 30 minutes

7.7.3.11 Energy Sub-Metering Systems and Energy Reporting

7.7.3.11(1) Provide all required meters, sensors, and trend logging equipment at end uses within the Facility to meet the energy monitoring requirements outlined in Appendix 3Q [Metering Matrix].

7.7.3.11(2) All meters will be connected to an integrated energy management system to monitor, record, report, and analyze energy consumption. Coordinate electrical metering and the energy management system with the requirements of Section 7.8 Division 26.

7.7.3.11(3) Provide complete digital metering systems.

7.7.3.11(4) Provide runtime logs on all compressors included freezers.

7.7.3.11(5) Metering intervals will be confirmed with the Owner's Mechanical engineer prior to meter selection and programming.

7.7.3.11(6) Provide meter as listed in Appendix 3Q [Metering Matrix].

7.7.3.11(7) Refer to measurement and verification section for more information on metering data storing and reporting.

7.7.3.11(8) Energy Reports

7.7.3.11(8)(a) System will include an easily configured energy reporting tool that provides the capabilities described in this section.

7.7.3.11(8)(b) The energy reporting tool will be accessible through the same user interface (Web browser or operator workstation software) as is used to manage the BMS.

7.7.3.11(8)(c) The energy reporting tool will be preconfigured to gather and store energy demand and consumption data from each energy source that provides metered data to the BMS. Meter data will be stored

at 5-minute intervals. This data will be maintained in an industry standard SQL database for a period of not less than five years.

7.7.3.11(8)(d) The energy reporting tool will allow the operator to select an energy source and a time period of interest (day, week, month, year, or date range) and will provide options to view the data in a table, line graph, bar graph, or pie chart. The tool will also allow the operator to select two or more data sources and display a comparison of the energy used over this period in any of the listed graph formats, or to total the energy used by the selected sources and display that data in the supported formats.

7.7.3.11(8)(e) The energy reporting tool will allow the operator to select and energy source and two time periods of interest (day, week, month, year, or date range) and display a graph that compares the energy use over the two time periods in any of the graph formats listed in the previous paragraph. The tool will also allow the operator to select multiple energy sources and display a graph that compares the total energy used by these sources over the two time periods.

7.7.3.11(8)(f) The energy reporting tool will allow the operator to easily generate the previously described graphs "on the fly," and will provide an option to store the report format so the operator can select that format to regenerate the graph at a future date. The tool will also allow the user to schedule these reports to run on a recurring basis using relative time periods, such as automatically generating a consumption report on the first Monday of each month showing consumption over the previous month. Automatically generated reports will be archived on the server in a common industry format such as Adobe PDF or Microsoft Excel with copies e-mailed to a user editable list of recipients.

7.7.3.11(8)(g) The energy reporting tool will be capable of collecting and displaying data from all the connected meter types.

7.7.3.11(8)(h) The user will have the option of using multiple unit types. All selected sources will be automatically converted to the selected units. The user will

similarly have the option of entering Facility area and occupancy hours and creating reports that are normalized on an area basis, an annual use basis, or an occupied hour basis.

7.7.3.11(8)(i) The user will have the option of entering benchmark data for an individual facility or a group of facilities.

7.7.3.11(8)(j) The user will have the option of displaying any or all of the following data on any chart, line, or bar graph generated by the energy reporting tool:

7.7.3.11.8.(j).1 Low/High/Average value of the metered value being displayed;

7.7.3.11.8.(j).2 Heating and/or Cooling Degree Days for the time period(s) being displayed; and

7.7.3.11.8.(j).3 The Environmental Index for the facilities and time periods being displayed.

7.7.3.11(8)(k) Provide dashboard configured as per the energy breakdown requirements as defined in Schedule 2, Appendix 2D [Energy] to assist the independent energy consultant assess the energy performance of the Facility. Provide all required KPIs.

7.7.3.11(8)(l) Provide a dedicated energy report per department (per AHU). Report for each department will include end-use breakdown and KPIs.

7.7.3.11(8)(m) ASHRAE Standard 147 Report: provide a daily report that shows the operating conditions of each chiller as recommended by ASHRAE Standard 147.

7.7.3.12 Controller Software

7.7.3.12(1) Furnish the following applications for building and energy management. All software application will reside and operate in the system controllers. Applications will be editable through operator workstation, web browser interface, or engineering workstation.

7.7.3.12(2) Provide software update on all controllers at Service Commencement to the most current commercially available software version.

7.7.3.12(3) System security. User access will be secured using individual security passwords and user names. Passwords will restrict the user to the objects, applications, and system functions as assigned by the system manager. User log on/log off attempts will be recorded. The system will protect itself from unauthorized use

by automatically logging off following the last keystroke. The delay time will be user adjustable.

7.7.3.12(4) System coordination. Provide a standard application for the proper coordination of equipment. This application will provide the operator with a method of grouping together equipment based on function and location. This group may then be used for scheduling or other applications.

7.7.3.12(5) Scheduling. Provide the capability to execute control functions according to a user created or edited schedule. Each schedule will provide the following schedule options as a minimum:

7.7.3.12(5)(a) Weekly Schedule. Provide separate schedules for each day of the week. Each schedule will be able to include up to 5 occupied periods (5 start-stop pairs or 10 events);

7.7.3.12(5)(b) Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule has executed, the system will discard and replace the exception schedule with the standard schedule for that day of the week; and

7.7.3.12(5)(c) Holiday Schedules. Provide the capability for the operator to define up to 24 special or holiday schedules. These schedules will be repeated each year. The operator will be able to define the length of each holiday period.

7.7.3.12(6) Binary Alarms. Each binary object will have the capability to be configured to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.

7.7.3.12(7) Analog Alarms. Each analog object will have both high and low alarm limits. The operator will be able to enable or disable these alarms.

7.7.3.12(8) Alarm Reporting. The operator will be able to determine the action to be taken in the event of an alarm. An alarm will be able to start programs, print, be logged in the event log, generate custom messages, and display on graphics.

7.7.3.12(9) Remote Communication. The system will have the ability to transmit the alarm/event using the BACnet control network.

7.7.3.12(10) Demand Limiting

7.7.3.12(10)(a) The demand-limiting program will monitor building power consumption from signals generated by a pulse generator mounted at the building power meter or from a watt transducer or current transformer attached to the building feeder lines.

7.7.3.12(10)(b) The demand-liming program will predict the probable power demand such that action can be taken to prevent exceeding the demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates the demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.

7.7.3.12(10)(c) Demand-limiting parameters, frequency of calculations, time intervals, and other relevant variables will be based on the means by which the local power company computes demand charges.

7.7.3.12(10)(d) Provide demand-limiting prediction and control for any individual meter monitored by the system or for the total of any combination of meters.

7.7.3.12(10)(e) Any implemented demand-limiting will not compromise Patient care functions or Patient Care Area environmental and thermal comfort.

7.7.3.12(11) Maintenance Management. The system will monitor equipment status and generate maintenance messages based upon user-designated runtimes, starts, and/or calendar data limits. Configure and enable maintenance alarms based on equipment manufacturer recommended maintenance schedule.

7.7.3.12(12) Sequencing. Provide application software based upon the sequence of operation to properly sequence chillers, boilers, pumps and additional system equipment to provide orderly start-up, operation, and shut-down of equipment.

7.7.3.12(13) PID (proportional-integral-derivative) Control. System will provide direct- and reverse-acting PID algorithms. Each algorithm will have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm will calculate a time-varying analog value that can be used to position an output or to stage a series of outputs. The calculation interval, PID gains, and other tuning parameters will be adjustable by a user with the correct security level.

7.7.3.12(14) Will stagger controlled equipment restart after power outage. Operator will be able to adjust equipment restart order and time delay between equipment restarts.

7.7.3.12(15) Energy Calculations. Provide software to allow instantaneous power or flow rates to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window average (e.g., rolling average). The algorithm will be flexible to allow window intervals to be user specified (e.g., 15 min, 30 min, 60 min). provide an algorithm that calculates a fixed-window average. A digital input signal will define the start of the window period (e.g., signal from a utility meter) to synchronize the fixed-window average with that used by the energy service provider.

7.7.3.12(16) Anti-Short Cycling. All binary output objects will be protected from short cycling by means of adjustable minimum on-time and off-time settings.

7.7.3.12(17) On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a setpoint. The algorithm will be direct-acting or reverse-acting and incorporate an adjustable differential.

7.7.3.12(18) Runtime Totalization. Provide software to totalize runtime for each binary input and output. Operator will be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified.

7.7.3.13 Controller

7.7.3.13(1) Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in this Division. Every device in the system which executes control logic and directly controls HVAC equipment will conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hard-wired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

7.7.3.13(2) Building Controllers (BCs). Each BC will conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L, and will be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

7.7.3.13(3) Advanced Application Controllers (AACs). Each AAC will conform to BACnet Advanced Application Controller (B-AAC) device profile

as specified in ANSI/ASHRAE 135, BACnet Annex L and will be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

7.7.3.13(4) Application Specific Controllers (ASCs). Each ASC will conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and will be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

7.7.3.13(5) Smart Sensors (SSs). Each SS will conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and will be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

7.7.3.13(6) Each piece of equipment will be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment will be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.

7.7.3.13(7) Provide a separate BC or ACC for each AHU or other HVAC system. A controller may control more than one system provided that all points associated with the system are assigned to the same controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.

7.7.3.13(8) All controllers will use the same programming language.

7.7.3.13(9) All controllers and software will be BTL listed at the time of shop drawing submission.

7.7.3.14 Packaged Equipment Controls

7.7.3.14(1) Electronic controls packaged with any equipment provided under this contract will communicate with the Facility BMS. The BMS will communicate with these controls to read the information and change the control setpoints. The information to be communicated between the BMS and the controls will be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers will communicate with other BACnet objects on the network using the read (execute) property service as defined in clause 15.5 of Standard 135.

7.7.3.14(2) Controllers will be capable of stand-alone operation and will continue to provide control functions if the network connection is lost.

7.7.3.14(3) Controllers will contain sufficient I/ O capacity to control the target system.

7.7.3.14(4) Controllers will have a physical connection for a laptop computer or a portable operator's tool.

7.7.3.14(5) The hardware will be suitable for the anticipated ambient conditions. Controllers used outdoors and/or in wet ambient conditions will be mounted within waterproof enclosures and rated for be expected ambient temperature conditions. Controllers used in conditioned space will be mounted in dust-proof enclosures and be rated for expected operating temperature conditions.

7.7.3.14(6) Provide diagnostic LEDs for power, communication, and processor. All wiring connections will be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.

7.7.3.14(7) Controllers will maintain all BIOS and programming information in the event of a power loss for at least 30 days.

7.7.3.14(8) Controllers will be able to operate at 90% to 110% of nominal voltage rating.

7.7.3.14(9) Power supply for the controllers will be rated at minimum of 125 % of ASC power consumption and will be fused or current limiting type.

7.7.3.14(10) Packaged controllers will not be used for air handling units (AHUs).

7.7.3.15 Input/output Interface

7.7.3.15(1) Hard-wired inputs and outputs may tie into the BMS through BCs, AACs, ASCs.

7.7.3.15(2) All input points and output points will be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points will be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.

7.7.3.15(3) Binary inputs will allow the monitoring of on/off signals from remote devices. The binary inputs will provide a wetting current of at least 12 mA to be compatible with commonly available control

devices and will be protected against contact bounce and noise. Binary inputs will sense dry contact closure without application of power external to the controller.

7.7.3.15(4) Pulse accumulation inputs will conform to all binary input requirements and will also accumulate up to 10 pulses per second.

7.7.3.15(5) Analog inputs will allow the monitoring of low-voltage (0–10 Vdc), current (4–20 mA), or resistance (thermistor or RTD) signals. Analog inputs will be compatible with and field configurable to commonly available sensing devices.

7.7.3.15(6) Binary outputs will provide for on/off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on BCs and AACs will have three-position (on-off-auto) override switches and status lights. Outputs will be selectable for normally open or normally closed operation.

7.7.3.15(7) Analog outputs will provide a modulating signal for the control of end devices. Outputs will provide either a 0–10 Vdc or a 4–20 mA signal as required to properly control output devices. Analog outputs on BCs and AACs will have status lights and a two-position (auto-manual) switch and manually adjustable potentiometer for manual override. Analog outputs will not drift more than 0.4 % of range annually.

7.7.3.15(8) The use of tri-state outputs are not permitted.

7.7.3.15(9) I/O points will be universal type, i.e. controller input or output may be designated (in software) as either binary or analog type point with appropriate properties. ASCs are exempted from this requirement.

7.7.3.15(10) The system size will be expandable to at least twice the number of input/ output objects required for this Project. Additional controllers (along with associated devices and wiring) will be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this Project will not require any hardware additions or software revisions in order to expand the system.

7.7.3.16 Hard-wired Points

7.7.3.16(1) All control points used for control or equipment will be hard-wired points and not rely on the network for control.

7.7.3.16(2) All control and monitoring points for critical environment rooms such as labs, pharmacy, cleanrooms, operating theatres, anterooms, and isolation rooms will be hard-wired points.

7.7.3.17 Software Points

7.7.3.17(1) Integrate all software points available via equipment BACnet interface.

7.7.3.18 Power Supplies

7.7.3.18(1) All BMS and controls hardware will be connected to UPS to ensure continued availability during utility power disruptions.

7.7.3.18(2) Power Supplies. Control transformers will be approved for installation in Canada. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with CEC requirements. Limit connected loads to 80 % of rated capacity.

7.7.3.18(3) Power Line Filtering. Provide internal or external surge protective devices for workstations and controllers.

7.7.3.18(4) Immunity to power and noise. Controllers and control equipment will be able to operate at 90 % to 110% of nominal voltage rating. Operation will be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m.

7.7.3.18(5) Power-fail restart. Controllers and control equipment to have power fail auto restart to ensure proper safety during power failure and a safe orderly recovery after power restoration.

7.7.3.19 Wiring

7.7.3.19(1) All wiring installations will comply with the Canadian Electrical Code and all applicable governing codes, statutes and ordinances.

7.7.3.19(2) All line voltage wiring will be approved products in approved raceway according to Canadian Electrical Code and Division 26 requirements.

7.7.3.19(3) All low-voltage wiring will meet CEC Class 2 requirements. Low-voltage power circuits will be sub-fused when required to meet Class 2 current limit.

7.7.3.19(4) All wiring (line and low-voltage) will be installed in accordance with the wiring methods specified in Divisions 26, 27 and 28 in all areas of the Facility.

7.7.3.19(5) Do not install Class 2 wiring in raceways containing Class 1 or line voltage wiring. Boxes and panels containing line-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

7.7.3.19(6) All wiring within enclosures will be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

7.7.3.19(7) All wiring will be installed as continuous lengths, with no splices permitted between termination points.

7.7.3.19(8) Size of raceway and size and type of wire type will be the responsibility of Project Co in keeping with the manufacturer's recommendations and CEC requirements, except as noted elsewhere in this Schedule.

7.7.3.19(9) Use colour-coded conductors throughout with conductors of different colours.

7.7.3.19(10) Adhere to this Schedule's Division 26 requirements where raceway crosses building expansion joints.

7.7.3.19(11) Project Co will maintain updated (record) wiring diagrams with terminations identified at the Facility.

7.7.3.19(12) All insulated wire to be copper conductors, approved and labelled for 90°C minimum service.

7.7.3.19(13) Life safety wiring raceways to be a distinctive colour different from other wiring types.

7.7.3.20 Communication Wiring

7.7.3.20(1) All communication wiring will be run in conduit or cable tray in all areas of the Facility.

7.7.3.20(2) Do not install communication wiring in raceways containing line voltage, Class 1, or Class 2 wiring.

7.7.3.20(3) Verify the integrity of the entire network following cable installation.

7.7.3.20(4) When a cable enters or exits a building, a lightning arrestor will be installed between the lines and ground. The lighting arrestor will be installed according to the manufacturer's instructions.

7.7.3.20(5) All runs of communication wiring will be unspliced length when that length is commercially available.

7.7.3.20(6) All communication wiring will be labeled to indicate origination and destination data.

7.7.3.20(7) BMS communication wiring will be provided in a distinct colour from other building network wiring.

7.7.3.20(8) BACnet MS/TP communications wiring will be installed in accordance with ASHRAE/ANSI Standard 135.

7.7.3.20(9) Ethernet and MS/TP cabling can be run together.

7.7.3.20(10) Fibre optics can be run with Ethernet and MS/TP cabling as long as conduit is bent to fibre optic standards, fibre optic cable is protected from damage by a protective sheath, and junction boxes are sized for fibre optic use.

7.7.3.21 Sensors

7.7.3.21(1) Provide sensors to achieve end-to-end accuracy specified in Table 1; refer to Section 7.7.3.3(2).

7.7.3.21(2) Install sensors in accordance with the manufacturer's recommendations.

7.7.3.21(3) Mount sensors rigidly and adequately for the environment in which the sensor operates.

7.7.3.21(4) Room temperature sensors will be installed on concealed junction boxes properly supported by wall framing.

7.7.3.21(5) All wires attached to sensors will be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

7.7.3.21(6) Sensors used in mixing plenums and at air handling unit discharge air will be of the averaging type.

7.7.3.21(7) All pipe-mounted temperature sensors will be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

7.7.3.21(8) Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.

7.7.3.21(9) Piping to the pressure ports on all pressure transducers will contain a capped test port located adjacent to the transducer.

7.7.3.21(10) All pressure transducers, other than those controlling variable air volume (VAV) boxes, will be located in field device panels, not on the equipment monitor or on ductwork. Mount transducers in a

location accessible for service without use of ladders or special equipment.

7.7.3.21(11) All air and water differential pressure sensors will have gauge tees mounted adjacent to the taps. Water gauges will also have shutoff valves installed before the tee.

7.7.3.21(12) Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches will be hard-wired to de-energize equipment as described in the sequence of operation. Switches will require manual reset. Provide contacts that allow BMS to monitor safety switch status.

7.7.3.21(13) Duct mounted humidity sensors are not acceptable.

7.7.3.21(14) Sensor range will be suitable for the specific application.

7.7.3.21(15) Humidity sensors will not drift more than 1 % of full scale annually.

7.7.3.21(16) Provide matched calibrated sensors for differential temperature measurement applications.

7.7.3.21(17) All zone thermostats will be adjustable type, combination thermostats / humidistats with temperature and relative humidity readouts / display. The BMS will control the manual adjustment temperature range and be able to lock out user changes if necessary. Zone temperature and humidity will feedback to the BMS.

7.7.3.21(18) Provide pressure sensors and end switches at infectious control isolation dampers in ductwork to ensure isolation has been achieved.

7.7.3.21(19) Provide sensors to monitor outdoor air volumes, space CO2 levels, and other levels as required.

7.7.3.21(20) Provide continuously operating sensors in the following spaces at minimum: OR spaces, surgical/interventional suites, MDRD sterile storage, OR sterile core, clean storages, AIR's, Hybrid AIR's, clean rooms, CL2+ Lab, Pharmacy and other spaces as determined by the Owner where pressurization, temperature and/or humidity monitoring is critical for safe operation.

7.7.3.21(21) Provide particle count sensors downstream of all HEPA filter installations.

7.7.3.21(22) Provide thermostats and humidity sensors throughout the Facility as required by CSA Z317.2. For areas critical to Facility operation,

room sensors will be provided. Mercury-containing components are not permitted.

7.7.3.21(23) In secure rooms, provide electronic, flat plate type (transducer) thermostats located flush mount on wall surface at minimum 2.4 m above finished floor. Temperature control for secure rooms will be controlled by the BMS – no user override is permitted.

7.7.3.21(24) Provide local pressure control for each isolation room and anteroom. Provide a local annunciator panel located in the corridor outside each of these rooms.

7.7.3.21(25) Occupancy sensors from the lighting control systems will be able to detect the presence of people within a room and indicate occupancy status to the BMS system, with this information accessible by any BMS controller in the system. Occupancy sensor delays and system responses to occupancy/vacancy will be software adjustable through the user interface and will not require manual adjustment at the sensor.

7.7.3.21(26) Outdoor air temperature sensors.

7.7.3.21(26)(a) Each building within the Facility will have a separate outdoor air temperature sensor.

7.7.3.21(26)(b) Each air handling unit processing outdoor air will have a dedicated outdoor air temperature sensor.

7.7.3.21(26)(c) Outdoor air sensors will be located on the north or east side of the building with a waterproof enclosure and sun shield to minimize the effects of solar loading.

7.7.3.21(27) Provide a human machine interface (HMI) for display, monitoring and adjustment of zone environment parameters in the following spaces at a minimum: OR spaces, surgical/interventional suites, MDRD sterile storage, OR sterile core, clean storages, AIR's, Hybrid AIR's, clean rooms, CL2+ Lab, Pharmacy and other spaces as determined by the Owner such that real time data is available at the point of care. For each application provide display, monitoring and adjustment to the following parameters: space pressure, air change rate, temperature, humidity, door contact switch status, occupancy mode and lighting level. In addition to BMS integration, provide local audio and visual alarms at the room entrance and at the local monitoring station if applicable. Users will be able to silence audio alarms.

7.7.3.22 Motorized Control Dampers

7.7.3.22(1) Type. Outdoor and return air mixing dampers and face-and-bypass dampers will be parallel-blade and will direct airstreams toward each other. Other modulating dampers will be opposed-blade. Two-position shut-off dampers will be parallel- or opposed-blade.

7.7.3.22(2) Leakage. Damper will be AMCA rated for leakage class 1A at 250 Pa static pressure differential.

7.7.3.22(3) All dampers will be modulating type, unless noted otherwise.

7.7.3.22(4) Floating actuators are not acceptable for modulating service.

7.7.3.22(5) All control dampers will have spring-return mechanism or electronic failsafe, configured for specified fail position.

7.7.3.22(6) Provide damper position feedback output for all motorized dampers.

7.7.3.22(7) Provide a visible and accessible indication of damper position on the drive shaft ends.

7.7.3.22(8) Dampers blades, axles, and linkages will operate without binding. On multiple assemblies, all sections will open and close simultaneously.

7.7.3.23 Smoke Dampers

7.7.3.23(1) Smoke dampers will be UL/ULC approved for use in passive systems, smoke control systems, and smoke management systems.

7.7.3.23(2) Smoke dampers will be UL/ULC-rated leakage Class 1.

7.7.3.23(3) Actuators will be factory-mounted as required by UL 555S / ULC-S112.1.

7.7.3.23(4) Ensure smoke dampers function properly and respond to the proper fire alarm system general, zone, and/or detector trips.

7.7.3.24 Control Valves

7.7.3.24(1) Control valves will be installed so that they are accessible and serviceable and so that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.

7.7.3.24(2) Isolation valves will be installed so that the control valve body may be serviced without draining the supply/return side piping system.

Unions will be installed at all connections to screw-type control valves.

7.7.3.24(3) Provide manual bypass valves around all control valves serving air handling unit coils to allow uninterrupted operation during valve servicing.

7.7.3.24(4) All control valves will be modulating type, unless noted otherwise.

7.7.3.24(5) Provide valve position status output for all control valves.

7.7.3.24(6) All control valves will have spring-return mechanism or electronic failsafe configured for specified fail position with the exception of reheat coil, unit heater and force flow heater control valves.

7.7.3.24(7) Control valves will fail normally open or closed as follows:

7.7.3.24(7)(a) Zone valves – normally open last position;

7.7.3.24(7)(b) Heating coils at air handlers – normally open;

7.7.3.24(7)(c) Chilled water control valves at air handlers – normally closed;

7.7.3.24(7)(d) Steam humidification control valves; and

7.7.3.24(7)(e) All other valves – normally open, or closed or last position as required to provide safe and reliable operation under failure situation.

7.7.3.24(8) Control Valves – Hydronic.

7.7.3.24(8)(a) In general, provide pressure independent, two-way, actuated ball valves.

7.7.3.24(8)(b) Valve actuator and trim minimum close-off (differential) pressure rating will be 150% of total system (pump) head for two-way valves and the greater of 300 % of pressure differential between ports A and B at design flow or 100% of total system (pump) head for 3-way valves.

7.7.3.24(8)(c) Sizing Criteria: Two-position service will be line size to minimize pressure drop, but maximum 14 kPa [2 PSI]. Modulating service will be sized to maintain adequate control valve authority to provide stable control of the load served, but maximum 21 kPa [3 PSI].

7.7.3.24(9) Control Valves – Steam.

7.7.3.24(9)(a) Valve actuator and trim minimum close-off (differential) pressure rating will be 150% of operating (inlet) pressure.

7.7.3.24(9)(b) Sizing Criteria.

7.7.3.24.9.(b).1 Two-position service: pressure drop 10% to 20% of inlet pressure.

7.7.3.24.9.(b).2 Modulating service (100 kPa or less): pressure drop 80 % of inlet pressure.

7.7.3.24.9.(b).3 Modulating service (101 kPa to 350 kPa): pressure drop 50% of inlet pressure.

7.7.3.24.9.(b).4 Modulating service (over 350 kPa): pressure drop 50% of inlet pressure.

7.7.3.25 Valve and Damper Actuators

7.7.3.25(1) Floating actuators are not acceptable for modulating service.

7.7.3.25(2) Stall Protection. Mechanical or electronic stall protection will prevent actuator damage throughout the actuator's rotation.

7.7.3.25(3) Spring-return Mechanism. Actuators used for power-failure and safety applications will have an internal mechanical spring-return mechanism or an UPS.

7.7.3.25(4) Manual Positioning. Operators will be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators will have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity will have a manual crank.

7.7.3.26 Airflow Monitoring

7.7.3.26(1) Provide airflow meters where required as part of the sub-metering system, where required for LEED prerequisites/credits, and where specified elsewhere in the Statement of Requirements. Refer to Appendix 3Q [Metering Matrix].

7.7.3.26(2) Provide airflow monitoring of all outdoor air intakes.

7.7.3.26(3) Provide airflow monitoring of supply air and return/exhaust air from all air handling units.

7.7.3.26(4) Provide airflow monitoring of all exhaust systems larger than 2,500 L/s.

7.7.3.26(5) All airflow monitoring stations will comply with minimum end-to-end accuracy requirements specified in Table 1.

7.7.3.26(6) Provide type of flow meter suitable for application and level of air contamination. Selected device will maintain specified accuracy throughout expected range of flow variation for specific system application.

7.7.3.27 Fluid Flow Meters

7.7.3.27(1) Provide fluid flow meters where required as part of the sub-metering system and as required for optimized system operation. Refer to Appendix 3Q [Metering Matrix].

7.7.3.27(2) All fluid flow meters to comply with minimum end-to-end accuracy requirements specified in Table 1.

7.7.3.27(3) Each meter will be individually calibrated and tagged accordingly against the manufacturer's primary standards which will be accurate to within 0.1 % of flow rate and traceable to the National Institute of Standards and Technology (NIST).

7.7.3.27(4) All wetted metal parts will be stainless steel.

7.7.3.27(5) Required accuracy will be maintained through expected range of flow variation for specific system application.

7.7.3.27(6) Provide type of flow meter suitable for application and service fluid. For hydronic flow meters, provide electromagnetic flow-tube type to reduce maintenance requirements.

7.7.3.27(7) Strap-on flow meters are not permitted.

7.7.3.28 Thermal Energy Meters

7.7.3.28(1) Provide thermal energy meters where required as part of the sub-metering system. Refer to Appendix 3Q [Metering Matrix].

7.7.3.28(2) All thermal energy meters to comply with minimum end-to-end accuracy requirements specified in Table; refer to Section 7.7.3.3(2).

7.7.3.28(3) All meters will be factory calibrated and traceable to NIST with certification.

7.7.3.29 Auxiliary Control Devices

7.7.3.29(1) Flow switches

7.7.3.29(1)(a) Flow-proving switches will be paddle (water service only) or differential pressure type (air or water service). Switches will be ULC listed, single-pole double-throw (SPDT) snap-acting, and pilot duty

rated (125 VA minimum). Paddle switches will have adjustable sensitivity. Differential pressure switches will have scale range and differential suitable for intended application.

7.7.3.29(1)(b) Use correct paddle for pipe diameter.

7.7.3.29(2) Relays

7.7.3.29(2)(a) Control relays will be plug-in type, ULC listed, and will have dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage will be suitable for application.

7.7.3.29(2)(b) Time delay relays will be solid-state plug-in type, UL listed, and will have adjustable time delay. Delay will be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage will be suitable for application.

7.7.3.29(3) Override timers

7.7.3.29(3)(a) Unless implemented in control software, override timers will be spring-wound line voltage, ULC listed, with contact rating and configuration required by application. Provide 0–6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

7.7.3.29(4) Current transmitters

7.7.3.29(4)(a) AC current transmitters will be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4–20 mA two-wire output. Full-scale unit ranges will be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy will be ±1 % full-scale at 500-ohm maximum burden.

7.7.3.29(4)(b) Transmitter will meet or exceed ANSI/ISA S50.1 requirements and will be CSA approved.

7.7.3.29(5) Current transformers

7.7.3.29(5)(a) AC current transformers will be CSA approved and will be completely encased (except for terminals) in approved plastic material.

7.7.3.29(5)(b) Transformers will be available in various current ratios and will be selected for ±1 % accuracy at 5 A full-scale output.

7.7.3.29(6) Voltage transmitters

7.7.3.29(6)(a) AC voltage transmitters will be self-powered single-loop (two-wire) type, 4–20 mA output with zero and span adjustment.

7.7.3.29(6)(b) Adjustable full-scale unit ranges will be 100–130 Vac, 200–250 Vac, 250–330 Vac, and 400–600 Vac. Unit accuracy will be ±1 % full-scale at 500-ohm maximum burden.

7.7.3.29(6)(c) Transmitters will meet or exceed ANSI/ISA S50.1 requirements and will be UL/CSA recognized at 600 Vac rating.

7.7.3.29(7) Voltage transformers

7.7.3.29(7)(a) AC voltage transformers will be CSA approved, and have built-in fuse protection.

7.7.3.29(7)(b) Transformers will be suitable for ambient temperatures of 4 °C–55 °C (40°F–130 °F) and will provide ±0.5 % accuracy at 24 Vac and 5 VA load.

7.7.3.29(8) Power monitors

7.7.3.29(8)(a) Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0 A current inputs or 0–0.33 V inputs.

7.7.3.29(8)(b) 1.0 % full-scale true root mean square (RMS) power accuracy, +0.5 Hz, voltage input range 120–600 V, and auto range select.

7.7.3.29(8)(c) Under voltage/phase monitor circuitry.

7.7.3.29(8)(d) Current transformers having a 0.5 % full scale accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

7.7.3.29(9) Current switches

7.7.3.29(9)(a) Current-operated switches will be self-powered, solid-state with adjustable trip current. Select switches to match application current and BMS system output requirements.

7.7.3.29(10) Pressure transducers

7.7.3.29(10)(a) Transducers will have linear output signal and field-adjustable zero and span.

7.7.3.29(10)(b) Transducer sensing elements will withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

7.7.3.29(10)(c) Water pressure transducer diaphragm will be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer will have 4–20 mA output, suitable mounting provisions, and block and bleed valves.

7.7.3.29(10)(d) Water differential pressure transducer diaphragm will be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure will be 2000 kPa (300psi.) Transducer will have 4–20 mA output, suitable mounting provisions, and 5-valve manifold.

7.7.3.29(11) Differential pressure switches

7.7.3.29(11)(a) Differential pressure switches (air or water service) will be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and will have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

7.7.3.29(12) Pressure-electric (PE) switches

7.7.3.29(12)(a) Will be metal or neoprene diaphragm actuated, operating pressure rated for 0–175 kPa (0–25 psig), with calibrated scale minimum setpoint range of 14–125 kPa (2–18 psig) minimum, UL listed.

7.7.3.29(12)(b) Provide one- or two-stage switch action as required by application. Electrically rated for pilot duty service (125 VA minimum) and/or for motor control.

7.7.3.29(12)(c) Switches will be open type (panel-mounted) or enclosed type for remote installation. Enclosed type will be NEMA 1 unless otherwise specified.

7.7.3.29(12)(d) Each pneumatic signal line to PE switches will have permanent indicating gauge.

7.7.3.30 Variable Frequency Drives

7.7.3.30(1) Provide complete VFDs for equipment and applications designated in Schedule 3.

7.7.3.30(2) All VFDs and ancillary components will be procured by one supplier in order to assure an integrated system and one point of contact for service.

7.7.3.30(3) Manufacturer will have been engaged in the production of this type of equipment for a minimum of ten years. Manufacturer will have local representation that locally stocks standard drives, modification kits, and spare parts for the power input range of drives used in this Facility.

7.7.3.30(4) Provide a 3-year warranty on all VFDs from date of Service Commencement. Warranty will include all parts and labour.

7.7.3.30(5) Each VFD, with all standard and optional features, will be factory packaged in a ULC-rated and listed enclosure most appropriate for each application and location, completely assembled and tested by the manufacturer in an ISO9001 facility. VFD assembly, associated options and peripherals will comply with the applicable requirements of the latest standards of ANSI, IEEE, NEMA, and the Canadian Electrical Code.

7.7.3.30(6) The VFD will meet product standard EN 61800-3 for the First Environment restricted level (Category C2). Base drives that only meet the Second Environment (Category C3, C4) will be supplied with filters to bring the drive-in compliance with the First Environment levels.

7.7.3.30(7) The VFD assembly, including the bypass (if specified), will be seismically certified and label as such. Seismic importance factor of 1.5 rating is required and will based upon actual shake table test data as defined by ICC AC-156.

7.7.3.30(8) VFDs to be of the Pulse-Width Modulated (PWM) type with a full wave diode bridge converter to convert incoming fixed voltage/frequency to a fixed DC voltage. The PWM strategy will incorporate a microprocessor to handle all logic functions as well

as the complex, sine-coded PWM generating algorithms that control output stage switching.

7.7.3.30(9) The variable frequency drives will convert three-phase, 60 Hz utility power to proportionally variable voltage and frequency, three-phase, AC power using the latest insulated-gate bipolar transistor (IGBT) technology for step less motor speed control of one or more three-phase induction motors. The VFD output waveform to be the PWM or Vector type waveform producing smooth torque at low frequencies and low motor current harmonics.

7.7.3.30(10) VFDs will be capable of controlling and setup for either variable or constant torque load as follows:

7.7.3.30(10)(a) Variable torque: loads such as centrifugal fans, pumps, and compressors.

7.7.3.30(10)(b) Constant torque: loads such as positive displacement pumps, reciprocating compressors, and screw compressors.

7.7.3.30(11) VFD will provide full rated output from voltages +/-10% of nominal voltage. Overload rating of the drive will be minimum 110% of its normal duty current rating for 1 minute in every 10 minutes.

7.7.3.30(12) VFDs will be capable of continuous full load operation under the installed environmental operating conditions.

7.7.3.30(13) All VFDs will have the same customer interface, including digital display, and keypad regardless of horsepower rating.

7.7.3.30(14) VFDs will have cooling fans. Fans will be replaceable without requiring VFD removal or removal of circuit boards. VFD cooling fans will cycle via thermal sensing and not operator continuously.

7.7.3.30(15) Loss-of-load (broken belt / broken coupling) relay output. The drive will be programmable to signal the loss-of-load condition via keypad warning, relay output, and / or over the serial communications bus.

7.7.3.30(16) If the input reference is lost, the VFD will give the user the option of: (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user.

7.7.3.30(17) VFDs will be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).

7.7.3.30(18) VFDs will have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts will be programmable.

7.7.3.30(19) VFDs will also be capable of DC injection braking that can be employed to stop a freewheeling motor before starting to avoid overvoltage nuisance tripping.

7.7.3.30(20) VFDs will be capable of automatically extending the ramp down time to keep the drive from tripping on overvoltage caused by regeneration of power by the load.

7.7.3.30(21) Line Conditioning and Filtering. In addition to the requirements in Division 23 and Division 26:

7.7.3.30(21)(a) Provide a coordinated AC transient surge protection system consisting of 4 MOVs (phase to phase and phase to ground), a capacitor clamp, and internal chokes. The MOV's will have **an** energy dissipation capability rated for the potential surge exposure at the VFD inputs VFDs that do not include coordinated AC transient surge protection will include an external SPD (Surge Protective Device) at the VFD input

7.7.3.30(21)(b) Provide EMI / RFI filters. VFD assembly to be CE Marked and comply with product standard EN 61800-3 for the First Environment restricted level (Category C2). Second environment (Category C3, C4) is not acceptable. Submit certified test reports with the shop drawing Submittal confirming compliance.

7.7.3.30(22) VFDs will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise. VFDs will have selectable software for optimization of motor noise, energy consumption, and motor speed control.

7.7.3.30(23) VFD Interface:

7.7.3.30(23)(a) Provide a backlit LCD display. The display will be in complete English words for programming and fault diagnostics (alpha-numeric codes are not

acceptable). All VFD faults will be displayed in English words

7.7.3.30(23)(b) The keypad will include Hand-Off-Auto selections and manual speed control.

7.7.3.30(23)(c) The drive will incorporate “bump less transfer” of speed reference when switching between “Hand” and “Auto” modes.

7.7.3.30(23)(d) There will be a built-in time clock in the VFD keypad. The clock will have a battery backup with 10 years minimum life span. The clock will date and time stamp faults and record operating parameters at the time of fault. VFD programming will be held in non-volatile memory and is not dependent on battery power

7.7.3.30(23)(e) All applicable operating values will be capable of being displayed in engineering (user) units. Minimum display values will be:

- 7.7.3.30.23.(e).1 Output Frequency
- 7.7.3.30.23.(e).2 Motor Speed (RPM, %, or Engineering units)
- 7.7.3.30.23.(e).3 Motor Current
- 7.7.3.30.23.(e).4 Motor Torque
- 7.7.3.30.23.(e).5 Motor Power (kW)
- 7.7.3.30.23.(e).6 DC Bus Voltage
- 7.7.3.30.23.(e).7 Output Voltage

7.7.3.30(23)(f) Provide a fireman’s override input.

7.7.3.30(24) Serial Communications. All VFDs will have a TIA-485 (RS-485) port as standard for interface with Facility BACnet IP network. BACnet protocol will be certified with BTL listing. The use of non-certified protocols are not allowed.

7.7.3.30(24)(a) Serial communication minimum capabilities will include: run-stop controls; speed setpoint adjustment; output speed / frequency; current (in amps); percent torque; power (kW); kilowatt hours; operating hours; drive temperature; all diagnostic warming and fault information; monitoring of VFD relay output status, digital input status, and all analog input and output values; remote VFD fault reset.

7.7.3.30(24)(b) Serial communication minimum capabilities when in bypass mode will include: bypass run-stop control; monitoring bypass relay output status and all digital

input status; all bypass diagnostic warning and fault information; remote bypass fault reset; control of bypass digital and analog outputs.

7.7.3.30(25) VFD Bypass. Bypasses will be furnished and mounted by the manufacturer as required for the application and specified in Division 22, 23, 25 or 26. All VFD with bypass configurations will be ULC listed by the manufacturer as a complete assembly and carry a UL508 label.

7.7.3.30(25)(a) A complete factory wired and tested bypass system consisting of a door interlocked; pad lockable circuit breaker, output contactor, bypass contactor, and fast acting VFD input fuses. UL Listed motor overload protection will be provided in both drive and bypass modes.

7.7.3.30(25)(b) Standalone keypad with LCD display.

7.7.3.30(25)(c) The VFD and bypass package will have a UL listed short circuit current rating (SCCR) of 100,000 Amps and this rating will be indicated on the UL data label.

7.7.3.30(25)(d) Motor protection from single phase power conditions - the bypass system will be able to detect a single-phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single-phase input power indication.

7.7.3.30(25)(e) The bypass system will be designed for stand-alone operation and will be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications will remain functional even with the VFD removed. Bypass systems that do not maintain full functionality with the drive removed are not acceptable.

7.7.3.30(25)(f) Serial communications – the bypass will be capable of being monitored and / or controlled via serial communications that match the VSD

7.7.3.30(25)(g) The bypass serial communications will allow control of the drive/bypass (system) digital outputs via the serial interface. This control will be independent of any bypass function or operating state. All system analog and digital I/O will be capable of being monitored by the BAS system.

7.7.3.30(25)(h) Provide manual or automatic transfer to bypass. Drive faults for automatic transfer to bypass mode will be user selectable for the following drive fault conditions:

- 7.7.3.30.25.(h).1 Over current
- 7.7.3.30.25.(h).2 Over voltage
- 7.7.3.30.25.(h).3 Under voltage
- 7.7.3.30.25.(h).4 Loss of analog input

7.7.3.30(25)(i) The bypass will include the ability to select the operating mode of the system (VFD/Bypass) from either the bypass keypad or digital input.

7.7.3.30(25)(j) Provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks will remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact will operate in VFD and bypass modes. The terminal strip will allow for independent connection of up to four (4) unique safety inputs.

7.7.3.30(25)(k) Fireman's Override Mode: Programmable override input which will allow the user to configure the unit to acknowledge some digital inputs, all digital inputs, ignore digital inputs or any combination of the above to suit the Governmental Authorities. The Override action may be initiated via the serial communications link.

7.7.3.31 Identification

7.7.3.31(1) Provide permanent warning labels to all equipment that can be automatically started by the control system. Permanent warning labels will be affixed to all motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

7.7.3.31(2) Control equipment and device labelling.

7.7.3.31(2)(a) Permanently label or code each point of field terminal strips to show the instrument or item served.

7.7.3.31(2)(b) Identify all control panels. Install panel identification label on outside of panel door.

7.7.3.31(2)(c) Identify all other control components with permanent labels. All plug-in components will be labeled such

that label removal of the component does not remove the label.

7.7.3.31(2)(d) Labels and tags will match unique identifiers shown on the record drawings.

7.7.3.31(2)(e) All sensors and actuators not in occupied areas will be tagged.

7.7.3.31(2)(f) Each device inside enclosures will be tagged.

7.7.3.31(3) Manufacturers' nameplates and certification/approval labels will be visible and legible after equipment is installed.

7.7.3.31(4) Identification of wires

7.7.3.31(4)(a) All wiring and cabling, including that within factory-fabricated panels will be labeled at each end of termination with control system address or termination number.

7.7.3.31(4)(b) Tag each network wire with a common identifier on each end.

7.7.3.31(4)(c) Tag each power source with the panel and breaker number it is fed from.

7.7.3.31(4)(d) Identify low voltage conduit runs as BMS conduit, power feeds not included.

7.7.3.31(4)(e) Identify each electric box, junction box, utility box with permanent label. Provide control company label.

7.7.3.31(4)(f) For conduit runs more than 2.4 m between junction boxes in one room, place identifier at least every 2.4 m.

7.7.3.31(4)(g) Place identify on each side where a conduit passes through a wall or other inaccessible path.

7.7.3.31(4)(h) Identify BMS communication conduits in same manner as above.

7.7.3.31(5) Provide tags for all control valves indicating service and number.

7.7.3.31(6) Provide tags for all motorized dampers indicating service and number.

7.7.3.32 Programming

7.7.3.32(1) Provide sufficient internal memory for the specified sequence of operation and trend logging of all points at 5-minute intervals for a period of 2-years; some critical areas such the Operating Rooms and MDRD will require 1-minute intervals, as reviewed by the Owner.

7.7.3.32(2) All equipment and point naming conventions for all BMS points will follow the ASHRAE 223P (Project Haystack) standard customized by Project Co for the Facility.

7.7.3.32(3) Provide all programming for each system to provide a fully operating system under all operating conditions.

7.7.3.32(4) Imbed into the control program sufficient comment statements to clearly describe each section of the program.

7.7.3.32(5) Use the appropriate programming types. All techniques used will provide actions for all possible situations and will be documented.

7.7.3.32(6) All setpoints, timers, deadbands, PID gains, etc. will be adjustable by the user with appropriate access level. Software points will be used for these variables. Fixed scalar numbers will not be embedded in programs except for physical constants and conversion factors.

7.7.3.32(7) Values for all points, including read (hardware) points used in control sequences will be capable of being overridden by the user with appropriate access level. If hardware design prevents this for hardware points, they will be equated to a software point, and the software point will be used in all sequences. Exceptions will be made for machine or life safety.

7.7.3.33 Automatic Fault Detection and Diagnostics

7.7.3.33(1) Provide BMS complete with automated fault detection, diagnosis and reporting (AFDDR) software, hardware interface and communication devices. Configure the AFDDR software to ensure Building Systems remain continuously optimized and the need for fault diagnosis by the Facility operator is minimized. Ensure the AFDDR software will record and provide reports of the BMS controller database software modification instances, Facility air quality, key performance indication of central system HVAC equipment control loops, key performance indication of zone control loops, occupant comfort, energy performance, ability to create virtual metering utilizing the BMS points to allow drill down capability from the main metering points to facilitate the operators in isolating poorly performing systems, operation / machine fault, manual override and other customizable web-accessible reports available to the Owner. AFDDR software vendor will advise BMS

of all points necessary to meter or build virtual meters that optimize AFDDR function. AFDDR Software will provide customizable web-accessible reports available to the Owner, with rules and dashboard customized as required by the Owner.

7.7.3.34 Measurement and Verification (M&V)

7.7.3.34(1) Provide a complete measurement and verification (M&V) system for collection and storage of Facility energy and water consumption and performance to confirm Facility performance.

7.7.3.34(2) Provide all physical and virtual meters as required to meet the intent of the “metering matrix”, Appendix 3Q [Metering Matrix].

7.7.3.34(3) Provide a complete digital metering system to monitor and track electricity, natural gas, thermal meter, and domestic water measurements of the building via the BMS.

7.7.3.34(4) Software will store all data in comma separated variable (.CSV) file format. Meters and points are to be read and stored every 5 minutes.

7.7.3.34(5) The software will allow the user to view instantaneous readings of voltage, current, energy, power, phase angle, present and peak demand from all electricity meters.

7.7.3.34(6) The software will allow the user to view all meter measurements in either metric or imperial units for any thermal or water meter.

7.7.3.34(7) The software will have the ability to export data into reporting applications (e.g. Web, Excel and notepad).

7.7.3.34(8) The software will store measurements for a minimum period of 36 months. Measurements will commence from the date of occupancy and be stored for the entire duration of the measurement and verification period.

7.7.3.34(9) The software will include service menus for diagnostic monitoring of the metering equipment.

7.7.3.34(10) The software will allow remote access through either a modem/telephone link or Internet access. Provide security access control to assign permission levels for remote access.

7.7.3.34(11) Output file format and storage.

7.7.3.34(11)(a) Data will be recorded every hour.

7.7.3.34(11)(b) Data will be provided in comma separated value (.CSV) files.

7.7.3.34(11)(c) Each row in the output file will represent a successive sample time.

7.7.3.34(11)(d) Include a time stamp for each line in the file.

7.7.3.34(11)(e) Separate each field by a single comma character.

7.7.3.34(11)(f) Each required monitoring point will contain a unique and understandable identifier.

7.7.3.34(11)(g) Each required monitoring point will be identified with a unique and understandable column.

7.7.3.34(11)(h) All recorded data is to be stored on the BMS server.

7.7.3.34(11)(i) Provide data files to the Owner in electronic format.

7.7.3.34(12) The system will be capable of storing data for a minimum of all metering points for a period of no less than 36 months.

7.7.3.34(13) The BMS will be utilized for the M&V process. All energy measurement points (mechanical and electrical) will be connected to the BMS for energy and water monitoring and calculation.

7.7.3.34(14) Division 22 and 23 energy metering devices will be connected directly to the BMS system. The BMS will provide for continuous monitoring of all related M&V metering points.

7.7.3.34(15) BMS system will connect separately to the main incoming electrical utility meter and other electrical sub-meters through BACnet interface connection to measure the total power consumption and subsystems of the building.

7.7.3.34(16) To reconcile actual energy use to predicted energy use, energy by end-use will be metered as indicated in Appendix 3Q [Metering Matrix].

7.7.3.34(17) Energy metering for mechanical systems.

7.7.3.34(17)(a) Divisions 22 and 23 energy metering will include various thermal energy meters, domestic water flow meters, airflow stations, air and water temperature sensors, electrical power consumption of variable frequency drives (pumps and fans) from BACnet interface, start/stop status of pump, fan as well as CT’s used for measuring mechanical equipment consumption, and other inputs indicated in the M&V Plan. All mechanical equipment not being supplied by packaged network interface card capable of

recording energy consumption, will be equipped with dedicated CT's used for metering purposes.

7.7.3.34(17)(b) All variable frequency drives for fans and pumps will provide system status, speed (%) and power consumption (kW or kWh) information to the BAS.

7.7.3.34(17)(c) Configure VFDs such that they populate continuous power consumption data to the BMS. Any energy optimization capabilities available within the VFD will also be programmed and activated.

7.7.3.34(17)(d) Water meters other than the municipal meter will have a digital output to the BMS providing flow rate and instantaneous totalizing water volume/consumption information.

7.7.3.34(17)(e) Thermal energy meters will connect to the BMS providing instantaneous data for liquid flow rate, supply and return water temperatures, kW and kWh and load/energy information.

7.7.3.34(17)(f) Gas meters will have connection to the BMS providing instantaneous data for totalizing gas consumption in cubic meters.

7.7.3.34(18) Energy metering for electrical systems

7.7.3.34(18)(a) The electrical system metering will be capable to measure the power line through dedicated meter and CTs for interior lighting, exterior lighting, emergency lighting, plug load and mechanical circuits. Calculated values may also be used, as outlined in Section 7.8.9. The BMS will connect to the electrical systems meters through BACnet interface connection in accordance with Appendix 3Q.

7.7.3.34(18)(b) CT's interval trending for lighting and plug loads to be minimum 30sec.

7.7.3.34(19) Provide Commissioning of the metering system to the satisfaction of the Owner and demonstrate the proper functioning of the metering system on the BMS.

7.7.3.34(20) Calibrate and test all energy and water monitoring sensors. Provide a calibration report to verify that the meters have been installed and calibrated to read within acceptable limits of accuracy as specified in Division 22, 23, 25 and 26.

7.7.3.35 Start-Up and Checkout Procedures

7.7.3.35(1) Startup testing. All testing will be performed by the Project Co and will make-up part of the necessary verification of an operating control system. this testing will be completed before the Owner is notified of the system demonstration.

7.7.3.35(2) Start up, check out, and test all hardware and software and verify communication between all components.

7.7.3.35(3) Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

7.7.3.35(4) Verify that all input/output points read properly.

7.7.3.35(5) Verify all alarms and interlocks.

7.7.3.35(6) Verify operation of the integrated system.

7.7.3.35(7) Calibrate and prepare for service all instruments, controls, and accessory equipment furnished as part of the Project.

7.7.3.35(8) Verify calibration of all input devices individually. Perform calibration procedures according to manufacturer's recommendations.

7.7.3.35(9) Verify that all binary output devices operate properly and that the normal positions are correct.

7.7.3.35(10) Verify that all analog output devices are functional, that start and span are correct, and that direction and normal positions are correct. Verify that all control valves and automatic dampers to ensure proper action and closure.

7.7.3.35(11) Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation. Tune all control loops.

7.7.3.35(12) Check each alarm separately to ensure correct annunciation.

7.7.3.35(13) Test all interlocks to check logic and ensure that the fail-safe condition is in the proper direction.

7.7.3.36 Control System Demonstration and Acceptance

7.7.3.36(1) Prior to acceptance, the control system will undergo a series of performance tests to verify operation and compliance with this specification. These tests will occur after installation is complete, Equipment has been started up, and system and equipment tests have been completed.

7.7.3.36(2) Provide the tests described in this section in addition to the tests required as a necessary part of the installation, start-up, and debugging process. The Owner's representative will be present to observe and review these tests. Provide at least 14 days notification in advance of the start of the testing procedures.

7.7.3.36(3) The demonstration process will follow that approved at part of the Commissioning procedures. Approved checklists and forms will be completed for all systems as part of the demonstration.

7.7.3.36(4) Demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Provide all test equipment required to prove proper operation.

7.7.3.36(5) Provide a log indicating the date, technician's initials, and any corrective action taken or needed for each control input and output.

7.7.3.36(6) Demonstrate compliance with "System Performance" section of Division 25.

7.7.3.36(7) Demonstrate compliance with sequences of operation through all modes of operation.

7.7.3.36(8) Demonstrate complete operation of operator interface.

7.7.3.36(9) Provide trend data output in a graphical form showing the step response of each BMS control loop. The test will show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25 % of its full range. The sampling rate of the trend will be from 10 seconds to 3 minutes, depending on the speed of the control loop. The trend data will show for each sample the setpoint, actuator position, and controlled variable values. Provide all tuning necessary to ensure each loop operates in an optimally tuned manner.

7.7.3.36(10) Provide trend data output showing the action of demand limiting on a minute-by-minute basis over at least a 30-minute period. The trend will include kW, demand limiting setpoint, and the status of sheddable equipment outputs.

7.7.3.36(11) Provide trend data output showing the capability of optimum start/stop algorithms. The change-of-value or change-of-stage trends will include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

7.7.3.36(12) Demonstrate interface to the building fire alarm system.

7.7.3.36(13) Demonstrate compliance with smoke control sequences of operation through all modes of fire and smoke event response throughout the Facility.

7.7.3.36(14) Provide operational logs for each system that indicate all setpoints, operating points, valve positions, modes, and equipment status. These logs will cover three 48-hour periods and have a sample frequency of not more than 5 minutes.

7.7.3.36(15) Provide all necessary repairs or revisions to the hardware and software as required to successfully complete all tests.

7.7.3.36(16) All tests described in Division 25 will be performed to the satisfaction of the Owner prior to the acceptance of the control system as meeting the requirements of completion.

7.7.3.36(17) The system will not be accepted until all forms and checklists have been completed as part of the demonstration and are submitted and approved as required.

7.7.3.37 Training

7.7.3.37(1) Provide training for Facility Management Staff prior to FMO taking over the Facility. Training will be provided on-site and be video recorded for future self-paced training.

7.7.3.37(2) Train the designated FMO Staff to enable them to do the following:

7.7.3.37(2)(a) Day-to-day operators:

- 7.7.3.37.2.(a).1 Proficiently operate the system;
- 7.7.3.37.2.(a).2 Understand BMS architecture and configuration;
- 7.7.3.37.2.(a).3 Understand system components;
- 7.7.3.37.2.(a).4 Understand system operation, including BMS control and optimizing routines and algorithms;
- 7.7.3.37.2.(a).5 Operate the workstation and peripherals;
- 7.7.3.37.2.(a).6 Log on and off the system;
- 7.7.3.37.2.(a).7 Access graphics, point reports, and logs;
- 7.7.3.37.2.(a).8 Adjust and change system setpoints, time schedules, and holiday schedules;
- 7.7.3.37.2.(a).9 Recognize malfunctions of the system by observation of graphical visual signals;
- 7.7.3.37.2.(a).10 Understand system drawings and operating and maintenance manuals;
- 7.7.3.37.2.(a).11 Access data from controllers; and
- 7.7.3.37.2.(a).12 Operate portable operator’s terminals.

7.7.3.37(2)(b) Advanced operators:

- 7.7.3.37.2.(b).1 Make and change graphics on the workstation;
- 7.7.3.37.2.(b).2 Create, delete, and modify alarms, including annunciation and routing of these;
- 7.7.3.37.2.(b).3 Create, delete, and modify point trend logs and graph;
- 7.7.3.37.2.(b).4 Create, delete, and modify reports;
- 7.7.3.37.2.(b).5 Add, remove, and modify system's physical points;
- 7.7.3.37.2.(b).6 Create, modify, and delete programming
- 7.7.3.37.2.(b).7 Add panels when required;
- 7.7.3.37.2.(b).8 Add operator interface stations;
- 7.7.3.37.2.(b).9 Create, delete, and modify system displays, both graphical and others;
- 7.7.3.37.2.(b).10 Perform BMS field checkout procedures;
- 7.7.3.37.2.(b).11 Perform BMS controller unit operation and maintenance procedures;
- 7.7.3.37.2.(b).12 Perform workstation and peripheral operation and maintenance procedures;
- 7.7.3.37.2.(b).13 Perform BMS diagnostic procedures;
- 7.7.3.37.2.(b).14 Configure hardware including PC boards, switches, communication, and I/O points; and
- 7.7.3.37.2.(b).15 Maintain, calibrate, and replace system components.

7.7.3.37(2)(c) System managers and administrators:

- 7.7.3.37.2.(c).1 Maintain software and prepare backups;
- 7.7.3.37.2.(c).2 Interface with project-specific, third-party operator software; and
- 7.7.3.37.2.(c).3 Add new users and understand password security procedures.

7.7.3.37(3) Provide a virtualized environment for the BMS and IBMP simulating a facility of similar size to the Facility. This virtualized environment will simulate all systems contained in Division 25, as well as the Fire Alarm system, and be used to train FMO user groups on the use and troubleshooting of the BMS by a system expert provided by Project Co. Project Co will make this training service available to the Owner at least twelve months prior to Service Commencement.

7.7.3.37(4) Provide an expert in the BMS who has experience using the system in healthcare environments. The expert will assist in Commissioning the BMS, as well as programming to assist in "Smart Commissioning" of the Facility and provide ongoing training and system development.

7.7.3.37(5) To ensure the Owner and Facility Management has a comprehensive understanding of the hardware and software, to ensure the ongoing development of KPI's (at the BMS level), and energy optimization, Project Co will employ and make available to the Owner a fulltime IBMP and BMS expert for two years following Service Commencement.

7.7.3.37(6) Project Co will employ a Master Technology Integrator who has experience using the IBMP and BMS systems in healthcare environments. The Master Technology Integrator will lead the design and configuration consultations of the integrated automation system and assist in developing a Smart Commissioning strategy for Facility, as well as provide ongoing training and optimization services; refer to Section 5.5 for additional requirements on commissioning / training.

7.7.4 Electrical Systems

7.7.4.1 System Overview

7.7.4.1(1) Electrical systems requiring BMS interfaces include:

7.7.4.1(1)(a) Generators;

7.7.4.1(1)(b) Lighting controls;

7.7.4.1(1)(c) Load management system;

7.7.4.1(1)(d) Electrical metering;

7.7.4.1(1)(e) Switchgear;

7.7.4.1(1)(f) ATS / HVATS;

7.7.4.1(1)(g) EVSE;

7.7.4.1(1)(h) UPS;

7.7.4.1(1)(i) Isolated Power Systems;

7.7.4.1(1)(j) Fire alarm system; and

7.7.4.1(1)(k) Clock system.

7.7.4.1(2) Applicable Area

7.7.4.1(2)(a) Applies to the Facility.

7.7.4.1(3) System Responsibilities

7.7.4.1(3)(a) Owner will:

7.7.4.1.3.(a).1 Provide design feedback to the Project Co.

7.7.4.1(3)(b) Project Co will:

7.7.4.1.3.(b).1 Provide BMS interfaces for the control, data and alarm points listed under “Performance Requirements” below, and as noted in Division 26 sections.

7.7.4.1.3.(b).2 Design, supply and install all system infrastructures.

7.7.4.1.3.(b).3 Design, supply and install all system equipment.

7.7.4.1.3.(b).4 Design, supply and install all system software.

7.7.4.1.3.(b).5 Commission all system infrastructure, equipment and software.

7.7.4.1.3.(b).6 Integrate the system to the following systems:

(b).6.1 Integrated building management platform.

7.7.4.1(4) Performance Criteria

7.7.4.1(4)(a) Generators (for each generator):

7.7.4.1.4.(a).1 Generator trouble points (all available points);

7.7.4.1.4.(a).2 Generator run status;

7.7.4.1.4.(a).3 Coolant temperature;

7.7.4.1.4.(a).4 Battery voltage; and

7.7.4.1.4.(a).5 Fuel level for each tank.

7.7.4.1(4)(b) Lighting controls:

7.7.4.1.4.(b).1 Refer to requirements in Section 7.8.14.

7.7.4.1(4)(c) Load management system:

7.7.4.1.4.(c).1 Refer to requirements in Section 7.8.

7.7.4.1(4)(d) Electrical metering:

7.7.4.1.4.(d).1 Refer to requirements in Section 7.8.9.

7.7.4.1(4)(e) Switchgear:

7.7.4.1.4.(e).1 Refer to requirements in Section 7.8.

7.7.4.1(4)(f) ATS / HVATS:

7.7.4.1.4.(f).1 Refer to requirements in Section 7.8.

7.7.4.1(4)(g) EVSE:

7.7.4.1.4.(g).1 Charge status and kW output; and

7.7.4.1.4.(g).2 Alarm / trouble points (all available points).

7.7.4.1(4)(h) UPS:

7.7.4.1.4.(h).1 Refer to requirements in Section 7.8.8.

7.7.4.1(4)(i) Isolated Power Systems:

7.7.4.1.4.(i).1 Refer to requirements in Section 7.8.7.2(7).

7.7.4.1(4)(j) Fire alarm system:

7.7.4.1.4.(j).1 Refer to requirements in Section 1.1.1.

7.7.4.1(4)(k) Clock system:

7.7.4.1.4.(k).1 Alarm for loss of central time signal; and

7.7.4.1.4.(k).2 Synchronization of BMS system time and all alarm inputs with central time signal.

7.7.5 FMO Network and Infrastructure

7.7.5.1 Basic Requirements

7.7.5.1(1) System Overview

7.7.5.1(1)(a) The FMO Network and Infrastructure is a dedicated IEEE 802.3 network, separate from the other networks in the Facility including the IM/IT data network. It will provide a single, consolidated networking infrastructure for IP communication of Facility Building Systems.

7.7.5.1(1)(b) The FMO network includes:

7.7.5.1.1.(b).1 Optical Line Terminals (OLTs), and Optical Network Terminals (ONTs);

7.7.5.1.1.(b).2 Network management software; and

7.7.5.1.1.(b).3 Structured cabling infrastructure that is universal and supports FMO network and IM/IT equipment required in the Facility, including:

(b).3.1 Interbuilding structured cabling;

(b).3.2 Intrabuilding structured cabling backbone;

(b).3.3 Intrabuilding structured cabling horizontal and patching; and

(b).3.4 Telecommunications grounding and bonding.

7.7.5.1(1)(c) The FMO network does not include the following equipment which will be provided by the Owner:

7.7.5.1.1.(c).1 IM/IT data network

7.7.5.1.1.(c).2 IM/IT Wi-Fi network

7.7.5.1.1.(c).3 Routers;

7.7.5.1.1.(c).4 Network security hardware; and

7.7.5.1.1.(c).5 Servers.

7.7.5.1(2) Applicable Area

7.7.5.1(2)(a) Applies to the Facility.

7.7.5.1(3) System Responsibilities

7.7.5.1(3)(a) Owner will:

7.7.5.1.3.(a).1 Provide design feedback to Project Co.

7.7.5.1(3)(b) Project Co will:

7.7.5.1.3.(b).1 Select the system in consultation with the Owner;

7.7.5.1.3.(b).2 Design, supply, install and commission all system infrastructure;

7.7.5.1.3.(b).3 Design, supply, install, configure, program and commission the FMO Network, including all required network equipment;

7.7.5.1.3.(b).4 Design, supply and install all system software; and

7.7.5.1.3.(b).5 Commission all system infrastructure, equipment and software.

7.7.5.2 Performance Criteria

7.7.5.2(1) General

7.7.5.2(1)(a) The Facility FMO Network and infrastructure will be designed and implemented in a manner consistent and appropriate for the critical nature of 24/7 acute care Facility operations.

7.7.5.2(1)(b) Project Co will provide a single software GUI for the FMO Network to manage all network operations without the need for Command Line Interface (CLI) programming. The GUI will allow for a simple to use centralized management of the following for all network devices:

7.7.5.2.1.(b).1 VLAN assignments;

7.7.5.2.1.(b).2 PoE; and

7.7.5.2.1.(b).3 Port Restrictions.

7.7.5.2(1)(c) Project Co will provide a dedicated software application actively monitor, report and troubleshoot all BACNet/IP device traffic on the FMO network.

7.7.5.2(1)(d) Project Co will provide all necessary Project management, qualified technical expertise, infrastructure design, installation coordination, labour, materials, equipment, services and other items required to fulfill its scope of work as defined in this section.

7.7.5.2(1)(e) The FMO Network is a critical component for the "Smart Commissioning" of Building Systems. Project Co will ensure the network is operational, commissioned, and connected to FMO networked Building Systems prior to Commissioning those systems.

7.7.5.2(1)(f) Project Co will provide all software licensing associated with the FMO network for two (2) years.

7.7.5.2(2) OLTs and ONTs

7.7.5.2(2)(a) The FMO network will operate on a Passive Optical Network (PON) backbone consisting of single-mode fibre optical cable, passive optical splitters, OLTs and ONTs.

7.7.5.2(2)(b) The FMO Network will be designed for redundancy of all core equipment and connections between core and edge switching. The FMO Network design will allow for concurrent upgrading of networking equipment and software to eliminate unplanned downtime.

7.7.5.2(2)(c) ONTs and OLTs will support a full range of modern networking capabilities, including multicast.

7.7.5.2(2)(d) Provide the minimum equipment bandwidth requirements below or the latest technology at the time of procurement:

7.7.5.2.2.(d).1 OLTs: 1 Gbps uplink and 1 Gbps downlink, per uplink port;

7.7.5.2.2.(d).2 ONTs: 1 Gbps per RJ-45 port; and

7.7.5.2.2.(d).3 Split ratio of 2:16 maximum.

7.7.5.2(2)(e) A single port on the OLTs will not be used to serve more than sixteen (16) ONTs on the FMO network.

7.7.5.2(2)(f) FMO Network OLTs will be installed within each MER in the Facility. Refer to Division 27 for information on MER topology.

7.7.5.2(2)(g) ONTs will be installed within dedicated wall cabinets within TRs.

7.7.5.2(2)(h) ONTs will be installed on the same floor as the equipment and mechanical controllers that they are serving

7.7.5.2(2)(i) ONT and OLT port counts will be sized for a minimum of 25 % spare within each space being served.

7.7.5.2(2)(j) Project Co will supply all connectors, patch cords, and SFPs to provide a fully functional network.

7.7.5.2(3) FMO Network Structured Cabling

7.7.5.2(3)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying installing, and Commissioning FMO Network structured cabling systems.

7.7.5.2(3)(b) All horizontal and structured cabling jacketing for the FMO network will be grey in colour.

7.7.5.2(3)(c) Provide all structured cabling, power peripherals and accessories required for a functional end-to-end system.

7.7.5.2(4) Intrabuilding Structured Cabling Backbone

7.7.5.2(4)(a) Intrabuilding backbone structured cabling will be provided as part of the IM/IT Structured Cabling System defined in Division 27.

7.7.5.2(4)(b) Single-mode fibre backbone IM/IT strands will be provided for FMO Network use.

7.7.5.2(5) Structured Cabling Horizontal and Patching

7.7.5.2(5)(a) Project Co will provide all horizontal structured cabling required to connect all systems and field devices that are not part of Division 27 or Division 28 to the FMO network.

7.7.5.2.5.(a).1 Provide complete Category 6A horizontal cabling for each device that requires ethernet/IP access to the integrated automation system as identified in Division 25.

7.7.5.2(5)(b) Provide rack mounted patch panels for FMO network equipment in each TR.

7.8 Electrical (Division 26)

7.8.1 Design Principles

7.8.1.1 Provide electrical systems that meet the requirements of the identified program in an efficient manner with optimal utilization of space, Staff and equipment resources, and provide a comfortable and safe working environment for Patients, Staff and visitors.

7.8.1.2 Electrical Systems will be:

7.8.1.2(1) Of a type and quality intended for use in a health care facility;

7.8.1.2(2) Functional, new and using the latest proven technologies in the design of equipment and systems;

7.8.1.2(3) Integrated where integration provides efficiency, operational and cost advantage;

7.8.1.2(4) Efficient;

7.8.1.2(5) Reliable;

7.8.1.2(6) Adaptable and expandable for future needs;

7.8.1.2(7) Configured with redundancy to allow flexible operation and concurrent maintenance; and

7.8.1.2(8) Located to allow equipment to be serviced conveniently.

7.8.1.3 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 extent of interruption to regular Facility operations.

7.8.2 Basic Requirements

7.8.2.1 The electrical systems and equipment will be designed and installed for post-disaster operation, meeting the performance requirements of Section 5.2.

7.8.2.2 Power Distribution Equipment:

7.8.2.2(1) Will be located indoors in unsprinklered Electrical Rooms unless noted otherwise;

7.8.2.2(2) MCCs, starters, and harmonic filters associated with mechanical loads may be located in mechanical service rooms; and

7.8.2.2(3) Where located in sprinklered service rooms, will use sprinkler-proof construction with features such as:

7.8.2.2(3)(a) Drip shields;

7.8.2.2(3)(b) Angled overhanging drip-proof louvres at ventilation openings; and

7.8.2.2(3)(c) Watertight fittings on exposed top-entry raceways and cables.

7.8.2.2(4) Where equipment or boxes may be exposed to rain or washdown, use waterproofing methods such as EYS fittings, water tight fittings, water tight boxes and/or duct seal to prevent water ingress.

7.8.2.3 Plan the installation of equipment to facilitate easy access to equipment that may require inspection or maintenance.

7.8.2.4 Provide electrical distribution schemes that are sized and configured to achieve service continuity in the event of equipment failure. Failure of any electrical equipment, feeder or circuit will neither impair Facility operation nor deprive any area of electrical power.

7.8.2.5 Size and configure equipment to permit routine testing and servicing of power generation and distribution equipment without impairing Facility operation or depriving any area of electrical power.

7.8.2.6 Utilize power distribution equipment that is robust, reliable, easily operated and maintained.

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

7.8.2.8 Provide power distribution systems at the following nominal voltage levels:

7.8.2.8(1) 12.47 kV, 3-phase, 3-wire systems for primary power distribution;

7.8.2.8(2) 600 V, 3-phase, 3-wire high-resistance grounded systems for distribution within the Facility and 600 V or 480 V 3-wire high-resistance grounded systems for large equipment loads such as chillers, pumps, imaging equipment and fans;

7.8.2.8(3) 600Y/347V or 208Y/120V, 3-phase, 4-wire systems for exterior and underground parking lighting loads;

7.8.2.8(4) 208 Y/120 V, 3-phase, 4-wire systems for distribution to branch circuit panels, lighting, receptacles, and small equipment loads; and

7.8.2.8(5) Other voltages where required to match utilization voltages of specialty Equipment (e.g. CT, MRI, EVSE).

7.8.2.9 Incorporate energy management systems to maximize the useable capacity of the Facility power systems and minimize utility electrical demand costs.

7.8.2.10 Integrate requirements for energy incentive programs into the electrical systems. Refer to Appendix 2D [Energy] for details.

7.8.2.11 Provide electrical infrastructure for the parking, private roadway and exterior site areas including lighting, signage, receptacles, equipment power and vehicle charging infrastructure. Refer to Part 4 for lighting requirements on public roadways.

7.8.2.12 Lighting

7.8.2.12(1) Provide lighting schemes that support functional needs and activities and enhance safety for Patients, Staff and visitors.

7.8.2.12(2) Design lighting with the objective of creating a comfortable working environment and an environment conducive to healing and recovery.

7.8.2.12(3) Utilize a combination of natural light, luminaries and controls to optimize daylight.

7.8.2.13 Electrical Rooms

7.8.2.13(1) Locate electrical equipment and feeder routes to minimize the risk to service continuity resulting from fire, flood, adverse weather, seismic events, construction activities and vandalism.

7.8.2.13(2) No major equipment or critical power system components will be located below the specified 5.0-m Flood Construction Level. Where electrical circuits and equipment are located below grade, provide protection against the risk of flooding.

7.8.2.13(3) Locate Electrical Rooms and power distribution equipment to minimize the distances for feeder runs, to provide easy access for equipment replacement and to avoid interference with other services and equipment.

7.8.2.13(4) Install at least one local Electrical Room per floor for each unit substation serving that floor. Local Electrical Rooms will be stacked vertically with at least three walls vertically aligned between floors to allow continuous risers.

7.8.2.13(5) Divide switchgear systems into separate rooms for each utility service and emergency power switchgear, with a minimum 2-hour fire resistance rated separation between them, such that in the event of a catastrophic failure in one room, full power can be restored to the Facility using the equipment in the other room.

7.8.2.13(6) Where fire-rated shafts or enclosures are used to achieve the wiring fire protection required by the VBBL, no conditional wiring or Equipment will be located in the same shafts or enclosures, and stacked fire-rated Electrical Rooms are not an acceptable method of protection.

7.8.2.13(7) Electrical Rooms will not contain plumbing or other unrelated components unless they are essential for the room functions (including fuel lines, gas lines, hydronic, sprinkler, or drain piping). Hydronic equipment will not be located in Electrical Rooms, including fan coils and hydronic unit heaters, except in the following conditions:

7.8.2.13(7)(a) It is not feasible to locate the hydronic equipment in adjacent mechanical spaces;

7.8.2.13(7)(b) Hydronic equipment and piping are not located above electrical or electronic equipment, or space for installing future equipment. Owner's preferred location is over the entrance door with minimal piping inside Electrical rooms; and

7.8.2.13(7)(c) Drip trays and piping sleeves are provided for all areas where leaks from equipment or pressurized piping may occur;

7.8.2.13(8) Install equipment, raceways, supports, ductwork, and all other components in Electrical Rooms such that a minimum clear height of 2.14 m AFF is available.

7.8.2.13(9) Protect electrical equipment from the risk of flooding due to sprinkler or mechanical piping leaks, using partitions, distance, elevation, containment curbs, tanking, or other methods as appropriate.

7.8.2.13(10) All floor-mounted or ground-mounted electrical equipment will be placed on minimum 89 mm high concrete housekeeping pads. This requirement is applicable to all spaces on the Health Campus, including mechanical rooms, underground parking and exterior areas.

7.8.2.13(11) Design the Electrical Rooms and generator plant to be readily accessible, secure, well ventilated and free of corrosive or explosive fumes, gases or any combustible material.

7.8.2.14 Equipment Replacement Strategy

7.8.2.14(1) Provide clear aisle ways and routes to permit removal of major electrical equipment from the Facility as well as to bring in new equipment into the Electrical Rooms without impacting Facility operation and site access.

7.8.2.14(2) The replacement pathways will allow new equipment to be brought into the Facility and its respective Electrical Room as an entire unit after factory testing, without being broken down into

subcomponents requiring assembly on site. On-site assembly of equipment shipping splits is acceptable if reassembly and installation are vendor supported to ensure equipment performance meets manufacturer specifications. Dismantling equipment into smaller components, such as switchgear sections smaller than a single vertical cubicle, dividing transformer cores into sections, or decoupling generator engines and alternators, is not acceptable. Pathways will allow for replacement of transformers without core and coil disassembly. Assembly of replacement transformer enclosures on-site is acceptable.

7.8.2.14(3) Indicate on floor plans the removal aisle ways and routes for major electrical equipment such as diesel generators, transformers sized 300 kVA and greater, switchgear sections, ATS and UPS cabinets.

7.8.2.15 Zoning

7.8.2.15(1) Zone the power distribution systems with precise boundaries to restrict the extent of an outage, provide certainty for maintenance, and identify the limits of spare capacities. Circuits across zone boundaries are not permitted except for the source feeders necessary to supply power to the zone. At the Health Campus level, zone boundaries will coincide with the overall Site and individual outlines of the buildings comprising the Facility. Within buildings, zone boundaries will coincide with floor levels and fire compartments.

7.8.2.15(2) Zoning and sizing of power distribution systems and locations of major equipment will be as noted in the sections below.

7.8.2.15(3) The Energy Centre will be sized to accommodate all of the power generation and distribution equipment necessary to serve the Facility, except where noted otherwise, with space and capacity allowances for future development.

7.8.2.15(4) The Energy Centre will feed multiple unit substations throughout the Facility with dedicated feeders to each. Unit substations will be located above the 5.0-m Flood Construction Level and at sufficient spacing to ensure that all floor areas in the Facility are within an 80-m horizontal wiring distance of the 600 V components of a unit substation, when wired in parallel with the Facility walls.

7.8.2.15(5) The following equipment will be located in the Energy Centre:

7.8.2.15(5)(a) High voltage switchgear (utility Vista switchgear, service boxes, revenue metering compartments, and transformer local disconnect switches may be

located elsewhere where specified in other Sections);

7.8.2.15(5)(b) Diesel generators and paralleling switchgear;

7.8.2.15(5)(c) HVATS for the vital, delayed vital and conditional power branches;

7.8.2.15(5)(d) Main switchgear for the utility, vital, delayed vital and conditional power branches;

7.8.2.15(5)(e) Unit substation containing 12.47/25 kV-600 V step-down transformers serving the Energy Centre and adjacent areas of the Facility; and

7.8.2.15(5)(f) Power distribution systems and ancillary equipment needed to serve the Energy Centre.

7.8.2.15(6) Unit substations for the Facility will be fed directly from the Energy Centre. The unit substation Electrical Rooms will include high-voltage transformer disconnect switches, 12.47 kV-600 V and 12.47 kV-480 V step-down transformers, and main 600V and 480V switchgear for the area served by the unit substation. These rooms may also include CDPs, distribution transformers, panelboards, and ancillary equipment such as capacitors and meters, for the area served by the unit substation.

7.8.2.16 Integrated Controls for High Voltage Equipment in the Energy Centre

7.8.2.16(1) The control system for the following equipment will be integrated by a common vendor, and this integrated control system will be designed, supplied and commissioned by the control system integrator as a single package:

7.8.2.16(1)(a) High-voltage utility power switchgear;

7.8.2.16(1)(b) Diesel generators;

7.8.2.16(1)(c) Generator master control systems;

7.8.2.16(1)(d) Generator paralleling switchgear;

7.8.2.16(1)(e) High-voltage automatic transfer switches;

7.8.2.16(1)(f) High-voltage emergency power switchgear; and

7.8.2.16(1)(g) DC control system including station batteries and chargers.

7.8.2.16(2) Integrated Control System will:

7.8.2.16(2)(a) Be compliant with the emergency power requirements of Section 7.8.4;

7.8.2.16(2)(b) Include two fully redundant master control systems with PLC controllers, power supplies, HMI touchscreen display panels, redundant I/O connections for each device;

7.8.2.16(2)(c) Be designed to have no single point of failure;

7.8.2.16(2)(d) Be designed such that the addition of future generators and feeder breakers will not require the replacement, upgrade or retrofit of the system. Include bus links and/or terminal lugs to match the bus such that any piece of distribution equipment has a means of extending or refeeding with minimal downtime; and

7.8.2.16(2)(e) Remotely operate all circuit breakers in each item of equipment listed above.

7.8.2.17 Provisions for Future

7.8.2.17(1) Provide a minimum of 20% spare capacity in the ampacity ratings of:

7.8.2.17(1)(a) Each distribution or isolation transformer;

7.8.2.17(1)(b) Each 600 V or 480 V switchgear lineup;

7.8.2.17(1)(c) Each 600 V, 480 V, or 208 V CDP;

7.8.2.17(1)(d) Each 600-V MCC;

7.8.2.17(1)(e) Each 120/208-V branch panelboard; and

7.8.2.17(1)(f) Each feeder.

7.8.2.17(2) Any spare capacity requirements in Section 7.8 will be calculated as a percentage of the initial installed continuous load capacity. This spare capacity will be provided in addition to the calculated continuous load during the first year of Facility operation. For example, if a 100-A, 80 % rated breaker is provided, the spare capacity required is 100 A x 80 % x 20% = 16 A continuous load for a maximum initial installed continuous load of 64 A. Size all feeders for less than 2 % voltage drop at the continuous load rating of the associated overcurrent device, with a maximum 5 % voltage drop from service to point of utilization when all feeders and branch circuits are loaded to 125 % of the calculated feeder continuous load. Submit load calculations before equipment is

procured, to verify this is provided for all of the equipment noted above.

7.8.2.17(3) Provide clear physical space equal to the footprint of one vertical switchgear section beside each switchgear lineup for Future Expansion. Where switchgear is arranged in continuous configurations with tie breakers, provide the clear physical space on both ends of the switchgear lineup, with space for a quantity of vertical switchgear sections equal to the number of power branches in the switchgear lineup. For example, a lineup with vital, delayed vital and conditional branches requires space for three future vertical switchgear sections, with the ability to connect the center section of the lineup to one of the spaces on the end using overhead bus duct.

7.8.2.17(4) In addition to the equipment provided under this Agreement, design and construct each Electrical Room with sufficient empty floor and wall space to allow an additional 25% of each type of equipment initially installed to be added for Future Expansion. Clear physical space required by other Sections at the ends of switchgear lineups may be counted toward this requirement, and transformers with high voltage primary windings are exempt from this requirement.

7.8.2.17(5) In order to minimize downtime during renovations, all distribution equipment with required adjacent physical space provisions will be provided with bus links and/or terminal lugs to match/extend the equipment bus. The end of the enclosure will have a cut-out with a separate cover in line with the existing bus to avoid metal cutting in future. Bolt bus links inside last cubicle and note their locations on the record drawings.

7.8.2.17(6) Provide adequate physical space to facilitate the future installation of feeders that will utilize the spare electrical capacity. Space provided will allow the installation of future feeders without disruption to Facility operations. Reserve 20% of the useable cross-sectional area of electrical risers and shafts as spare for future. Where electrical sleeves are grouped, reserve 20% of their useable cross-sectional area as spare for future.

7.8.2.17(7) At each CDP and branch panelboard:

7.8.2.17(7)(a) Provide the greater of one (1) spare breaker or a quantity of spare breakers equivalent to 10% of the total number of installed breakers in that panel. Rating and features of the spare breaker(s) will match the most common breaker installed in the panel.

7.8.2.17(7)(b) Equip the panel with fully prepared space(s) throughout, reserving at least 15 % of the total panel spaces for future in addition to the spare breaker requirements above. Each prepared space will include all of the hardware and connectors necessary to add circuit breakers into the panel in the future.

7.8.2.17(8) Include for additional future provisions noted elsewhere in this Schedule, before spare capacity is calculated. For example, equipment serving a Shelled Space or area designated for a specific Future Expansion use, will be sized for the worst-case specified fit-out use of the space, with 20% spare capacity. The planned capacity expansion and high-lift conversion of the heat recovery chiller plant as noted in Sections 7.5.7.4(8) and 7.5.7.4(14) and the future NEU primary side pumps noted in Section 7.5.2.1(4) do not have to be considered in this equipment sizing calculation, except that spare power capacity on the transformers and switchgear serving the chillers will be sufficient for a future high-lift heat recovery chiller plant meeting the performance criteria of Section 7.5.7.4 to generate up to 13MW of heat supplied to the NEU from the Facility.

7.8.2.17(9) In interior spaces designated for Future Expansion, provide any infrastructure needed for the Future Expansion use extending to the perimeter of the space. Branch circuit wiring, breakers, and raceways within the partitions surrounding the space may be omitted for future fit-out. Upstream equipment associated with the space, e.g. imaging transformers, may also be omitted if dedicated space provisions are reserved for this equipment and renovations outside of service spaces are not needed for its future installation. Refer to Section 5.1.1.1 for specific requirements for these spaces.

7.8.2.17(10) Provide as spare a quantity of loose breakers equal to 1% of the number of each type and rating of all breakers on campus to a maximum of five (5) breakers for each type and rating. Provide a minimum of one (1) breaker of each type and rating. Provide one or more cabinet(s) sized to suit and locate in the Energy Centre.

7.8.2.17(11) Where other Sections require equipment sizing based on load during the first year of Facility operation, this load will be evaluated as the peak demand load during the first consecutive twelve (12) month period with all Health Campus systems and departments fully functional and commissioned, plus calculated peak demand loads for any interior shell spaces designated for specific Future Expansion uses that have not yet been fit out. The planned capacity expansion of the heat recovery chiller plant

noted in Section 7.5.7.4 does not have to be considered in this equipment sizing calculation.

7.8.2.18 Protective Device Co-ordination

7.8.2.18(1) The protective devices in the electrical distribution system will be co-ordinated to provide selective tripping under any fault condition for the available short-circuit currents in the following scenarios:

7.8.2.18(1)(a) When the electric utility service is supplying the loads;

7.8.2.18(1)(b) When emergency generators are supplying the loads; and

7.8.2.18(1)(c) When both electric utility service and generators are paralleled and supplying the loads.

7.8.2.18(2) The coordination of protective devices will achieve fully selective tripping from the utility's service protection or any generator main breaker up to and including the circuit breaker feeding the final (branch) panelboard in order to localize an overcurrent condition to restrict outage to the final feeder or Equipment that is affected. Fully selective coordination requirements include selective tripping throughout the instantaneous region, as well as ground fault coordination, where applicable for 4-wire systems, with downstream phase trip settings. The final feeder breaker and the branch circuit breaker will be selectively coordinated in all areas of the time-current curves except in the instantaneous region.

7.8.2.18(3) Co-ordination will be achieved through the choice of manufacturer-listed selective combinations of protective devices, the use of time and current trip settings, zone-selective interlocking, and through the reduction of fault levels through the system impedance.

7.8.2.18(4) Rate all distribution devices to handle available fault duty at line terminals based on maximum utility available fault level at 25 kV. Perform and implement a short circuit and coordination study to ensure that all protective devices provide selective coordination to ensure tripping of the downstream device nearest the fault and not a cascading effect involving upstream devices. All feeder breakers will be fully selective and set so that they will not trip on equipment inrush currents.

7.8.2.18(5) Provide circuit-breaker-type power distribution equipment fully rated for the calculated fault current level. Series-rated or integrated equipment-rated device combinations will not be permitted.

7.8.2.18(6) Project Co will retain an electrical engineer, who is a Professional Engineer registered in British Columbia, as part of the Project team. Submit to the Owner a detailed protective device coordination study of the electrical system signed and sealed by Project Co's electrical engineer.

7.8.2.19 Arc Flash Hazard Reduction

7.8.2.19(1) Incorporate design features to reduce arc flash hazards on electrical systems such that maintenance operations on live equipment such as racking in/out of breakers, thermal scanning of feeder terminations, or installation of branch circuit conductors on emergency power panels could expose workers to arc flash incident energy levels no greater than 12 cal/cm2. The system will be designed with mitigating features to limit arc flash incident energy levels throughout the system to less than 40 cal/cm2.

7.8.2.19(2) Utilize technologies for arc flash hazard reduction, such as the following:

7.8.2.19(2)(a) thermal imaging ports;

7.8.2.19(2)(b) bus differential protection;

7.8.2.19(2)(c) arc-overcurrent protection relays;

7.8.2.19(2)(d) zone-selective interlocking protection;

7.8.2.19(2)(e) limiting available fault current from transformers;

7.8.2.19(2)(f) maintenance mode settings of circuit breakers;

7.8.2.19(2)(g) remote control of switching; and

7.8.2.19(2)(h) motorised racking devices.

7.8.2.19(3) Submit to the Owner a detailed arc flash study signed and sealed by Project Co's electrical engineer.

7.8.2.19(4) In accordance with the approved arc flash study, provide equipment labelling indicating the available incident energy levels at each switchgear lineup, panelboard, MCC, or stand-alone switch or protective device where workers may be exposed to live parts during servicing, adjustment and/or maintenance.

7.8.2.20 Power Quality

7.8.2.20(1) The electrical distribution system will be protected from the disruptive effects of

7.8.2.20(1)(a) Lightning strikes;

7.8.2.20(1)(b) Current surges (causing voltage drops);

7.8.2.20(1)(c) Voltage surges;

7.8.2.20(1)(d) Overvoltage;

7.8.2.20(1)(e) Undervoltage;

7.8.2.20(1)(f) Harmonic currents;

7.8.2.20(1)(g) Electromagnetic interference;

7.8.2.20(1)(h) Radio frequency interference;

7.8.2.20(1)(i) Ferroresonance; and

7.8.2.20(1)(j) Switching transients.

7.8.2.20(2) Provide equipment and systems that assure the 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.

7.8.2.20(3) Establish and maintain an overall power quality that assures suitable conditions for operation of all electrical and electronic equipment throughout the Facility.

7.8.2.20(4) Provide equipment, such as filters, SPD shielding, etc., specifically designed to control and remove all adverse power quality conditions that could damage or impair function of electronic equipment used in the Facility. Adverse power quality conditions include voltage spikes, dips and droops, transients, harmonics, EMI and radio frequency interference. Systems will be designed and installed in accordance with recommended practices for powering and grounding electronic equipment, including IEEE 1100 and the equipment manufacturer's recommendations.

7.8.2.20(5) To prevent interference, locate EMI- and radio-frequency interference-producing equipment and vibrating equipment at a sufficient distance from spaces with sensitive Equipment such as medical imaging, EEG, audiology and lab areas.

7.8.2.20(6) Provide station-class lightning arrestors at the first high-voltage switch connected to each utility service.

7.8.2.20(7) Provide RC snubber networks at the primary of 12.47 kV-600 V or 12.47 kV-480 V transformers to prevent circuit breaker switching-induced transients from damaging the transformers.

7.8.2.20(8) Provide SPD at:

7.8.2.20(8)(a) Each switchgear bus;

7.8.2.20(8)(b) Each CDP;

7.8.2.20(8)(c) Each motor control centre; and

7.8.2.20(8)(d) Each panelboard serving Communications Rooms.

7.8.2.20(9) Surge Protective Devices:

7.8.2.20(9)(a) Will be connected to the bus by a circuit breaker on the line side for isolation and overcurrent protection.

7.8.2.20(9)(b) Will be internally mounted or close-coupled with leads shorter than 300 mm from the breaker terminals to the SPD, and with bends in these leads adding up to no more than 90 degrees.

7.8.2.20(9)(c) Provided on 600-V Equipment will be suitable for application on a 600-V high-resistance grounded system.

7.8.2.20(10) Harmonic Mitigation

7.8.2.20(10)(a) Motors rated 7.5 HP or greater and provided with VFDs will use one of the following methods to limit the THD at the bus feeding the VFD to than 5% of the full load fundamental current and less than 8% THD under 30% loading:

7.8.2.20.10.(a).1 An individual passive harmonic filter connected on the line side of the VFD.

7.8.2.20.10.(a).2 12-pulse VFD type.

7.8.2.20.10.(a).3 Active front end VFD type.

7.8.2.20.10.(a).4 Active harmonic correction at the bus feeding the VFD.

7.8.2.20(10)(b) Passive Harmonic Filters:

7.8.2.20.10.(b).1 Will treat all of the characteristic low frequency harmonics generated by a 3-phase, diode bridge rectifier load (5th, 7th, 11th, 13th, etc.).

7.8.2.20.10.(b).2 Will suppress the characteristic harmonics without the need for individual tuning or the

requirement to phase shift against other harmonic sources.

7.8.2.20.10.(b).3 Will achieve harmonic mitigation by a passive inductor and capacitor network. Active electronic components will not be used.

7.8.2.20.10.(b).4 Will never introduce a capacitive reactive power (kVAR) that is greater than 20% of its kVA rating to ensure compatibility with engine generators. Filters will be disconnected from the system when their associated loads are off if needed to achieve this result.

7.8.2.20.10.(b).5 Will neither resonate with system impedances in the power distribution system nor attract harmonic currents from other harmonic sources.

7.8.2.20(10)(c) Input line reactors and/or DC link chokes associated with VFDs will not be acceptable in-lieu of passive harmonic filters.

7.8.2.20(10)(d) Provide load reactors on VFDs where needed to keep output peak voltage and dV/dt below the specified insulation limits of the VFD output conductors and motor windings.

7.8.2.20(10)(e) Perform a computerized harmonics analysis of the Facility electrical system based on the final single line diagram. Analysis will illustrate the effect of all VFDs and other power conversion equipment on system harmonics. Provide additional harmonic mitigation measures as needed to keep harmonic distortion levels below IEEE 519 recommended limits at each 600V or 480V switchgear, CDP and MCC bus in the Facility, treating each bus as the point of common coupling for the purposes of this analysis. Where this harmonics analysis has demonstrated at the conclusion of the 70% Design and Construction Document phase that the IEEE 519 limits will be met, based on verifiable equipment characteristics matching the final equipment selections, the design may vary from the prescriptive options required by Section 7.8.2.20(10)(a).

7.8.2.20(10)(f) Provide the ability to demonstrate to the Owner 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.

7.8.2.20(10)(g) Harmonic mitigation Equipment and VFDs connected to 600-V systems will be suitable for application on a 600-V high-resistance grounded system.

7.8.2.20(10)(h) For all motors with VFDs, provide a means to safely dissipate common-mode electrical charge on the rotor and prevent electrically-induced bearing damage.

7.8.2.21 Magnetic Field Strength

7.8.2.21(1) Provide magnetic shielding and select Equipment locations as required to limit magnetic fields from electrical distribution equipment to the following levels:

7.8.2.21(1)(a) 10 milligauss in any occupied area, or in any area containing computer or communications equipment (areas of mechanical and electrical rooms without computer or communications equipment are exempt from this requirement);

7.8.2.21(1)(b) 5 milligauss in any Patient Care Area or any area where cathode ray tube displays are to be used, and

7.8.2.21(1)(c) 2 milligauss in any area where medical electrical equipment is to be tested (e.g. biomedical workshop) or very sensitive medical electrical equipment is to be used (e.g.: electroencephalograph (EEG), electrocardiograph (ECG/EKG).

7.8.2.21(2) Where extremely sensitive equipment is to be used, the room will likely require magnetic shielding, and the maximum permissible magnetic field strength will be obtained from the equipment manufacturer.

7.8.2.21(3) For the purposes of controlling magnetic field strength, an "area" will be from wall to wall and from the finished floor to the greater of 2.25 m above the finished floor or the maximum height that medical electrical equipment can reach, either fixed or arm mounted.

7.8.3 Utility Power supply

7.8.3.1 Basic Requirements

7.8.3.1(1) Provide a 12.47-kV dual supply utility service with a single backup supply service for the Facility.

7.8.3.1(2) BC Hydro to supply a new 12.47-kV double dual radial service to the Site that will terminate at two (2) indoor Vista switches located within the Facility. Each Vista switch will be located in a separate dedicated room, adjacent to each other, and located on the first level above grade and the designated Flood Construction Level.

7.8.3.1(3) Coordinate with BC Hydro for underground civil and Vista room standards, protective device coordination, and other service requirements. Provide electrical service information and submit service applications as needed.

7.8.3.1(4) Provide two dedicated service entrance rooms for power service terminations, adjacent to and on the same level as the Vista rooms. Each service entrance room will contain high-voltage utility incoming switchgear (service box) complete with service termination compartment, main circuit breaker, surge arrester and revenue metering instrument transformer compartment for one running service. The standby service will only be connected at the Vista switches and switched by BC Hydro to restore hospital power upon failure of one of the running circuits.

7.8.3.1(5) Provide high voltage main utility feeders between each service entrance room and the Energy Centre utility power switchgear. Main utility feeders will be concrete-encased to provide 2-hour fire rated protection, follow diverse routes and be routed entirely inside of the building envelope and outside of Clinical Spaces.

7.8.3.1(6) Project Co will be responsible for providing all on-site civil, architectural and ancillary infrastructure required by BC Hydro to accommodate the service connection and indoor Vista switches. All infrastructure and equipment for the incoming service will be in conformance with the requirements of BC Hydro.

7.8.3.2 Performance Criteria

7.8.3.2(1) All high voltage components of the Facility power systems will be rated for operation at either 12.47 kV or 25 kV, with initial energization at 12.47 kV. Where voltage conversion transformers are provided to step utility voltage down from 25kV to 12.47kV, equipment on the secondary side of these transformers or connected to the alternate source of an HVATS on the secondary side may be rated for 12.47kV only. Where voltage conversion transformers are provided to step utility voltage down from 25kV to 12.47kV, the following requirements apply:

7.8.3.2(1)(a) Step-down 25kV-12.47kV transformers will be provided in the Energy Centre for each utility service (running circuits only, connected downstream of the BC Hydro Vista switches), each sized with a base kVA ANN rating greater than the peak demand for the associated utility service during the first twelve (12) months of Facility operation with all systems and departments fully functional;

7.8.3.2(1)(b) Transformers will be equipped with cooling fans to achieve an AFN rating of 133% of the base KVA ANN rating, to provide spare capacity for future load growth;

7.8.3.2(1)(c) Transformers will be fully commissioned but initially bypassed for 12.47kV system operation, and arranged so that they can be connected for 25kV utility operation without any additional components or extended outages;

7.8.3.2(1)(d) Bus links and adjacent switchgear space provisions will be provided at the primary of each transformer to allow additional utility capacity to be tapped from these points in the future without extended outages to these transformers or primary switchgear; and

7.8.3.2(1)(e) Where other Sections indicate requirements for 12.47/25kV dual-rated equipment, they will also be applicable to 12.47kV single-rated equipment.

7.8.3.2(2) Comply with all applicable BC Hydro requirements, including:

7.8.3.2(2)(a) Requirements for Customer-Owned Primary Services Supplied at 4 kV to 35 kV (Primary Guide);

7.8.3.2(2)(b) Interconnection Requirements for Closed-Transition Transfer of Standby Generators; and

7.8.3.2(2)(c) Requirements for Manually Read Primary Service Voltage Revenue Metering (4 kW to 35 kV).

7.8.3.2(3) Design the electrical utility services and Electrical Rooms to be accessible to authorized personnel only. On-site underground services will be in concrete-encased duct banks sloped away from the Facility and drained to the site drainage system. Pull boxes (manholes/maintenance holes) will have lockable hasps and will not be located in secure areas, on roadways, or in areas accessible to Patients.

7.8.3.2(4) Feeders from the service entrance rooms to the Energy Centre will be sized to carry at least 8 MVA at 12.47 kV and 16 MVA at 25 kV based on the method of installation.

7.8.3.2(5) Main utility feeders will terminate at the utility power switchgear located within the Energy Centre, as close as practicable to the point where the main utility feeders enter the Energy Centre.

7.8.3.2(6) The utility incoming switchgear will be metal-enclosed type rated for 600 A minimum comprising:

7.8.3.2(6)(a) A draw-out vacuum circuit breaker main breaker;

7.8.3.2(6)(b) A dedicated compartment for utility metering instrument transformers;

7.8.3.2(6)(c) A surge arrester conforming to BC Hydro service entrance requirements;

7.8.3.2(6)(d) Separate service entrance compartment and outgoing feeder termination compartment;

7.8.3.2(6)(e) 3-phase digital multi-function type protective relay at the main breakers with ANSI protective functions 50/51, 50/51N and additional protective functions as required; integral digital metering capable of displaying real-time V, A, kVA, kW with peak demand registers; and a communication port integrated with the BMS to indicate breaker load values and switching status;

7.8.3.2(6)(f) Redundant 120 V AC IM/IT UPS circuits or 125 V DC battery-backed power supply with charger for protective relays and controls. Power supply wiring between the UPS or battery room and the switchgear room will be protected against exposure to fire for no less than 1h.

7.8.3.2(7) Arrange each service to be separate such that two services will not occupy the same duct bank, maintenance hole or manhole in the on-site below-grade infrastructure.

7.8.4 Emergency Power

7.8.4.1 Basic Requirements

7.8.4.1(1) Provide an emergency power system that has the capability to restore and sustain a supply of electricity to emergency loads if the normal utility supply is lost.

7.8.4.1(2) Emergency power system will include four (4) 12.47/25 kV prime power rated diesel generator sets of equal capacity, minimum 2000 kW each. The total generator capacity will be sufficient to supply power to 100% of the Health Campus peak power demand, including motor starting requirements, with 30% of nameplate capacity reserved as spare (20% for Future Expansion plus 10% reserve capacity).

7.8.4.1(3) The emergency power system will be resistance grounded to limit the ground fault current for equipment protection.

7.8.4.1(4) Design and construct the Energy Centre with a minimum of two (2) separate 2-hour fire rated generator rooms for system redundancy in the event of a catastrophic generator failure.

7.8.4.1(5) Energy Centre will be constructed with sufficient undeveloped adjacent space to accommodate two (2) additional generators in the future, sized identically to the generators initially installed, and associated ancillary equipment. Space and systems will be arranged such that the future addition can occur without disruption to the continued operation of the emergency power system. Indicate the location of this adjacent space on Energy Centre floor plans.

7.8.4.1(6) The emergency power system will include a common double-ended generator paralleling switchgear that is configured for the parallel operation of six (6) diesel generators split evenly between two (2) buses, such that the addition of a generator to each bus in the future will not require the replacement, upgrade or retrofit of the paralleling switchgear or control equipment, or emergency power system downtime.

7.8.4.1(7) The system will be designed and arranged in such a way that a failure, maintenance shutdown, or replacement of any generator or ancillary equipment will not jeopardize the continued operation of the other generator(s).

7.8.4.1(8) Generators and day tanks will be located above the designated Flood Construction Level inside the Energy Centre. Refer to Section 5.2 for post-disaster requirements.

7.8.4.1(9) Provide a permanently connected load bank for generator full load testing, connected to the main generator paralleling bus. Load bank kW and kVA ratings will match the prime kW and kVA ratings of one (1) generator and will be equipped with switched load steps. Load steps will be of different increments such that the load bank in combination with a portion of the Health Campus load can be matched to the generator prime rating within 1% and

automatically switched to maintain this level. Load bank will be installed outdoors, in a location where the heat that it produces does not affect other building components, occupants, or helicopter flight paths. Load bank will disconnect from the generator paralleling bus on loss of utility power.

7.8.4.2 Performance Criteria

7.8.4.2(1) With one generator offline, the remaining generator capacity will be sufficient to supply power to 100% of the peak vital and delayed vital power demand for the Facility, including motor starting requirements, with 30% of nameplate capacity reserved as spare (20% for Future Expansion plus 10% reserve capacity).

7.8.4.2(2) With two (2) generators offline, the remaining generator capacity will be sufficient to supply power to 100% of the designated post-disaster systems and operational areas for the Facility, including motor starting requirements, with 30% of nameplate capacity reserved as spare (20% for Future Expansion plus 10% reserve capacity). Designated post-disaster systems and operational areas include all equipment served from or serving:

7.8.4.2(2)(a) Vital and UPS power branches;

7.8.4.2(2)(b) Generator auxiliary systems;

7.8.4.2(2)(c) Smoke control and smoke venting systems;

7.8.4.2(2)(d) Fire alarm and fire suppression systems;

7.8.4.2(2)(e) Emergency Department;

7.8.4.2(2)(f) Ambulance Garage;

7.8.4.2(2)(g) Critical Care Complex;

7.8.4.2(2)(h) NICU;

7.8.4.2(2)(i) Two (2) Operating Rooms;

7.8.4.2(2)(j) One (1) level of Inpatient Care rooms; and

7.8.4.2(2)(k) Clinical Operations Centre.

7.8.4.2(3) The generator paralleling switchgear will be metal-clad type rated for at least 600 A and operation at 12.47 kV.

7.8.4.2(4) The double-ended paralleling switchgear design will be devoid of single points of failure and configured as two (2) physically separate switchgear lineups interconnected by two (2) tie-

breakers through a cable tie. Install these two switchgear lineups to be physically separate; do not install them in a contiguous manner.

7.8.4.2(5) Each half of the double-ended generator paralleling switchgear will have:

7.8.4.2(5)(a) Two (2) generator main breakers;

7.8.4.2(5)(b) One (1) tie breaker;

7.8.4.2(5)(c) Three (3) feeder breakers providing emergency power input to High Voltage Automatic Transfer Switches;

7.8.4.2(5)(d) One (1) prepared space that will accept a draw-out vacuum circuit breaker in the future for an additional generator connection; and

7.8.4.2(6) One bus of the generator paralleling switchgear will have one (1) feeder breaker for a load bank connection, rated for 100% of a single generator's full load prime power rating.

7.8.4.2(7) Each circuit breaker position in the generator paralleling switchgear will be equipped with a draw-out vacuum circuit breaker including:

7.8.4.2(7)(a) 3-phase digital multi-function type protective relay with ANSI protective functions 50/51, 50N/51N, and additional protective functions as required;

7.8.4.2(7)(b) Integral digital metering capable of displaying V, A, KVA, KW with peak demand registers; and

7.8.4.2(7)(c) A communication port integrated with the BMS to indicate breaker load values and switching status.

7.8.4.2(8) Two (2) fully redundant master control systems will be provided, each arranged to control six (6) engine-generators: four (4) generators provided under this contract and two (2) in the future. The master control systems will be designed to have no single point-of-failure and will include:

7.8.4.2(8)(a) Redundant PLC controllers operating in a hot/standby arrangement;

7.8.4.2(8)(b) Redundant power supplies;

7.8.4.2(8)(c) Separate enclosures to accommodate redundant control equipment; and

7.8.4.2(8)(d) Redundant HMI touchscreen display panels located in the Energy Centre Control Room and paralleling the switchgear room, arranged such that if any one fails, or is taken out of service, the other seamlessly continues to provide full control of the system.

7.8.4.2(9) Master control systems will include paralleling controls and load management controls. Paralleling controls may be distributed and integrated into genset-mounted control systems only if they provide the same level of redundancy as controls integrated into a central master control system.

7.8.4.2(10) The generators will normally operate in parallel and provide features including load sharing and base loading. It will be possible to select a pair of generators and use the Facility load as a base load for annual load testing of either generator.

7.8.4.2(11) Provide one (1) complete set of spare power and controls raceways extending from the rooms housing the generator paralleling switchgear and controls locations to each future generator. Cap off these raceways. Size and quantity of these raceways will be similar to the provisions for initially installed generators.

7.8.4.2(12) The BMS will monitor and record emergency loads and provide alarms and systems status associated with the generator plant and transfer switch system.

7.8.4.2(13) Locate the generators inside the Energy Centre to enable routine and emergency maintenance activities to be performed quickly and efficiently. Removal of the generators from the Facility will be simple and will require neither disassembly of the Facility or its systems, nor special lifting equipment.

7.8.4.2(14) Do not locate generators outdoors or where they are subject to damage from vandalism, falling objects or debris, road traffic, fire, flood or adverse weather conditions. Generators packaged in outdoor weatherproof walk-in type enclosures are not acceptable.

7.8.4.2(15) Diesel generators to have engine-driven radiators for cooling the engine. The cooling airflow path to be designed such that overall static pressure loss from intake to exhaust through louvres, silencers and dampers does not exceed the external static pressure capability of the engine-driven radiator fan.

7.8.4.2(16) Design the emergency power generation plant so that the sound levels that it will create at the facades of neighbouring buildings within the Facility, or at exterior spaces associated with the Facility (such as walkways, entryways, balconies or patios) will not

exceed 60 dBA. In addition, provide high grade exhaust mufflers and other sound attenuation means, as necessary, to prevent generator plant noise from causing interior noise levels within neighbouring buildings within the Facility (with windows closed) from exceeding the required interior noise level thresholds (such as NC 35–40 for Patient rooms) by more than 5 NC points. For the benefit of nearby residents, the Project Co will provide noise control measures, as necessary, to prevent generator plant noise from exceeding 55 dBA at the property lines of any existing residential properties. Project Co will retain a professional Acoustic and Vibration Consultant to assess generator plant noise levels at the facades of neighbouring buildings within the Facility and of nearby residential buildings and to develop noise control measures that will assure that the above noise limits are met. In carrying out these tasks, the Acoustic and Vibration Consultant will employ industry standard sound source modelling and sound propagation techniques/software.

7.8.4.2(17) Generator plants will be mounted on spring isolators and/or inertia bases as deemed necessary and sufficient by the Project Co's professional Acoustic and Vibration Consultant so as to adequately control the transmission of vibration into the Facility structure so that the resulting vibration levels experienced throughout the Facility do not exceed the limits specified in the Vibration Limits table in Section 5.9.6.

7.8.4.2(18) Diesel generator exhaust emissions at full load on 100% diesel fuel will not exceed the Environmental Protection Agency Non-Road 'Tier 2' limits and Metro Vancouver regional emissions limits. Locate the diesel generator exhaust outlet above roof level and away from Facility openings to prevent re-entrainment of emissions into air-intakes of existing and future buildings planned on-site.

7.8.4.2(19) Emergency power branches will serve emergency loads as defined by CSA Z32 and as required to meet the Appendix 3A [Clinical Specifications and Functional Space Requirements], including:

7.8.4.2(19)(a) Vital branch loads:

- 7.8.4.2.19.(a).1 Exit signs;
- 7.8.4.2.19.(a).2 Medical gas alarm panels;
- 7.8.4.2.19.(a).3 Medical vacuum system;
- 7.8.4.2.19.(a).4 Fire fighters' elevators;
- 7.8.4.2.19.(a).5 At least one elevator per bank;
- 7.8.4.2.19.(a).6 Elevator cab and machine room lighting;
- 7.8.4.2.19.(a).7 Fire alarm and EVAC paging system;
- 7.8.4.2.19.(a).8 Telecommunications systems;

7.8.4.2.19.(a).9 Smoke control systems;
7.8.4.2.19.(a).10 Automated dispensing cabinets for medication;
7.8.4.2.19.(a).11 Path of egress lighting including lighting at all Facility entrances;
7.8.4.2.19.(a).12 50% of stair and ramp lights;
7.8.4.2.19.(a).13 50% of receptacles and lights in all Patient care rooms;
7.8.4.2.19.(a).14 50% of receptacles in all common Patient areas including Dining/Activity Areas and lounges;
7.8.4.2.19.(a).15 Minimum 25 % of main lighting in each room corridor and interior area;
7.8.4.2.19.(a).16 Selected lighting and receptacles in generator room, maintenance shops, medication, and Care Team Stations;
7.8.4.2.19.(a).17 Pharmacy dispensing areas, mechanical and electrical service rooms;
7.8.4.2.19.(a).18 Fire pump automatic transfer switches (emergency power source);
7.8.4.2.19.(a).19 Receptacles for computers not on UPS power; and
7.8.4.2.19.(a).20 Equipment with emergency power as required to support the Equipment listed in Appendix 2E [Equipment and Furniture], or as determined during final Equipment selection with the Owner.

7.8.4.2(19)(b) Delayed vital branch loads:
7.8.4.2.19.(b).1 Fume hoods; and
7.8.4.2.19.(b).2 All elevators not on vital, with at least one (1) elevator per bank of multiple elevators on delayed vital.

7.8.4.2(19)(c) Conditional branch loads:
7.8.4.2.19.(c).1 Food service equipment;
7.8.4.2.19.(c).2 50% of stair and ramp lights;
7.8.4.2.19.(c).3 50% of receptacles and lights in all Patient care rooms;
7.8.4.2.19.(c).4 50% of receptacles in all common Patient areas including Dining/Activity Areas and lounges;
7.8.4.2.19.(c).5 EVSE;
7.8.4.2.19.(c).6 Equipment without emergency or UPS power requirements as required to support the Equipment listed in Appendix 2E [Equipment and Furniture], or as determined during final Equipment selection with the Owner; and

7.8.4.2.19.(c).7 Loads not included in other power branches.

7.8.4.2(20) Mechanical equipment to be connected to electrical power distribution branches in accordance with CSA Z32 at a minimum. Provide critical mechanical systems with bypass means or connections to multiple power branches to allow systems to remain operational while any single electrical component is de-energized for maintenance. This will include at least one half (1/2) of the heating plant capacity and one third (1/3) of the cooling plant capacity remaining operational during upstream electrical maintenance.

7.8.4.2(21) All elevators will be capable of simultaneous operation when all generators are online. Load management system will include a load-shedding step with input to the elevator controllers limiting elevators to sequential operation when two (2) generators are offline, while still allowing one (1) elevator from each bank to operate simultaneously.

7.8.5 High-Voltage Distribution

7.8.5.1 Basic Requirements

7.8.5.1(1) The high-voltage distribution will consist of three (3) source branches (utility power branch A, utility power branch B, and generator power) and three (3) load branches (vital, delayed vital, and conditional power).

7.8.5.1(2) Provide separate 12.47 kV/25 kV distribution systems for each source and load branch.

7.8.5.1(3) All load branches will be capable of being automatically restored from the emergency generators if utility power is lost.

7.8.5.1(4) Each source and load branch will be arranged such that a failure or maintenance shutdown on any part of one branch, including tie breakers and transfer switch arrangements, will not cause an outage of the whole branch nor deprive any area of electrical power.

7.8.5.1(5) Provide metal clad electrical equipment for the high-voltage distribution systems, except the utility incoming switchgear, which may be metal-enclosed construction.

7.8.5.1(6) Provide a continuous white lamacoid mimic bus riveted to the front of the enclosure, clearly indicating the functions in each cell of the distribution equipment.

7.8.5.1(7) The exterior finish of high-voltage distribution equipment will be colour coded as follows: royal red for vital, navy blue for delayed vital, yellow for conditional, grey for utility power, and green for generator power. The colour of each piece of equipment will match the colour of the source of power that normally feeds the equipment.

7.8.5.2 Performance Criteria

7.8.5.2(1) Utility power branch A will receive power input from utility incoming switchgear A. Provide a separate high-voltage automatic transfer switch (HVATS) to serve half of each of the load branches and designate as HVATS-V-A, HVATS-DV-A, and HVATS-C-A, respectively. The preferred source input of the HVATS will be directly fed from utility power branch A; the alternate source input of the HVATS will be directly connected to the generator paralleling switchgear bus A.

7.8.5.2(2) Utility power branch B will receive power input from utility incoming switchgear B. Provide a separate HVATS to serve half of each of the load branches and designate as HVATS-V-B, HVATS-DV-B, and HVATS-C-B, respectively. The preferred source input of the HVATS will be directly fed from utility power branch B; the alternate source input of the HVATS will be directly connected to the generator paralleling switchgear bus B.

7.8.5.2(3) High-voltage automatic transfer switch (HVATS) will be:

7.8.5.2(3)(a) A complete assembly that is purpose-built as automatic transfer switch equipment and listed to CSA 178.3 and/or UL 1008A;

7.8.5.2(3)(b) Metal-clad switchgear construction consisting of four (4) draw-out vacuum circuit breakers and able to bypass and isolate the automatic transfer breaker-pair on both sides of the dual incoming sources;

7.8.5.2(3)(c) Capable of closed-transition transfer (make-before-break transfer) between the incoming sources, avoiding interruption to downstream loads during weekly testing or when retransferring to the utility source after a power outage; and

7.8.5.2(3)(d) Rated for 600 A, including vacuum circuit breakers, internal bus and sensors.

7.8.5.2(4) High-voltage vital power switchgear will be split into an A bus, receiving its input directly from HVATS-V-A, and a B bus, receiving its input directly from HVATS-V-B. This switchgear will

be 600-A rated and configured with a tie breaker and a quantity of feeder breakers as required to feed each of the following loads using dedicated radial feeders:

7.8.5.2(4)(a) Each 12.47 kV-600 V or 12.47 kV-480 V main transformer for vital power in the Facility.

7.8.5.2(4)(b) In addition to the above feeder breakers, include one (1) prepared space that will accept a draw-out vacuum circuit breaker in the future to serve future renovations or additions.

7.8.5.2(4)(c) In addition to the above feeder breakers, provide bus link provisions and available space to add one (1) additional breaker cell on each end of the switchgear lineup.

7.8.5.2(5) High-voltage delayed vital power switchgear will be split into an A bus, receiving its input directly from HVATS-DV-A, and a B bus, receiving its input directly from HVATS-DV-B. This switchgear will be 600-A rated and configured with a tie breaker, and a quantity of feeder breakers as required to feed each of the following loads using dedicated radial feeders:

7.8.5.2(5)(a) Each 12.47 kV-600 V or 12.47 kV-480 V main transformer for delayed vital power in the Facility.

7.8.5.2(5)(b) In addition to the above feeder breakers, include one (1) prepared space that will accept a draw-out vacuum circuit breaker in the future to serve future renovations or additions.

7.8.5.2(5)(c) In addition to the above feeder breakers, provide bus link provisions and available space to add one (1) additional breaker cell on each end of the switchgear lineup.

7.8.5.2(6) High voltage conditional power switchgear will be split into an A bus, receiving its input directly from HVATS-C-A, and a B bus, receiving its input directly from HVATS-C-B. This switchgear will be 600-A rated and configured with a tie breaker and a quantity of feeder breakers as required to feed each of the following loads using dedicated radial feeders:

7.8.5.2(6)(a) Each 12.47 kV-600 V or 12.47 kV-480 V main transformer for conditional power in the Facility.

7.8.5.2(6)(b) In addition to the above feeder breakers, include one (1) prepared space that will accept a draw-out

vacuum circuit breaker in the future to serve future renovations or additions.

7.8.5.2(6)(c) In addition to the above feeder breakers, provide bus link provisions and available space to add one (1) additional breaker cell on each end of the switchgear lineup.

7.8.5.2(7) Each circuit breaker position in the high voltage distribution will have:

7.8.5.2(7)(a) 3-phase digital multi-function type protective relay with ANSI protective functions 50/51, 50N/51N, and additional protective functions as required for closed-transition interconnection protection;

7.8.5.2(7)(b) integral digital metering capable of displaying V, A, KVA, KW with peak demand registers and harmonic parameters; and

7.8.5.2(7)(c) a communication port integrated with the BMS to indicate breaker load values and switching status.

7.8.5.2(8) The tie breakers between switchgear A and B buses will be interlocked with the source breakers to prevent paralleling of multiple incoming power sources.

7.8.5.2(9) The high voltage feeders fed from vital, delayed vital and conditional branches will be kept entirely independent of each other and will not occupy the same maintenance hole, pull pit, junction box, pull box, cable tray, fire rated shaft, enclosure, etc., except where required to connect power sources at tie breakers and transfer switches.

7.8.5.2(10) Provide redundant 120 V AC IM/IT UPS circuits or 125 V DC battery-backed power supply with charger for protective relays and controls. Power supply wiring between the UPS or battery room and the switchgear room will be protected against exposure to fire for no less than 1h.

7.8.5.2(11) Power Transformers

7.8.5.2(11)(a) Will be dry type with copper windings, delta connected primary and wye-connected secondary;

7.8.5.2(11)(b) kVA capacity indicated will be based on Class 220 degree C insulation, 150 degree C rise;

7.8.5.2(11)(c) Will have ANN/AFN (air natural cooled / air force cooled) ratings and have cooling fans that will provide a minimum additional 33 % capacity over the base (air natural cooled) rating;

7.8.5.2(11)(d) Will have tested minimum efficiency meeting the U.S. Department of Energy (DoE) 2016 final rule (CFR Title 10 Part 431) and NRCan 2019 requirements; and

7.8.5.2(11)(e) The secondary wye point of power transformers will be high-resistance grounded.

7.8.6 Buried Duct Bank System for Campus Distribution

7.8.6.1 Basic Requirements

7.8.6.1(1) Provide buried concrete encased and reinforced electrical duct bank systems for all services, communications links, and feeders not located within the Facility. Duct bank systems are required for incoming utility high voltage and communications services, inter-building wiring, as well as wiring and spare duct provisions to/from the Energy Centre. Where redundant ducts are required, the ducts will be in two or more physically separated duct banks. A distance of 1.8 m will be considered the minimum physical separation.

7.8.6.1(2) Provide physically separated maintenance holes along each buried concrete encased duct bank system including provisions to facilitate connections of two (2) separate groups of power branches to the following locations from the Energy Centre:

7.8.6.1(2)(a) Each unit substation room;

7.8.6.1(2)(b) Future CSRC; and

7.8.6.1(2)(c) Future West Precinct.

7.8.6.1(3) Vital and conditional power feeders will be routed diversely and physically separated from each other. They will not follow the same route nor occupy the same duct bank, maintenance hole or pull pit except as noted above. Delayed vital feeders may be routed with conditional feeders, and utility power feeders may be routed with Vital feeders, with barriers separating the different power sources as required. Each BC Hydro service will be physically separated as well.

7.8.6.1(4) All underground duct banks will be identified at the point they enter/exit the perimeter of any building. The markers will be

located directly over the buried ducts and indicate the type and depth of each duct bank.

7.8.6.2 Performance Criteria

7.8.6.2(1) The Facility will receive a minimum of two (2) physically separated concrete-encased duct bank systems originating at the Energy Centre, each consisting of at least four (4) 103 mm ducts.

7.8.6.2(2) Provisions for future CSRC and West Precinct construction will include a minimum of two (2) physically separated concrete-encased duct bank systems per location, originating at the Energy Centre, each consisting of at least four (4) 103 mm ducts, capped at the edges of the Health Campus closest to these developments. Duct banks may terminate closer to the Energy Centre if undeveloped routes sufficient to extend the duct banks to the edges of the Health Campus are reserved for future installation.

7.8.6.2(3) Maintenance holes to be minimum 4.2 m long x 2.4 m wide x 2.25 m high with cast-iron covers.

7.8.6.2(4) Provide a maintenance hole with a drained sump immediately before each duct bank enters (or exits) the Facility. Slope all ducts towards maintenance holes or install T-drains at low points in ducts where this is not possible.

7.8.7 Distribution Equipment – 600 Volts and Below

7.8.7.1 Basic Requirements

7.8.7.1(1) A minimum of two (2) unit substations in the Facility will derive and distribute 600 V locally. Each will have a minimum of (3) three 600 V main switchgear lineups (vital, delayed vital, conditional), and all of the switchgear lineups will be interconnected with interlocked tie breakers such that each switchgear lineup can be powered from either of the other two lineups while the transformer normally powering it is fully isolated for maintenance. For unit substations where chiller equipment is fed via main 12.47 kV-480 V transformers, each 480 V switchgear lineup will be interconnected with interlocked tiebreakers such that it can be powered from another switchgear lineup while the transformer normally powering it is fully isolated for maintenance.

7.8.7.1(2) All switchgear and CDP (including 600 V, 480 V, and 208 V equipment) will have prepared bus links or a set of spare lugs to easily extend the bus to a future section. This also allows for temporary connections should they be needed in future. Links will

be bolted to the inside lower portion of the cubicle from which they will be extending the bus.

7.8.7.1(3) If utility power is lost, all vital and delayed vital distribution will be automatically restored from generator power. Conditional distribution will have the capability to be automatically restored from generator power but will be initially configured for manual transfer.

7.8.7.1(4) Provide separate 600 V distribution branches to serve each load category indicated below, with additional 480 V distribution branches permitted to be used for chillers, imaging equipment or UPS. Connect the distribution branches to the main 600 V or 480 V switchgear busses as follows:

7.8.7.1(4)(a) Vital branches to serve loads classified as vital;

7.8.7.1(4)(b) Delayed vital branches to serve loads classified as delayed vital; and

7.8.7.1(4)(c) Conditional branches to serve loads classified as conditional.

7.8.7.1(5) Life safety loads, as defined by the CEC, will be included in the vital branches and delayed vital branches as permitted by CSA Z32.

7.8.7.1(6) The loads on each HVATS (vital, delayed vital, and conditional) will be divided evenly, to the fullest extent possible during normal system configuration, between the A buses and B buses and the two (2) running utility services.

7.8.7.1(7) All distribution branches will be arranged such that any part of one (1) branch can be safely isolated for maintenance without affecting another branch or depriving any area of electrical power.

7.8.7.1(8) Provide a minimum clear physical space (or spare section) equal to one (1) complete/full size vertical switchgear section at each switchgear lineup to allow expansion in the future. Such future sections will be provided sufficient space for an easy installation.

7.8.7.1(9) Provide automatic power factor correction to ensure that the overall power factor for each utility service does not fall below 90% lagging and the generator buses are not loaded with a leading power factor under any conditions.

7.8.7.1(10) In accordance with Section 7.8.9 Metering, separate the Facility electrical loads into ‘metered load category groupings’ and ‘non-metered load category groupings’. Provide dedicated

panelboards, motor control centres, CDPs, and feeders as needed to segregate the electrical load category groupings for metering. Alternatively, metering information may be obtained from individual circuit metering, equipment data or calculated values where explicitly permitted.

7.8.7.2 Performance Criteria

7.8.7.2(1) 600 V and 480 V distribution within each unit substation:

7.8.7.2(1)(a) 600 V distribution will be derived from three (3) main 12.47 kV-600 V transformers dedicated to vital, delayed vital, and conditional branches;

7.8.7.2(1)(b) 480 V distribution serving chillers will be derived from two (2) 12.47 kV-480 V main transformers dedicated to delayed vital;

7.8.7.2(1)(c) 480 V distribution for imaging equipment:

7.8.7.2.1.(c).1 distribution for imaging equipment will be derived from a minimum of three (3) 600 V-480 V transformers that serve imaging equipment. Transformers will be directly fed from the vital or delayed vital 600 V switchgear;

7.8.7.2.1.(c).2 Each vital 480V imaging equipment CDP will be provided with a redundant connection to a delayed vital 480V imaging equipment CDP, to permit isolation and maintenance of upstream components; and

7.8.7.2.1.(c).3 Each delayed vital 480V imaging equipment CDP, and associated upstream transformer, will be of equal or larger ampacity to any equipment connected to it via manual transfer switches or tie breakers.

7.8.7.2(1)(d) Each of the main transformers at the same voltage level in the same Electrical Room will be of identical characteristics and sized with a minimum ANN rating equal to the largest peak demand of any two (2) of the associated power branches during the first year of Facility operation. Each transformer will be equipped with cooling fans and have a minimum AFN fan-cooled rating of 133 % of its base ANN rating to allow for future load growth;

7.8.7.2(1)(e) Will have each power branch at each substation (vital, delayed vital, and conditional) normally fed

from the dedicated main transformer associated with it. Each 600 V or 480 V main bus for each power branch will consist of a physically separate metal-enclosed switchgear lineup and have a normally open tie breaker connected to every other switchgear lineup in the same substation. The 600 V or 480 V main switchgear, main breaker and tie breakers for each branch will be of the same characteristics and capable of carrying the full AFN nameplate load of one main transformer;

7.8.7.2(1)(f) Will have each 600 V or 480 V main switchgear lineup complete with: main and tie breakers, a quantity of feeder breakers as required by the sections below and prepared spaces. Prepared spaces to be determined by the leftover space available in any vertical sections, but will never be less than one per branch; and

7.8.7.2(1)(g) Will have key interlocks in place between the main breakers and tie breakers in each 600 V or 480 V main switchgear branch to prevent interconnection of transformer secondaries.

7.8.7.2(2) 600 V or 480 V main switchgear will:

7.8.7.2(2)(a) Directly feed all vital, delayed vital, and conditional CDPs or MCCs, conditional bus duct risers, UPS systems, chillers, and fire pump automatic transfer switches fed from the substation at 600 V. Directly feed in this context means feeder circuits will not have intermediate terminations, splices, splitters, taps, or protective devices between the feeder breaker and the terminations at the equipment being fed. Notwithstanding this requirement, conditional 600-V CDPs or conditional 600-V MCCs may be directly fed from a bus duct riser tap instead of being directly fed from the main switchgear;

7.8.7.2(2)(b) Directly feed automatic harmonic and power factor correction systems (where provided);

7.8.7.2(2)(c) Have arc-overcurrent protection relays, with optical sensors extending through each breaker compartment, bus compartment and cable compartment, which will provide a trip signal to de-energize the main bus within eight (8) milliseconds of detecting an arc flash. Utilize point type and/or

fibre-optic type optical sensors to ensure proper coverage within compartments. Tripping may occur at the secondary main breaker provided that the line side components of the breaker are fully isolated from the rest of the switchgear lineup by a fixed metallic barrier;

7.8.7.2(2)(d) Consist of draw out power circuit breakers for all protective devices, approved and labeled for continuous operation at 100% of rated current, with provisions for remote racking. All breakers will be equipped with solid-state trip units with adjustable LSI elements and adjustable ground fault detection;

7.8.7.2(2)(e) Be designed, factory-assembled and tested in accordance with CSA C22.2 No.31 and ANSI C37.20.1;

7.8.7.2(2)(f) Be connected to the IBMP system to indicate operational status, position, trip events and ground fault detection for each breaker;

7.8.7.2(2)(g) Include a pulsing type ground-fault detection system to assist in identifying the location of ground faults;

7.8.7.2(2)(h) Have breakers sized and set to coordinate with the distribution equipment that they will feed, achieving selective coordination of protective devices (for phase and ground elements) and minimizing arc flash incident energy levels;

7.8.7.2(2)(i) Have one (1) spare 1600 A frame power circuit breaker in the 600 V vital switchgear lineup in each substation. Each of the other 600 V or 480 V main switchgear lineups will have a minimum of one (1) prepared space;

7.8.7.2(2)(j) Have a continuous white lamacoid mimic bus riveted to the front of the enclosure, clearly indicating the functions in each cell of the distribution equipment; and

7.8.7.2(2)(k) Have the exterior finish colour coded as follows: royal red for vital, navy blue for delayed vital, yellow for conditional, and orange for UPS. The colour of each piece of equipment will match the colour of the source of power that normally feeds the equipment.

7.8.7.2(3) Low Voltage ATS

7.8.7.2(3)(a) Will be approved to CSA C22.2, No.178.1;

7.8.7.2(3)(b) Will be closed-transition soft transfer type; and

7.8.7.2(3)(c) Will have integral dual-source bypass and isolation capability.

7.8.7.2(4) CDPs:

7.8.7.2(4)(a) All breakers to be molded case type with electronic trip units having field-adjustable LSI elements, except as follows:

7.8.7.2.4.(a).1 CDPs that have an LSI breaker protecting the CDP source feeder may use molded case switches or other types of disconnecting means without protective functions as the main disconnecting means instead of a breaker. Devices with fixed short-time trip settings may not be used on CDP mains;

7.8.7.2.4.(a).2 Feeder breakers where both the largest breaker downstream (at its highest settings) and the smallest breaker upstream (at its lowest settings) are selective throughout their entire time and fault current ranges (including for times less than 0.01s) may use an LI type breaker with adjustable instantaneous settings instead of LSI;

7.8.7.2.4.(a).3 Tie breakers where the largest breaker downstream (at its highest settings) is selective throughout its entire time and fault current range (including for times less than 0.01s) may use an LI type breaker with adjustable instantaneous settings instead of LSI; and

7.8.7.2.4.(a).4 Branch circuit breakers do not require LSI type breakers.

7.8.7.2(4)(b) Each vital, delayed vital and UPS CDP or MCC will be connected via manual transfer switches or tie breakers to a conditional CDP or MCC serving the same level, to permit isolation and maintenance of upstream components. 480V UPS CDPs are excluded from this requirement where all downstream 208V panels can by powered through manual transfer switches or tie breakers at the 208V level. Bypass connections to delayed vital instead of conditional are permitted.

7.8.7.2(4)(c) Each conditional CDP will be of equal or larger ampacity to any equipment connected to it via manual transfer switches or tie breakers.

7.8.7.2(4)(d) Each CDP will be equipped with a lockable disconnecting means within the same room.

7.8.7.2(5) Distribution Transformers:

7.8.7.2(5)(a) UPS transformers will be harmonic mitigating type.

7.8.7.2(5)(b) Conditional distribution transformers will be sized for their peak conditional load, plus the largest peak load of any CDP connected to the transformer secondary via manual transfer switch or tie breaker, in addition to 20% spare based on this combined load.

7.8.7.2(5)(c) Capable of being individually isolated for maintenance purposes without outages to any loads other than the ones directly served by that transformer.

7.8.7.2(5)(d) Class H 220 °C insulation with temperature rise not exceeding 150 °C maximum in 40 °C ambient.

7.8.7.2(5)(e) High-efficiency type, with tested minimum efficiency meeting the U.S. Department of Energy (DoE) 2016 final rule (CFR Title 10 Part 431) and NRCan 2019 requirements.

7.8.7.2(6) Panelboards:

7.8.7.2(6)(a) Neutral with same ampere rating as mains unless noted otherwise.

7.8.7.2(6)(b) Hinged door with two-point latch and locks.

7.8.7.2(6)(c) Panelboards are not to be fed from below. All feeders will be routed down from the ceiling for top entry into the panelboard.

7.8.7.2(6)(d) Select, configure, locate and install all components of power distribution systems to minimize the transmission of noise, vibration or unwanted heat into other parts of the Facility and Health Campus. Provide shielding, isolation, grounding, bonding, harmonic filtration, or other means to prevent

interference between systems or degradation of performance of an individual system.

7.8.7.2(6)(e) All electrical distribution equipment will be located in service rooms, unless otherwise noted. All panelboards will be located in service rooms, electrical closets or Back of House corridors not intended for public or Patient use. Panelboards and electrical closets are not permitted in sterile areas or Patient rooms. IPCs for the ORs do not require a service closet but will be located in the non-sterile corridor.

7.8.7.2(6)(f) Sprinkler heads will be located such that the spray deflector of any sprinkler head within 1.83 m of electrical equipment will not have an unshielded direct path to any enclosure openings or electronic components of MCCs, transformers, meters, harmonic filters, etc.

7.8.7.2(6)(g) Branch panelboards will only feed branch circuits on the same floor and department where they are located.

7.8.7.2(6)(h) Provide at least one (1) vital and one (1) UPS panelboard in each Communications Room to service equipment loads including planned future cabinets. Size these panelboards to carry any automatically switched loads such as dual-corded power supplies in the event of an outage to one of the power branches.

7.8.7.2(6)(i) Provide one (1) conditional branch panelboard, minimum 200 A, 208 V / 3-phase, 42-circuit, within each retail shell space, dedicated to the future retail uses. Panels to be fed with a breaker and feeder matching the panelboard ampacity, with the future retail load included in distribution equipment load calculations before spare capacity is calculated.

7.8.7.2.6.(i).1 Provide a 400-A panelboard within M2.1.1 Coffee Shop/Café/Seating.

7.8.7.2(6)(j) Provide two (2) conditional branch panelboards, minimum 100 A, 208 V / 3-phase, 42-circuit, in weatherproof outdoor kiosks, for connecting the seasonal exterior ‘Lights of Hope’ displays. One panelboard will be located at the Plaza, the other location will be as determined with the Owner.

7.8.7.2(6)(k) Do not daisy-chain or sub-feed panelboard feeders. All panelboard feeders will be directly fed from a CDP.

7.8.7.2(6)(l) Provide one (1) vital branch panelboard, minimum 100 A, 208 V / 3-phase / 4-wire, with 20 empty breaker spaces, in the Shop-Electrical for future equipment testing provisions. Provide one (1) vital power 600V/3-phase/30A circuit and disconnect in the Shop-Electrical for motor testing purposes.

7.8.7.2(7) Isolated Power Systems

7.8.7.2(7)(a) Each panelboard serving patient care environments in Operating Rooms and Interventional Suites will be fed from a dedicated isolated power system. Housekeeping receptacle circuits will be located outside of patient care environments in these rooms. Fixed luminaires and permanently connected medical electrical equipment do not require isolated power.

7.8.7.2(7)(b) Line isolation monitors for isolated power systems will transmit leakage current values for each system to the BMS and initiate central alarm events when leakage current exceeds 5 mA. Provide local annunciation and displays of leakage current for each isolated power system.

7.8.7.2(7)(c) Provide post-installation test reports for each system confirming that the system hazard index and maximum hazard index are below the limits specified in CSA Z32.

7.8.7.2(8) Motor Starters and MCCs:

7.8.7.2(8)(a) Provide individual enclosed motor starters for individual motors unless noted otherwise. Provide MCCs for groups of four (4) or more motors that require individual motor starters if located within a 30-m radius and on the same power branch and the same floor.

7.8.7.2(8)(b) Provide combination starters for all motors 1/2 HP and larger that are not controlled by variable frequency drive or include an integral control package. All motors of 1/2 HP or more will be 600 V, 3 phase.

7.8.7.2(8)(c) Combination motor starters to include magnetic MCP type short circuit protection, overload protection, integral control power transformers, HOA or start/stop control and at least two (2) auxiliary contacts in addition to seal-in contacts. Include under voltage and single phase dropout protection functions. Provide “power on” and “running” LED type indicators on each starter.

7.8.7.2(9) Power Factor Correction Equipment:

7.8.7.2(9)(a) Will provide automatic and dynamic correction of each building’s power factor to ensure that the overall power factor as well as the power factor on each 600-V main switchgear bus does not fall below 95 % lagging or become leading.

7.8.7.2(9)(b) Will consist of automatic switched capacitor banks for each 600-V main switchgear bus and integral power factor controllers that constantly measure the reactive power at the mains and controls the connection and disconnection of capacitor steps.

7.8.7.2(9)(c) Will be anti-resonant (de-tuned) for application in the electrical system containing non-linear loads.

7.8.7.2(10) Unless otherwise specified, all receptacles accessible to Patients requiring GFCI protection will have the GFCI protection incorporated into the branch circuit breaker.

7.8.7.2(11) Power distribution for each unit substation will include:

7.8.7.2(11)(a) Directly fed CDP/MCC feeder risers or conditional bus duct risers with tap boxes that directly feed conditional 600V CDPs and 600V MCCs. Where bus duct risers are used, they will have a minimum of one (1) tap box space available at each Electrical Room that the bus duct serves, in addition to the tap boxes initially required. The tap boxes will use breakers only and will only feed CDPs in the same Electrical Room or MCCs on the same floor, and reserved spaces will be able to accommodate a breaker up to 400A. Bus ducts are not permitted for UPS, vital, or delayed vital distribution;

7.8.7.2(11)(b) At least one (1) 600V vital or conditional CDP on every floor in each vertically-stacked local Electrical Room riser. 600V vital and conditional CDPs may be on alternating floors within the same vertically

stacked Electrical Room riser, provided each pair of vertically-stacked Electrical Rooms has at least one 600V vital and one 600V conditional CDP. If these CDPs are on alternating floors, a minimum of six (6) 150 mm diameter re-penetrable fire-rated sleeves interconnecting each pair of alternating Electrical Rooms is required in addition to other future provisions;

7.8.7.2(11)(c) MCCs, delayed vital CDPs, and 480-V CDPs located as required by the design;

7.8.7.2(11)(d) 600V or 480V Clinical UPS CDPs on at least every third floor in each vertically-stacked Electrical Room riser;

7.8.7.2(11)(e) 208V vital, conditional, and Clinical UPS CDPs on every floor in each vertically-stacked Electrical Room riser; and

7.8.7.2(11)(f) At least one step down distribution transformer for each 600V CDP, located within the same Electrical Room as the CDP that it feeds. Distribution transformers will only feed a single CDP, except where there is no 600V or 480V CDP for that branch in adjacent vertically-stacked Electrical Rooms, in which case 208V CDPs in adjacent vertically-stacked Electrical Rooms may be sub-fed from the Electrical Room where the transformer is located.

7.8.7.2(12) No splitters or fused switches will be used except where feeding a single equipment package with multiple power connections and power system redundancy is not required.

7.8.8 UPS Systems

7.8.8.1 Basic Requirements

7.8.8.1(1) Provide central UPS systems and distribute UPS power to all areas, equipment and systems that require an uninterrupted source of power during utility outages as required by this Schedule and all of its applicable Appendices.

7.8.8.1(2) Distributed individual UPS systems for specialized medical equipment are exempt from the central UPS requirement where noted below.

7.8.8.1(3) Provide specialized individual UPS systems for each imaging system in the Interventional Suites and Operating Room - Hybrid,

fed from vital power. These UPS systems will be fully compatible with the imaging systems and have sufficient capacity to permit uninterrupted fluoroscopy and table control for at least five (5) minutes following a power outage. Where UPS power is required for imaging systems in other areas, the associated controls, workstations and displays of the imaging system will be supplied from the central clinical UPS system to prevent system restarts during utility power outages, with other components fed from vital power. Where these controls, workstations and displays are not compatible with the central UPS system, provide specialized individual UPS systems meeting the manufacturer's recommendations, fed from vital power.

7.8.8.1(4) Two separate central UPS systems will be provided for UPS loads within the areas served by each unit substation. One (1) of these systems will be exclusively reserved for IM/IT systems loads, while the other will be for clinical areas and other uses. Each UPS system will be of expandable modular design with N+1 module redundancy.

7.8.8.1(5) The following areas, equipment and systems will be supplied from the IM/IT UPS systems:

- 7.8.8.1(5)(a) All servers and rack-mounted IM/IT equipment;
- 7.8.8.1(5)(b) All equipment and systems located in Communications Rooms;
- 7.8.8.1(5)(c) Network equipment for the wired and wireless networks;
- 7.8.8.1(5)(d) Wireless access points;
- 7.8.8.1(5)(e) Nurse call system;
- 7.8.8.1(5)(f) Public address system;
- 7.8.8.1(5)(g) Video surveillance system;
- 7.8.8.1(5)(h) BMS and IBMP systems;
- 7.8.8.1(5)(i) Staff duress system;
- 7.8.8.1(5)(j) Access control system;
- 7.8.8.1(5)(k) Intrusion detection and security systems;
- 7.8.8.1(5)(l) Switchgear and generator relaying and control systems, including load management system,

except where power is supplied by a local battery bank;

7.8.8.1(5)(m) Addressable lighting control system;

7.8.8.1(5)(n) Voice communication systems; and

7.8.8.1(5)(o) Distributed antenna system.

7.8.8.1(6) All areas, equipment and systems requiring central UPS power and not supplied by the IM/IT UPS systems will be supplied from the clinical UPS systems, including:

7.8.8.1(6)(a) Items in Attachment 1 [Equipment List] to Appendix 2E [Equipment and Furniture] requiring UPS power, except for items requiring dedicated individual UPS systems;

7.8.8.1(6)(b) All lighting, receptacles, and equipment in the Clinical Operations Centre and associated Conference/Meeting Rooms;

7.8.8.1(6)(c) All receptacles for patient physiological monitoring Equipment;

7.8.8.1(6)(d) All receptacles for computers and displays in Care Team Stations and imaging control rooms; and

7.8.8.1(6)(e) Lighting, receptacles, and equipment in clinical and support areas noted in other sections as requiring UPS power.

7.8.8.1(7) Provide each clinical UPS system with expansion provisions to allow future fit-out to at least 150% of the system's measured peak demand load during the first year of Facility operation, plus one (1) redundant module for N+1 operation. These expansion provisions will include UPS room space, mechanical cooling capacity, associated feeders, transformers, CDPs, mounting racks, paralleling buses, and spare breakers for connecting future modules. Each Clinical UPS system will be initially provided with sufficient UPS and battery modules for continuous operation at 125% of its measured peak demand load during the first year of Facility operation, plus one (1) redundant module for N+1 operation.

7.8.8.1(8) Provide each IM/IT UPS system with expansion provisions that include UPS room space, mechanical cooling capacity, associated feeders, transformers, CDPs, mounting racks, paralleling buses,

and spare breakers for connecting future modules. These expansion provisions will allow future fit out for:

7.8.8.1(8)(a) 8kW per equipment rack and 10kW per server cabinet, applied to panels and feeders serving the Communications Rooms, and an overall minimum demand factor of 0.70 applied to these loads for sizing UPS, UPS cooling, transformer, and CDP expansion provisions;

7.8.8.1(8)(b) 150% of the remaining IM/IT UPS loads' peak demand load during the first year of Facility operation; and

7.8.8.1(8)(c) One (1) redundant module for N+1 operation

7.8.8.1(9) Each IM/IT UPS system will be initially provided with sufficient UPS and battery modules, and mechanical cooling capacity for continuous operation as follows:

7.8.8.1(9)(a) 2.5kW per equipment rack in TRs serving the underground parking and mechanical spaces, 4kW per equipment rack in other areas, and 6kW per server cabinet, with an overall minimum demand factor of 0.70 applied to these loads for UPS sizing;

7.8.8.1(9)(b) 7.8.8.1(9)(b) 125% of the remaining IM/IT UPS loads' peak demand load during the first year of Facility operation;

7.8.8.1(9)(c) One (1) redundant module for N+1 operation; and

7.8.8.1(9)(d) The demand load used to size the IM/IT UPS systems will include all load from dual-corded power supplies that would be automatically transferred to UPS during a vital source outage.

7.8.8.1(10) The design of the Communications Room UPS and mechanical systems will meet the following requirements:

7.8.8.1(10)(a) Provide a minimum of 6,000 BTUs of cooling for each equipment rack within a Communications Room, with future capacity of 12,000 BTUs for each rack within the room including spare or future racks. At a minimum, ductwork to each room and chilled water or condenser water piping to terminal units will be sized for future cooling loads. Additionally, space will be allocated in the ceiling for future terminal units as required to serve future loads.

7.8.8.1(10)(b) The design of the UPS and mechanical systems will provide the ability to add additional UPS and mechanical cooling load without requiring downtime on any of the systems installed in the TRs MERs.

7.8.8.1(11) All dual-power-source equipment located in Communications Rooms will have one (1) electrical supply feed from the central IM/IT UPS system and one (1) feed from vital. In each Communications Room, provide at least one (1) 120/208-V IM/IT UPS panelboard and one 120/208-V vital panelboard, each sized to supply 125 % of their initial combined continuous load for redundancy during single-source outages. Panelboards in Communications Rooms to be minimum 42 circuit, 100 A.

7.8.8.2 Performance Criteria

7.8.8.2(1) Central UPS systems:

7.8.8.2(1)(a) Will have modular architecture with no single, system-level point of failure;

7.8.8.2(1)(b) Will have multiple UPS modules connected in parallel, with a minimum one (1) empty module space per system reserved for Future Expansion. Each UPS module will be replaceable without interrupting power to the remaining modules.

7.8.8.2(1)(c) Will have a minimum of two (2) lithium-ion battery strings per system, with a combined capacity that can provide 15 minutes of back up time when the UPS system is carrying its full ('N') rated load;

7.8.8.2(1)(d) Will be online, double-isolation type having a minimum 90 % energy efficiency;

7.8.8.2(1)(e) Will have passive harmonic filters on the source side of each UPS system to limit the total harmonic current distortion to 5 % at the filter line terminals when the UPS modules are carrying 100% rated load;

7.8.8.2(1)(f) Will have static bypasses to automatically bypass the UPS system in the event of failure;

7.8.8.2(1)(g) Will have wrap-around maintenance bypass switches to allow servicing the UPS system, including paralleling boards and transformers, without requiring an outage to the UPS loads;

7.8.8.2(1)(h) Will be located in dedicated rooms, containing only UPS modules, batteries, transformers, paralleling equipment, bypass equipment and ancillary systems. UPS components will not be located in Communications Rooms or Electrical Rooms with equipment on other branches of power; and

7.8.8.2(1)(i) UPS modules will be suitable to receive input from a 600-V high-resistance grounded system.

7.8.8.2(2) Each central UPS system will be directly fed from 600V main switchgear as follows (with input transformers permitted to step down input voltage to 480V):

7.8.8.2(2)(a) UPS input connected to delayed vital;

7.8.8.2(2)(b) UPS static bypass connected to vital; and

7.8.8.2(2)(c) UPS wrap-around maintenance bypass connected to vital.

7.8.8.2(3) Provide an audible warning on BMS workstations indicating when any UPS system battery supply has less than 75 % battery charge remaining. Provide adequate labelling to determine which UPS system is in alarm.

7.8.8.2(4) Provide monitoring of all alarm and trouble conditions of the UPS systems by the IBMP. Activate a countdown timer on BMS workstations to display alarms triggered at 75 %, 50%, and 25 % battery life.

7.8.8.2(5) UPS systems will be capable of providing 2000-A fault clearing current for downstream circuit breakers without operation of the static bypass switches.

7.8.9 Metering

7.8.9.1 Basic Requirements

7.8.9.1(1) Provide a networked digital metering system that will provide detailed information about the power system parameters at specified points in the power distribution system.

7.8.9.1(2) The metering system will include the following:

7.8.9.1(2)(a) Electrical energy, power and power quality meters;

7.8.9.1(2)(b) Digital protective relays or electronic trip units with integral metering functions, associated with circuit breakers;

7.8.9.1(2)(c) Mechanical or lighting controls equipment with metering capabilities;

7.8.9.1(2)(d) Device communication interface hardware;

7.8.9.1(2)(e) Ancillary equipment including CTs, PTs, servers, terminals, and displays; and

7.8.9.1(2)(f) Software, licensing and programming.

7.8.9.1(3) All components of the digital metering system will be fully compatible with each other and integrated into a single seamless EPMS network, which aggregates and stores all electrical meter data for the Facility indefinitely, with software included to enable remote viewing and analysis of meter data. The EPMS network may be a stand-alone system, or a fully-integrated feature of the IBMP or BMS systems.

7.8.9.1(4) EPMS network analytics features to include software capable of displaying information dashboards with all available real-time, trend, and event log data from the meter points as follows:

7.8.9.1(4)(a) Energy dashboard to display peak, average, real-time, and trend values of kWh energy consumption, with minimum 15-minute intervals, for each meter point, department-level grouping and load category grouping.

7.8.9.1(4)(b) Power dashboard to display peak demand, average, real-time, and trend kW/kVA values for each meter point, department-level grouping and load category grouping, and for each branch of power (UPS, vital, delayed vital, conditional).

7.8.9.1(4)(c) Power quality dashboard to display voltage levels, flicker, voltage/current harmonics, voltage surge and sag information for each power quality type meter point, including events, statistics, real-time, and trend values.

7.8.9.1(5) Revenue metering (Measurement Canada approved) to be installed for the following points and load category groupings:

7.8.9.1(5)(a) Each retail tenant panel feeder.

7.8.9.1(6) Power quality metering capable of measuring individual voltage and current harmonics (up to 31st), total harmonic distortion, fast transient surges, and event waveform capture to be installed for the following points and load category groupings:

7.8.9.1(6)(a) Each utility incoming service;

7.8.9.1(6)(b) Each generator feeder;

7.8.9.1(6)(c) Each HVATS output;

7.8.9.1(6)(d) Each main transformer secondary output;

7.8.9.1(6)(e) Each UPS system output (paralleled UPS outputs may be metered as a group);

7.8.9.1(6)(f) Each CDP mains;

7.8.9.1(6)(g) Each MCC mains;

7.8.9.1(6)(h) Elevators (metering will be capable of directional power measurements);

7.8.9.1(6)(i) Imaging equipment; and

7.8.9.1(6)(j) IM/IT equipment.

7.8.9.1(7) Energy information metering to be installed for the following points and load category groupings:

7.8.9.1(7)(a) Each panelboard feeder;

7.8.9.1(7)(b) Each chiller feeder;

7.8.9.1(7)(c) Cooling (including cooling towers, split systems, CRAC units, hydronic cooling circulation pumps);

7.8.9.1(7)(d) Heat recovery (including heat recovery chillers, heat recovery loop circulation pumps);

7.8.9.1(7)(e) Heating (including boilers, electric heating, heat tracing, hydronic heating circulation pumps);

7.8.9.1(7)(f) Ventilation (including supply, return, exhaust, make-up and pressurization fans);

7.8.9.1(7)(g) Pumps;

7.8.9.1(7)(h) MDRD (including bedpan disinfectors);

7.8.9.1(7)(i) Central Food Production kitchen (including all outlets and equipment within Kitchen and other Food Service areas);

7.8.9.1(7)(j) Interior lighting;

7.8.9.1(7)(k) Exterior lighting;

7.8.9.1(7)(l) Electric vehicle charging – general use;

7.8.9.1(7)(m) Ambulance charging;

7.8.9.1(7)(n) AGV charging; and

7.8.9.1(7)(o) Plug loads (including all outlets not included in other load categories).

7.8.9.1(8) Energy information metering will use meters with voltage and current measurements on each phase, 0.5 % ANSI energy accuracy class, except for these load category groupings, which may use calculated values based on control system data, single-phase current-only measurements, or addition/subtraction of multiple meter points:

7.8.9.1(8)(a) Interior lighting;

7.8.9.1(8)(b) Cooling;

7.8.9.1(8)(c) Heat recovery;

7.8.9.1(8)(d) Heating;

7.8.9.1(8)(e) Ventilation;

7.8.9.1(8)(f) Pumps;

7.8.9.1(8)(g) Imaging equipment;

7.8.9.1(8)(h) IM/IT equipment;

7.8.9.1(8)(i) Electric vehicle charging; and

7.8.9.1(8)(j) Plug loads.

7.8.9.1(9) The following load categories will be sub-divided into department-level groupings of their energy and power consumption in the EPMS network analytics:

7.8.9.1(9)(a) Interior lighting;

7.8.9.1(9)(b) Plug loads;

7.8.9.1(9)(c) MDRD;

7.8.9.1(9)(d) Kitchen; and

7.8.9.1(9)(e) Electrical panelboard loads.

7.8.9.1(10) Mechanical equipment with nameplate ratings less than 100 W or emergency-only operation such as VAV boxes, fire pumps, stairwell pressurization fans, etc., may be excluded from metering and included in the plug load grouping where fed from the same panel.

7.8.9.1(11) All types of meters except those integrated into EV chargers, lighting controls, or mechanical controls equipment will locally display the measured values at each of the above-noted equipment in addition to transmitting the measured values for data aggregation and long-term storage.

7.8.9.1(12) Provide to the Owner sufficient device licenses to enable remote terminal access to the EPMS system. These licences will enable the Owner to access real-time, peak demand, trend data, etc., to produce custom reports on:

7.8.9.1(12)(a) Energy performance optimization;

7.8.9.1(12)(b) Power demand, reliability and availability;

7.8.9.1(12)(c) Sustainability metrics; and

7.8.9.1(12)(d) Power quality.

7.8.9.2 Performance Criteria

7.8.9.2(1) Comply with the detailed metering, measurement and verification requirements included in Appendix 3Q [Metering Matrix].

7.8.9.2(2) Mechanical equipment with nameplate ratings less than 100 W or emergency-only operation such as VAV boxes, fire pumps, stairwell pressurization fans, etc., may be excluded from metering and included in the plug load grouping where fed from the same panel.

7.8.10 Wiring Methods, Materials and Devices

7.8.10.1 Basic Requirements

7.8.10.1(1) Use wiring methods, materials and devices that result in safe, reliable and flexible electrical power, lighting, IM/IT and Life Safety Systems.

7.8.10.1(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. Access is required at all pullboxes, junction boxes, outlet boxes, conduit stub-ups, and lay-in raceways. Lay-in raceways where any section of the raceway in excess of 2 m will be deemed inaccessible.

7.8.10.1(3) Seal raceways, luminaires, boxes, penetrations, wiring and other electrical components in all exterior partitions as well as interior partitions for spaces where compartmentalization and pressurization are required. These spaces and partitions include isolation rooms, anterooms, Operating Rooms, Sterile Core, Pharmacy area cleanrooms, Patient relocation compartments, Areas of Refuge, Contained Use Areas, and any other areas subject to pressure differential monitoring. Ensure that the sealing forms part of a continuous air barrier around each compartment, coordinated with architectural, mechanical, and all other trades. Sealing is to be done with only certified products approved for the intended use.

7.8.10.1(4) CSA Z32 classification for each Patient Care Area in the Facility will be determined in consultation with the Owner based on the Design. The Owner will confirm the classification of Patient Care Areas as basic, intermediate or critical care. The minimum circuit and receptacle requirements for each Patient Care Area type will be 150% of the quantities identified in CSA Z32.

7.8.10.1(5) The following list is provided to illustrate the classification of Patient Care Areas described in Appendix 3A [Clinical Specifications and Functional Space Requirements], according to their relationship to the CSA Z32 criteria. In the electrical sections of this schedule and related appendices, the term “critical care area” refers to all of the room types with that CSA Z32 Patient Care Area classification, and not the Critical Care Complex Component name in Appendix 3A [Clinical Specifications and Functional Space Requirements]. The list may not be exhaustive, and includes:

7.8.10.1(6) Basic care areas:

- 7.8.10.1(6)(a) Exam rooms (except Evoked Potentials, ECG, EEG, EMG); and
- 7.8.10.1(6)(b) Phlebotomy rooms/bays.

7.8.10.1(7) Intermediate care areas:

- 7.8.10.1(7)(a) Exam Rooms - Evoked Potentials, ECG, EEG, EMG;
- 7.8.10.1(7)(b) Exam/treatment rooms/bays (except Resuscitation);
- 7.8.10.1(7)(c) Assessment/treatment rooms/bays;
- 7.8.10.1(7)(d) Procedure Rooms (except General, Bronchoscopy, ERCP/GI Endoscopy, and GI Endoscopy);

7.8.10.1(7)(e) Patient Rooms (except Critical Care, NICU, SRMC);

7.8.10.1(7)(f) Bedrooms;

7.8.10.1(7)(g) Imaging;

7.8.10.1(7)(h) Peritoneal dialysis stations;

7.8.10.1(7)(i) Hemodialysis stations;

7.8.10.1(7)(j) Infusion treatment bays/beds; and

7.8.10.1(7)(k) Monitoring/holding/prep/recovery bays (Except Recovery Bay – C-Section).

7.8.10.1(8) Critical care areas:

7.8.10.1(8)(a) Operating Rooms;

7.8.10.1(8)(b) Interventional Suites;

7.8.10.1(8)(c) Procedure rooms – General, Bronchoscopy, ERCP/GI Endoscopy, GI Endoscopy;

7.8.10.1(8)(d) Patient Rooms – Critical Care, NICU, SRMC;

7.8.10.1(8)(e) Recovery Bay – C-Section;

7.8.10.1(8)(f) ACU Patient rooms/bays; and

7.8.10.1(8)(g) Exam/Treatment Room – Resuscitation.

7.8.10.1(9) This Schedule and Appendix 3O [Electrical IM/IT Matrix] identify specific power receptacle types and quantities, branch circuit quantities, outlet power branches, IM/IT device types and quantities, and device location requirements for key area types. Where these requirements exceed the CSA Z32 minimum requirements, comply with the requirements of this Schedule and Appendix 3O [Electrical IM/IT Matrix].

7.8.10.1(10) Where Appendix 3O [Electrical IM/IT Matrix] specifies quantities at headwalls, these quantities apply to each patient location where there are multiple patient locations within the space.

7.8.10.1(11) Where Appendix 3O [Electrical IM/IT Matrix] specifies quantities at booms, these quantities apply to each boom where there are multiple booms within the space.

7.8.10.1(12) Where Appendix 3O [Electrical IM/IT Matrix] specifies quantities for headwalls, quantities will be doubled in bariatric spaces with doubled quantities of medical gas outlets, to allow treatment of

two (2) patients in the space during surge or infectious outbreak situations.

7.8.10.1(13) All duplex receptacles in Lab spaces, Control-AV, Studio-Photo, Studio-Video, Video Editing Rooms, Technical Room-Imaging, Workrooms, areas with a CSA Z32 critical care area classification, and Imaging-CT rooms will be 5-20R type. Two duplex headwall receptacles on vital power in each other Patient Care Area will be 5-20R type.

7.8.10.1(14) Provide receptacles and hard-wired connections for every item of fixed and moveable Equipment in Appendix 2E Attachment 1 [Equipment and Furniture] including moveable Equipment for the department that is shared between multiple spaces, in addition to receptacle quantities listed in this Schedule and Appendix 3O [Electrical IM/IT Matrix]. Where the receptacle quantities in this Schedule and Appendix 3O [Electrical IM/IT Matrix] are sufficient for all of the moveable Equipment that will be used in a space, including moveable Equipment for the department that is shared between multiple spaces, with one additional general, use duplex receptacle per headwall, boom and room wall, no additional receptacles are required for the moveable Equipment. For the purpose of determining receptacle and connection details, fixed equipment includes plug-in equipment permanently mounted to Facility components or infrequently moved such as printers and desktop computers. Provide all necessary electrical equipment components as required to complete an installation in accordance with manufacturers installation recommendations and make all connections for Owner-supplied equipment.

7.8.10.1(15) Provide receptacles or hard-wired connections for every item of fixed and moveable equipment required by other provisions of this Agreement, including the following:

7.8.10.1(15)(a) Kitchen equipment;

7.8.10.1(15)(b) Mechanical systems;

7.8.10.1(15)(c) IM/IT systems;

7.8.10.1(15)(d) Elevators;

7.8.10.1(15)(e) AGV systems;

7.8.10.1(15)(f) Pneumatic tube systems; and

7.8.10.1(15)(g) Bed Bug Sauna heat chamber disinfection equipment.

7.8.10.1(16) Provide a 'receptacle bank' allowance in addition to the other requirements of this Schedule, as follows:

7.8.10.1(16)(a) A total of 3000 additional CSA 5-20R duplex receptacles and the associated circuiting and power distribution equipment will be provided, to account for any additional functional and operational requirements of the Owner.

7.8.10.1(16)(b) Should the Owner decide to delete receptacles required by this Schedule, Attachment 1 [Equipment List] to Appendix 2E [Equipment and Furniture] or Appendix 3O [Electrical IM/IT Matrix], an equal quantity of receptacles will be added to the bank for allocation elsewhere in the Facility.

7.8.10.1(16)(c) Each receptacle in the bank will include all labour and material costs for locating it anywhere in the Facility and on any power branch that the Owner decides.

7.8.10.1(17) Final power receptacle types and quantities, branch circuit quantities, outlet power branches, IM/IT device types and quantities, and locations of each device for each space in the Facility will be as determined in consultation with the Owner. The Owner will review these details and confirm the requirements prior to installation of these elements.

7.8.10.2 Performance Criteria

7.8.10.2(1) Utilize non-alloyed copper for conducting components of electrical equipment including switchgear buses and transformer windings.

7.8.10.2(2) Utilize non-alloyed copper for all conductors that form part of the Facility’s wiring system, unless otherwise noted. Minimum conductor size will be #12 AWG. Aluminum conductors may be used for 600 V, 480 V, and 208 V feeders with ampacities greater than 120 A, except for the bonding conductors in feeders serving Patient Care Areas, which will be copper.

7.8.10.2(3) Power wiring will have insulation of chemically cross-linked thermosetting polyethylene unless otherwise noted.

7.8.10.2(4) Project Co may use Teck cable in mechanical plant rooms and service rooms for connection to equipment, only where the entire length of cable is accessible for inspection and replacement. Cables installed behind walls or ceilings, or in spaces with access through Patient Care Areas, Restricted Circulation corridors, or sterile areas are not considered accessible and are not permitted.

Teck cable will be installed in perpendicular runs and will be neatly strapped to dedicated cable support systems or tray. Do not support armoured cabling from mechanical ducts, pipes or Equipment. Where possible, Teck cable runs will be consolidated into common routes. Teck cables will be supported such that connections to moving or vibrating Equipment does not transmit the vibration.

7.8.10.2(5) Provide a dedicated neutral conductor for each branch circuit.

7.8.10.2(6) Conceal all wiring and wiring support systems from public view except where reviewed by the Owner.

7.8.10.2(7) 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.

7.8.10.2(8) Do not install conduit or wiring in floor slabs, except where it is impossible to supply the device from a ceiling space (above or below) and specific approval has been granted by the Owner.

7.8.10.2(9) Route feeders to panelboards from the ceiling space above. Do not feed panelboards fed via the slab below, and do not 'daisy-chain' multiple panelboards.

7.8.10.2(10) Install wiring and conduit connections with sufficient flexibility of movement to minimize the noise and vibrations of electrical equipment/components (including transformers, luminaries, motors) to below an acceptable level as required in health care facilities. Design will comply with noise criteria identified in other sections.

7.8.10.2(11) Provide tamper resistant ('TR' type) receptacles with Tamper Resistant fasteners for waiting areas and all Patient accessible, non-Patient-care areas in Mental Health Areas. Receptacles in all Patient Care Areas will be hospital grade, while receptacles in all other areas will be heavy duty specification grade.

7.8.10.2(12) Colour code the power receptacles as follows:

7.8.10.2(12)(a) Conditional power – WHITE

7.8.10.2(12)(b) Vital and Delayed Vital power – RED

7.8.10.2(12)(c) UPS power – ORANGE

7.8.10.2(13) Identify all power receptacles with the source panel ID and circuit number. Arrange colour of labelling of receptacles, safety

switches, panels, and other distribution equipment in accordance with Owner colour coding standards, as follows:

7.8.10.2(13)(a) Vital power - RED with WHITE text

7.8.10.2(13)(b) Delayed vital power - BLUE with WHITE text

7.8.10.2(13)(c) Conditional power - BLACK with WHITE text

7.8.10.2(13)(d) UPS - ORANGE with BLACK text

7.8.10.2(14) Utilize brushed stainless steel heavy duty cover plates for receptacles and switches. Where noted in Appendix 3N [Safety and Risk Reduction Matrix], provide extra heavy duty receptacles, Tamper Resistant type receptacles, and/or Tamper Resistant fasteners and fittings. Grouped receptacles and/or switches will have a single cover plate for the group.

7.8.10.2(15) Receptacles and cover plates will be suitable for the environment where they are located, including wet areas and outdoor areas.

7.8.10.2(16) Design each room such that receptacles are distributed throughout the room as required to support functionality and convenient use of equipment by users, in accordance with Good Industry Practice and as required by other provisions of the Agreement. Provide sufficient quantities of receptacles:

7.8.10.2(16)(a) To meet or exceed the requirements of these documents and CSA Z32; and

7.8.10.2(16)(b) To support all of the systems and equipment to be installed or used, including any additional power outlets required by other provisions of this Agreement; and as required by Good Industry Practice to provide convenience, flexibility of use and operational support.

7.8.10.2(17) Allow a maximum connection of four (4) duplex receptacles per 15-A or 20-A amp circuit, except for critical care areas that will have no more than three duplex receptacles per 15-A or 20-A circuit.

7.8.10.2(18) Utilize CSA 5-20R 15/20-A T-slot receptacles with a dedicated circuit for each printer / copier, except where a special receptacle type is required to suit the selected equipment.

7.8.10.2(19) Utilize CSA 5-20R 15/20-A T-slot receptacles for housekeeping, spaced a maximum of 15 metres apart staggered along alternate sides of each corridor. Provide dedicated conditional circuits for

housekeeping receptacles, to a maximum of six (6) receptacles per circuit. All parts of all spaces will have access to a housekeeping receptacle within 7.5 m without having to run an equipment cord through a doorway.

7.8.10.2(20) Provide a minimum of one (1) housekeeping receptacle within each enclosed Patient Care Area, and no more than two (2) such receptacles will be on the same circuit.

7.8.10.2(21) Where USB charging ports are specified, provide either dual USB Type-C type female ports integrated into a single-gang duplex 5-15R receptacle or a stand-alone 4-port USB Type-C single-gang wall-mounted or desk-mounted device. Each USB port will be capable of simultaneous 100-W power output.

7.8.10.2(22) In offices:

7.8.10.2(22)(a) Provide a minimum of one (1) duplex receptacle on each wall and a minimum of one (1) duplex receptacle spaced every two (2) metres of open wall space.

7.8.10.2(22)(b) Provide one (1) vital and one (1) UPS duplex receptacle at each office workstation location. In single occupancy enclosed offices, design for the location of possible workstations on at least two (2) walls by providing a separate set of one (1) vital and one UPS duplex receptacle at each location.

7.8.10.2(22)(c) Provide a minimum of one (1) vital and one (1) UPS circuit per four (4) workstations.

7.8.10.2(22)(d) Provide a minimum of one (1) vital and one (1) UPS circuit per two (2) single-person enclosed offices.

7.8.10.2(22)(e) Provide one (1) USB charging port on vital power at each workstation. Multiple USB ports may be installed in the same device only where located within 1-m cord length from the associated workstation.

7.8.10.2(23) At each administration workstation or computer workstation, provide a minimum of one (1) vital and one (1) UPS duplex receptacle, in addition to any printer/copier receptacles and circuits required and in addition to specific non-workstation receptacle requirements for the room type. These requirements also apply to workstations within spaces detailed in Appendix 3O [Electrical IM/IT Matrix] where workstation receptacle requirements are not indicated.

7.8.10.2(24) In each exam, exam/treatment room, and consultation/therapy room, provide a minimum of:

7.8.10.2(24)(a) Two (2) vital and two (2) conditional duplex receptacles located at each exam table and identical quantities at each desk.

7.8.10.2(24)(b) One duplex receptacle on each wall and a minimum of one duplex receptacle spaced every three (3) metres of open wall space.

7.8.10.2(25) In each Clean Utility room:

7.8.10.2(25)(a) Provide a minimum of two (2) duplex receptacles, 50% of which will be fed from vital power and the remainder connected to conditional power.

7.8.10.2(26) In each Care Team Station:

7.8.10.2(26)(a) Provide two (2) UPS duplex receptacles for each computer workstation, located below the work counter.

7.8.10.2(26)(b) Provide one (1) USB charging port on vital power at each workstation and eight (8) USB ports at the location designated for mobile device charging. Multiple USB ports may be installed in the same device only where located within 1-m cord length from the associated workstation.

7.8.10.2(26)(c) Provide general purpose vital power receptacles along work counters spaced at 0.5 m on centre, alternating receptacles above and below the work counter. These general purpose receptacles will be in addition to dedicated equipment and computer workstation receptacles.

7.8.10.2(26)(d) Provide duplex vital power receptacles on all open walls with a maximum spacing of 2 m.

7.8.10.2(26)(e) Provide dedicated power outlets for permanently located equipment, including printers.

7.8.10.2(27) In each Patient room, the minimum requirements for duplex receptacles are as follows:

7.8.10.2(27)(a) Four (4) at the bed wall for general use - connect two (2) of the receptacles to vital power and two (2)

to conditional power, with one (1) from each power branch on each side.

7.8.10.2(27)(b) One (1) conditional at the bed wall for dedicated electric bed use.

7.8.10.2(27)(c) One (1) vital for the TV.

7.8.10.2(27)(d) One (1) conditional for the ceiling lift system (if lift system installed in room).

7.8.10.2(27)(e) One (1) conditional openly accessible for general use in the visitors' area.

7.8.10.2(27)(f) One (1) receptacle for housekeeping.

7.8.10.2(28) For each Imaging-MRI room:

7.8.10.2(28)(a) Ensure only non-ferrous components, fittings, fixtures and fasteners are used;

7.8.10.2(28)(b) Bond all sections of copper shielding to ground;

7.8.10.2(28)(c) Install EMI filters on all wiring entering the room; and

7.8.10.2(28)(d) Electrically interlock entry door with the MRI equipment.

7.8.10.2(29) Provide a minimum of four (4) duplex receptacles in each medication room in addition to permanently located equipment and workstations. Connect 50% of these receptacles to vital power and the remainder to conditional power.

7.8.10.2(30) In each large group therapy room:

7.8.10.2(30)(a) Provide receptacles with maximum spacing of 3 m on all walls, and flush floor mounted receptacles when either room dimension exceeds 4 m.

7.8.10.2(30)(b) Provide power for all AV system equipment as described in Section 7.9 Communications (Division 27).

7.8.10.2(31) Provide convenience duplex receptacles at all equipment charging locations at 1 m spacing, above counters where applicable. Equipment charging locations will include those noted in Appendix 3A [Clinical Specifications and Functional Space Requirements] and the following spaces, at minimum:

7.8.10.2(31)(a) Central and local storage rooms;

7.8.10.2(31)(b) Alcoves;

7.8.10.2(31)(c) Inpatient reception; and

7.8.10.2(31)(d) Medication rooms.

7.8.10.2(32) Provide a minimum of six (6) convenience duplex receptacles for equipment charging in Alcove-Local equipment spaces.

7.8.10.2(33) Provide convenience duplex receptacles for equipment charging at each Holter Monitor Analysis Area at 0.2 m spacing, above counters where applicable.

7.8.10.2(34) Provide adequate space, power, and outlet provisions within each department for the charging and storage of wireless devices.

7.8.10.2(35) In each conference room and meeting room:

7.8.10.2(35)(a) Provide a minimum of one (1) duplex receptacle spaced every 2 m of wall space and one (1) duplex receptacle spaced a maximum 1 m above work counters.

7.8.10.2(35)(b) At all locations with AV equipment, provide all duplex receptacles and circuit connections needed for AV equipment power, coordinated with the AV templates described in Section 7.9 Communications (Division 27).

7.8.10.2(35)(c) Provide power for all floor boxes in multimedia rooms as described in Section 7.9 Communications (Division 27).

7.8.10.2(36) In all service rooms, including electrical, generator and UPS rooms, mechanical and elevator machine rooms:

7.8.10.2(36)(a) Provide general-purpose CSA 5-20R T-slot receptacles along the perimeter wall at a maximum spacing of one (1) vital and one (1) conditional every 3 m and at each interior column. All rooms to have one (1) vital and one (1) conditional receptacle immediately adjacent to the room entry door. In large rooms, receptacles will also be installed such that every part of each room can be reached from a 7.5 m extension cord. Each receptacle will be provided with a dedicated circuit.

7.8.10.2(37) In Communications Rooms:

7.8.10.2(37)(a) Provide general-purpose CSA 5-20R T-slot receptacles along the perimeter wall at a maximum spacing of one (1) vital or one (1) conditional (alternating sources) every 3 m and at each interior column. All rooms to have one (1) vital and one (1) conditional receptacle immediately adjacent to the room entry door. In large rooms, receptacles will also be installed such that every part of each room can be reached from a 7.5-m extension cord. Each receptacle will be provided with a dedicated circuit.

7.8.10.2(37)(b) Provide two CSA L21-30R 30A/208V twistlock receptacles above each rack with one connected to IM/IT UPS and the other to vital power.

7.8.10.2(38) In the Energy Centre Control Room:

7.8.10.2(38)(a) Provide Clinical UPS receptacles for all permanently located equipment.

7.8.10.2(38)(b) Provide one (1) Clinical UPS and one (1) conditional duplex receptacle for each computer workstation location.

7.8.10.2(38)(c) Provide one (1) USB charging port on UPS power at each workstation. Multiple USB ports may be installed in the same device only where located within 1-m cord length from the associated workstation.

7.8.10.2(38)(d) Provide general purpose receptacles above work counters spaced at 1 m on centre. 50% of these receptacles will be fed from vital power and the remainder connected to conditional power, alternating between sources.

7.8.10.2(38)(e) Provide general purpose CSA 5-20R T-slot receptacles along the perimeter wall at a maximum spacing of one (1) every 3 m. Connect 50% of receptacles to vital power and the remainder to conditional power, alternating between sources.

7.8.10.2(39) In Complete Nourishment, Nourishment Rooms, Nutrition Centres, Serveries and Central Food Production:

7.8.10.2(39)(a) Provide CSA 5-20R T-slot receptacles above kitchen counters at 1-m spacing, connected to conditional power.

7.8.10.2(39)(b) Provide general purpose duplex receptacles along the perimeter wall at a maximum spacing of one (1) every 3 m. Connect to conditional power.

7.8.10.2(39)(c) Provide receptacles on a dedicated circuit for all large electrical load equipment such as microwaves, coffee makers, refrigerators, stoves, etc.

7.8.10.2(40) In MDRD:

7.8.10.2(40)(a) Provide receptacles on a dedicated circuit for all fixed medical device reprocessing equipment and all equipment requiring special receptacles (e.g. other than 5-15R or 5-20R). Install receptacles in modular ceiling plates above each workstation, located so that cables and cords do not impact circulation or span and drape between workstations.

7.8.10.2(40)(b) Provide general purpose duplex receptacles along the perimeter wall at a maximum spacing of one (1) every 3 m. Connect to conditional power.

7.8.10.2(40)(c) Provide general purpose duplex 5-20R T-slot receptacles above counters at 1-m spacing, connected to vital power.

7.8.10.2(41) Provide conditional power circuits to two (2) Public Bike Share stations on the Health Campus to meet City requirements.

7.8.10.2(42) Provide one (1) conditional duplex outlet for every ten (10) bicycle parking stalls, distributed evenly throughout the bicycle parking areas, with a maximum of (1) two duplex outlets per circuit.

7.8.10.2(43) In workshops and workrooms:

7.8.10.2(43)(a) Provide general purpose duplex receptacles along the perimeter wall at a maximum spacing of one (1) every 3 m. Connect to conditional power.

7.8.10.2(43)(b) Provide general purpose duplex 5-20R T-slot receptacles above counters at 1-m spacing. 50% of these receptacles will be fed from vital power and the remainder connected to conditional power, alternating between sources.

7.8.10.2(44) Provide one convenience duplex receptacle for every four (4) seats in lounge, waiting, on-call and similar rooms. Provide two (2) USB charging ports for every two (2) convenience duplex receptacles.

7.8.10.2(45) Provide a minimum of one (1) duplex receptacle for every 35 square metres, or portion thereof, of all support, logistics, service, housekeeping and storage spaces, and all other spaces without specific receptacle requirements in the sections above. Receptacles will be installed such that every part of each room can be reached from a 7.5 m extension cord. A minimum of one (1) duplex receptacle will be provided per room.

7.8.10.2(46) For each RO or domestic water connection for the purposes of providing dialysis treatment or servicing of dialysis equipment, a 5-20R receptacle on a dedicated circuit will be provided adjacent to the water connection point.

7.8.10.2(47) Provide a minimum of one (1) CSA 6-50R type welding receptacle in each service room that houses boilers, chillers, or air handling units. Receptacles will be installed such that every part of the space can be reached from a 20 m extension cord after all equipment has been installed.

7.8.11 Raceways

7.8.11.1 Basic Requirements

7.8.11.1(1) Provide raceways for all wiring and cabling to support, protect and organize all wiring and cabling systems. Raceway systems will not be accessible to Patients.

7.8.11.1(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. Raceways containing multiple branch circuits will be sized to allow the wiring cross-sectional area to be increased by 50% in the future without exceeding CEC maximum fill requirements.

7.8.11.1(3) Install all raceways in a neat and secure manner in such a way that they are protected from damage, are not in conflict with mechanical or architectural components and allow for future changes and additions. Access to all boxes, outlets, and lay-in raceways will be maintained throughout.

7.8.11.1(4) Design and install raceways without sharp edges or tight bends so that cables will be pulled in or laid in and removed without damage to the cables.

7.8.11.1(5) Construct separate raceways to isolate wiring of different systems and prevent magnetic interference between circuits.

7.8.11.1(6) Refer to Section 7.9 Communications for detailed requirements for raceways for IM/IT systems.

7.8.11.2 Performance Criteria

7.8.11.2(1) Except as noted otherwise, install all wiring in EMT with steel couplings and connectors. Final connections less than 3 m in length to light fixtures may utilize armoured cable (Teck or AC90). Chiller branch circuit wiring and conditional wiring downstream of the HVATS within back of house corridors may utilize Teck cable.

7.8.11.2(2) Mineral insulated conductors or other approved conductors tested to ULC-S139 requirements may be used for fire-rated wiring. Straps and supports for mineral insulated conductors will be as recommended by the manufacturer.

7.8.11.2(3) Provide all duct banks with a minimum quantity of 50% of the total number of conduits reserved as spare. Size of the spare conduits to equal the largest filled conduit size.

7.8.11.2(4) All ducts will be tested by pulling a steel mandrel matching the duct size through the duct prior to installing any conductors. This testing will be witnessed and documented for inclusion in the maintenance manuals. Any duct found with obstructions, gaps or abrasive parts will be rectified to the satisfaction of the Owner.

7.8.11.2(5) Install all raceways and cables in finished areas within finished walls or above finished ceilings.

7.8.11.2(6) Raceways and cables are to be surface mounted in unfinished mechanical, electrical, and Communications Rooms. In mechanical, electrical, and Communications Rooms where conduit is installed below 2 m and other locations where conduits are exposed to possible mechanical damage, provide supplementary mechanical protection to exposed EMT or use rigid galvanized steel conduit.

7.8.11.2(7) Do not encase EMT in concrete. Utilize rigid PVC conduit where conduit encased in concrete is necessary to achieve a concealed installation in finished spaces such as exposed concrete stairwells and conference room floor boxes. Such conduit runs will:

7.8.11.2(7)(a) Be as short as possible;

7.8.11.2(7)(b) Emerge from the concrete in the closest adjacent space above suspended ceilings; and

7.8.11.2(7)(c) Be reviewed by the Owner and achieve a concealed installation in finished spaces.

7.8.11.2(8) Minimum EMT conduit trade size is 21 mm, except that minimum EMT conduit size for IM/IT outlets will be as set out in Section 7.9 Communications (Division 27).

7.8.11.2(9) Use flexible conduit for all final connections to vibrating equipment, such as transformers and motors. Flexible PVC conduit (ENT) is not permitted in any locations. Flexible conduit sections will include a sufficient, but not excessive, amount of slack for movement in all directions such that they do not cause vibration or noise to extend into the structure.

7.8.11.2(10) Minimum flexible conduit trade size is 21 mm and maximum length of any flexible conduit run is 1.5 m.

7.8.11.2(11) Armoured cable (BX) may be used for final connections from concealed junction boxes to lighting fixtures on suspended ceilings in non-clinical areas. Armoured cable ISO-BX may be used for final connections from concealed junction boxes to lighting fixtures on suspended ceilings in clinical areas. The maximum length of any armoured cable from the junction box to the lighting fixture is 3 m.

7.8.11.2(12) Use PVC coated rigid galvanized steel conduit for the underground portion of wiring connecting a building to the first pull box located outside of the building. Use rigid PVC conduits for exposed sections subject to washdown and portions of wiring beyond the first exterior pull box.

7.8.11.2(13) Install individual bonding conductors in each raceway.

7.8.11.2(14) Raceways will typically be concealed; however, surface raceways may be installed where reviewed by the Owner. Typical areas with surface raceways will include laboratory spaces, workbenches, Care Team Stations, and other areas where frequent changes in power and telecommunication outlets are likely.

7.8.11.2(15) Armoured cable (BX) may be used to connect modular pre-fabricated components of non-clinical electrical systems. Modular wiring will consist of pre-cut flexible wiring that will terminate at an easily located and accessible junction box above the ceiling. The junction box will be located in the same space within 3 m (horizontally) of the prefabricated unit. Excess lengths of armoured cable will be neatly coiled up in the ceiling space to accommodate future changes. All wiring installed in walls will be vertical from device to ceiling space.

7.8.11.2(16) All power outlet boxes will be a minimum 102 mm (4”) square welded steel type.

7.8.11.2(17) Bond and ground all conduits, cable trays, racks and other infrastructure as per CEC and TIA 607B to the associated building ground.

7.8.11.2(18) Identify all conduits, raceways, pull boxes, and junction boxes using painted colour bands in accordance with the Owner's colour coding standard. Provide all power and communication systems with unique colours in accordance with the colouring scheme. Major colour will be 100 mm wide and minor colour to be 50 mm wide. Identify raceways with coloured bands (using either spray paint or coloured labels) at intervals of 6 m and at points where the raceway enters a wall or floor (e.g. raceway is identified on both sides of a penetration to facilitate tracing of raceway). Colour-code all junction boxes using spray paint or labels on the cover. Neatly identify the relevant system and circuit ID using permanent marker pen. Identify parallel conduit runs at common locations. Identification in areas exposed to view will have neat writing and sharp-edged colour bands.

7.8.11.2(19) Install approved fire stopping at electrical penetrations to maintain all fire separations as required by the VBBL and the Governmental Authority. Provide all fire stop locations with manufactured identification labels intended for the purpose that indicate the specific fire stop system used.

7.8.12 Grounding and Bonding

7.8.12.1 Basic Requirements

7.8.12.1(1) Provide grounding and bonding for all electrical and IM/IT equipment and systems, for limiting potential differences, for maintaining power quality, for the safety of people, and for protection against damage to equipment or property from electrical faults. Install grounding and bonding as required by all applicable codes and Division 27 requirements.

7.8.12.1(2) Provide supplementary equipotential bonding per CSA Z32 in all Patient Care Areas in the Facility. Provide insulated bonding conductors with all feeders and branch circuits supplying security systems loads.

7.8.12.2 Performance Criteria

7.8.12.2(1) Utilize non-alloyed copper for all conductors and conducting components of electrical equipment that form part of the grounding and bonding systems, except for lugs rated for use with copper conductors and metallic equipment enclosures.

7.8.12.2(2) Provide high-resistance system grounding in the locations specified.

7.8.12.2(3) Provide a minimum #12 copper bonding conductor in every raceway. Provide a #6 copper bonding conductor on each cable tray and ensure each section of the tray is securely bonded.

7.8.12.2(4) Bond all exposed conductive non-current-carrying components of equipment in Patient Care Areas to a room ground reference box using bonding conductors sized to meet CSA Z32 test requirements. Uniquely identify each bonding conductor at each end.

7.8.12.2(5) Provide a ground bus in each Electrical and Communications Room connected to the main building ground electrode, of sufficient size to double the number of grounding and bonding conductors initially connected without adding additional busbars or multi-conductor lugs or drilling new holes. Ground buses and the grounding/bonding conductors interconnecting them will be sized and installed in accordance with CEC and ANSI/TIA-607-C requirements. TBB will be sized in accordance with PHSA standards. Ground buses and risers for Electrical Rooms and Communications Rooms will be completely independent and bonded together only at the main unit substation room ground buses.

7.8.12.2(6) Provide a lightning protection system for the Facility buildings to the requirements of CAN/CSA-B72-M87. A lightning protection system will be installed for the Facility regardless of the calculated risk index.

7.8.12.2(7) Bond all electrical equipment located on the roof level, including antennas, satellite receivers, and luminaires, to the lightning protection system.

7.8.12.2(8) Where installed in conduit, lightning protection conductors will be installed in PVC conduit.

7.8.13 Lighting

7.8.13.1 Basic Requirements

7.8.13.1(1) Lighting systems will accommodate the needs of hospital Staff, Patients, and visitors, and will support the visual tasks being performed and the desired appearance of the space. The lighting installed will meet the requirements of Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 3O [Electrical IM/IT Matrix].

7.8.13.1(2) Provide complete lighting solutions that align with the requirements and recommendations of the VBBL, WorkSafe BC OHS Regulation (General Conditions, Illumination, Section 4.64 – 4.69), ANSI/IES RP-29-16, IES Lighting Handbook (10th Edition), and CSA Z317.5-17. Where the recommendations vary among these standards, whichever illuminance levels are greatest and whichever requirements apply to LED lighting will govern unless otherwise reviewed with the Owner.

7.8.13.1(3) Lighting design in Communications Rooms and multimedia rooms to also comply with requirements in Section 7.9 Communications (Division 27).

7.8.13.1(4) Provide luminaires that are easily maintainable and accessible. In Operating Rooms, Interventional Suites, Pharmacy Sterile Preparation, and MDRD Sterile Storage and Distribution areas, use luminaires with the ability to have drivers replaced without having to enter the room or adjacent Restricted Corridor or sterile area, and without having to break the ceiling seam around the fixture. Remote drivers to be in secure, locked recessed cabinets that are accessible without disruption to the operations of the surrounding areas. Driver cabinets in interstitial spaces are not required to be locked and recessed. Driver cabinets are preferred to be located on the same floor as the fixtures and as close as possible. In other Patient Care Areas, utilize luminaires with the ability to have drivers and lamps / LED modules replaced from below without a need to break the ceiling seam around the fixture, or provide remote drivers on the wall in a secure, locked recessed cabinet. Drivers mounted on top of the luminaire may be used in non-Patient Care Areas where T-bar ceilings allow access to the drivers.

7.8.13.1(5) Provide luminaires that require minimal cleaning and permit practical and easy access and disassembly by authorized Staff. In locations where it is necessary to locate luminaires in locations not routinely accessible without fall restraint / staging (for example high Enclosed Atrium), utilize long-life luminaires.

7.8.13.1(6) All luminaires will be free of light leaks. Luminaires in secure and common Patient areas will be of form to provide a friendly, inviting, welcoming, non-institutional ambience feel while providing Vandal Resistant and Ligature Resistant performance in all areas accessible to Patients in Mental Health Areas.

7.8.13.1(7) Provide appropriate luminaires to support the Owner's infection control policies and procedures including minimizing accumulation of dust and debris. Locate luminaires such that they can be easily cleaned. In Patient areas, do not provide wall-mounted lighting

that would create a dust shelf above. In critical Patient Care Areas, provide NSF-2 listed luminaires.

7.8.13.1(8) Selection and location of all luminaires will be closely coordinated with the video surveillance system to avoid “wash-out” of video surveillance video images and to ensure proper illumination levels are maintained to permit adequate video capture from the video surveillance system.

7.8.13.1(9) As architectural features, design lighting in exterior areas, lobbies, waiting areas, the Main Entrance Lobby, and Enclosed Atrium with high quality products aesthetically pleasing to the public and Staff.

7.8.13.2 Performance Criteria

7.8.13.2(1) Specify luminaire construction based on the specific risks and needs of the space into which the luminaires are being installed. Appendix 3N [Safety and Risk Reduction Matrix] indicates specific Vandal Resistant and Tamper Resistant luminaire types and features required.

7.8.13.2(1)(a) All luminaires and controls devices in Mental Health Areas will be Ligature Resistant.

7.8.13.2(1)(b) Luminaires in stairwells and underground parking areas will have tamperproof fasteners and minimum .187 gauge acrylic or .125 gauge polycarbonate lenses.

7.8.13.2(1)(c) Luminaires in stairwells will be mounted between 3.0 m - 4.0 m AFF at landings for ease of maintenance access. Alternate mounting locations will only be approved where necessary to achieve required illuminance levels.

7.8.13.2(2) Before finalizing lighting layouts and ordering luminaires, a sample of each luminaire type will be provided to the Owner for review.

7.8.13.2(3) Use LED lighting technology for all luminaires. Do not use incandescent, HID or fluorescent lighting unless otherwise indicated in this Schedule or with approval by the Owner.

7.8.13.2(4) Utilize premium grade quality luminaires with emphasis on energy efficiency (69 lumens/watt minimum) and high colour fidelity. Where achieving the energy efficiency specified in this section is not feasible due to functional constraints imposed by the task being performed by the luminaire, the luminaire will be exempt

from the energy efficiency requirement. Examples of luminaires that are exempt from the energy efficiency requirement include:

7.8.13.2(4)(a) Medical procedure luminaires

7.8.13.2(5) Luminaires, lamps and LED modules will have a colour temperature of 3500 K for general lighting and 4100 K for exam lighting unless indicated otherwise for functions of certain areas. Exterior lighting will be 3000K in accordance with dark sky recommendations

7.8.13.2(6) Master-slave wiring of multiple luminaires from a single driver or ballast is not permitted.

7.8.13.2(7) No area will have luminaires circuited from one power source only. Circuit the luminaires in all interior and exterior areas from both vital and conditional (or UPS) so that if one power branch is not available, emergency light levels are met.

7.8.13.2(8) Do not use exterior low pressure sodium, high pressure sodium, and mercury vapor lamps. Do not use incandescent or fluorescent lamps.

7.8.13.2(9) HID sources are not permitted for interior or exterior applications.

7.8.13.2(10) LED drivers and addressable control modules to meet the following requirements:

7.8.13.2(10)(a) Operable from 50/60 Hz input source of 120 V through 277 V or 347 V through 480 V with sustained variations of ± 10% (voltage) with no damage;

7.8.13.2(10)(b) Input power factor greater than 0.90 from 20% to 100% rated load;

7.8.13.2(10)(c) Input current THD less than 20% from 20% to 100% rated load;

7.8.13.2(10)(d) Comply with NEMA 410 for inrush current limits;

7.8.13.2(10)(e) Output current regulated to ± 5 % across published load range;

7.8.13.2(10)(f) Output ripple current at maximum output:

7.8.13.2.10.(f).1 less than 15 % measured peak-average/average;

7.8.13.2.10.(f).2 less than 5 % low frequency content (< 120 Hz).

7.8.13.2(11) Integral means of limiting surges to the LED's, based on IEEE/ANSI C62.41.2 surge characteristics:

7.8.13.2(11)(a) for interior applications: common mode and differential mode surge protection of 2.5 kV (100 kHz, 30 Ohm ring wave);

7.8.13.2(11)(b) for exterior applications: common mode and differential mode surge protection of 3 kV (1.2/50 µs, 2 Ohm combination wave).

7.8.13.2(12) Able to tolerate sustained open circuit and short circuit output conditions without failure, without need for external fuses or trip devices, and with auto resetting.

7.8.13.2(13) Comply with IEEE 1789 recommended practices for minimizing flicker effects and ensure systems have no visible flicker when tested with a flicker wheel, including dimming systems across the full dimming range.

7.8.13.2(14) Minimum operating temperature:

7.8.13.2(14)(a) -20˚C (-4˚F) for interior applications;

7.8.13.2(14)(b) -40˚C (-40˚F) for exterior applications.

7.8.13.2(15) Metallic enclosure for optimal thermal performance.

7.8.13.2(16) Integral thermal foldback to reduce driver power in the event that case temperature exceeds rated maximum temperature.

7.8.13.2(17) Compatible with the dimming system.

7.8.13.2(18) Class A sound rating.

7.8.13.2(19) For downlights: compact enclosure with integral studs allowing the driver to be mounted on the outside of the luminaire or on a junction box, without the need for an additional enclosure.

7.8.13.2(20) Integral colour-coded connectors.

7.8.13.2(21) Free of any PCBs.

7.8.13.2(22) Labelled compliant with the latest edition of the following standards:

7.8.13.2(22)(a) CSA-C22.2 No. 223, Power Supplies with Extra-Low Voltage Class 2 Outputs,

7.8.13.2(22)(b) CSA C22.2 No 250-13, Light Emitting Diode (LED) Equipment for use in Lighting Applications.

7.8.13.2(23) Comply with applicable requirements of the FCC rules and regulations, Title 47 CFR part 15, for EMC and EF emissions of non-consumer equipment.

7.8.13.2(24) RoHS compliant.

7.8.13.2(25) Warranty: 5 years.

7.8.13.2(26) LEDs will meet the following requirements:

7.8.13.2(26)(a) All luminaires to have correlated colour temperature tolerances within a 3-step MacAdam ellipse limit and to maintain a CRI of ≥ 80 throughout the full dimming range.

7.8.13.2(26)(b) In Patient Care Areas, provide luminaires with CRI ≥ 85 and R9 and R13 > 50.

7.8.13.2(26)(c) Where luminaires are used for Patient observation, examination (e.g. where examinations occur but separate articulating arm exam or surgical luminaires are not installed), or bloodwork, provide luminaires with R9 and R13 > 80.

7.8.13.2(26)(d) Comply with IESNA LM-79 testing procedures;

7.8.13.2(26)(e) Maximum temperature at the base of the “LED cap” mounted to the substrate to be controlled to ensure full lamp life;

7.8.13.2(26)(f) Minimum lumen maintenance of L70 @ 50,000 hours. Comply with IESNA LM-80 and LM-21 testing procedures;

7.8.13.2(26)(g) LEDs of the same type to be from the same manufacturing batch and labelled with bin information sufficient to allow future colour matching of replacement luminaires;

7.8.13.2(26)(h) Capable of continuous dimming, flicker and noise free, from 10%–100% of rated lumen output;

7.8.13.2(26)(i) Provide certified test results for each type of luminaire, driver, and control device used on the Project, including compatibility tests for any combination of these devices used on the project (e.g. dimming compatibility).

7.8.13.2(27) Provide standalone battery-operated emergency unit lighting in the security rooms, at the CACF, Energy Centre Control Room, Clinical Operations Centre, generator rooms, unit substations, HV switchgear rooms, Operating Rooms, Interventional Suites, Resuscitation Rooms, Procedure Rooms, and UPS rooms.

7.8.13.2(28) Utilize low glare recessed luminaires, direct/indirect or architectural troffers, specifically designed to eliminate direct glare in treatment rooms, offices, reception areas, Care Team Stations and areas where computer terminals or similar screens are used.

7.8.13.2(28)(a) Position luminaires and PACS workstation displays to minimize glare on the displays. This includes positioning corridor luminaires out of a direct line of sight from displays with the corridor doors open, and positioning PACS displays so they are not directly opposite each other.

7.8.13.2(29) Design lighting in corridors to limit glare to Patients being transported on stretcher (e.g. direct slot lighting along the sides of corridor, wall washing, or indirect lighting).

7.8.13.2(30) Provide luminaires and controls functions appropriate to each room type as detailed in the room templates in Appendix 3O [Electrical IM/IT Matrix]. For rooms without associated room templates, provide luminaires and controls in accordance with the general requirements of this schedule.

7.8.13.2(31) Place a luminaire outside each Change Cubicle-Patient-Hot, controlled by a ceiling mounted occupancy sensor inside the cubicle to alert Staff that the cubicle is occupied. Connect to vital power. Luminaire off delay on vacancy to be 30 seconds or less.

7.8.13.2(32) For spaces without room templates, provide separate lighting control switches as follows:

7.8.13.2(32)(a) Room entry (for general area lighting and night light);

7.8.13.2(32)(b) Headwall Patient zone (for Patient reading light, night light, and general area lighting), located above the bed to allow Patient to access them;

7.8.13.2(32)(c) Headwall Provider zone (for exam lighting, bedside Staff light, and observation light);

7.8.13.2(32)(d) Visitor/family zone (for visitor/family zone lighting);

7.8.13.2(32)(e) Workstation (for workstation lighting); and

7.8.13.2(32)(f) In corridor adjacent to Patient room door (for observation light).

7.8.13.2(33) Provide an amber LED night light at 450 mm AFF along the walkway between the Patient bed and ensuite washroom to prevent tripping hazards. Night light to direct light to the floor and be located to not disturb Patient sleep. Provide switch at Patient bed head.

7.8.13.2(34) Provide an amber LED night light at 450 mm AFF within the ensuite washroom. Night light in ensuite does not need to be controlled by switch but will be controlled by photocell such that when lights are turned on in ensuite, the night light turns off.

7.8.13.2(35) 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 (e.g. vertical illumination).

7.8.13.2(36) Provide specific dedicated lighting for video conferencing to facilitate visual quality of video transmission in accordance with IESNA Design Guideline DG-17.

7.8.13.2(37) Provide lighting for specific functions with illumination levels as required by CSA Z317.5. Provide dedicated lighting designed for the types of functions conducted in rooms and areas where specialized analytical or diagnostic work is carried out. Provide lighting to illuminate room counter and work areas in exam rooms, medication rooms, offices, Care Team Stations, and all other space types. Provide lighting for food preparation area counters, including in the ADL-Kitchen.

7.8.13.2(38) All exterior lighting to be LED. Outdoor spaces will have luminaires to assure full cut-off photometric to prevent light leakage into the Facility while eliminating shadows. All outdoor spaces within the property will have a minimum average general illumination of 10 lux. All entrances will be lit above 10 lux for Wayfinding. Public streets will be lit in compliance with City requirements.

7.8.13.2(39) Provide low-level lighting, bollards, wall-mounted and post-top lighting where needed to provide safe, well-lit walkways, parking areas and roads.

7.8.13.2(40) Exterior lighting will have a colour temperature of 3000 K.

7.8.13.2(41) Utilize Vandal Resistant and dark-sky compliant exterior luminaires. Comply with LEED requirements for light trespass and light pollution.

7.8.13.2(42) Utilize high-abuse decorative fixtures for Patient accessible exterior roof areas. Select and locate fixtures to provide uniform illumination levels on all surface areas, avoiding shadows.

7.8.13.2(43) Provide LED green pictogram exit signs on vital power. Utilize edge-lit type exit signs in the public lobby and large multi-purpose room. Utilize Vandal Resistant high-abuse exit signs in Mental Health Areas in accordance with Appendix 3N [Safety and Risk Reduction Matrix].

7.8.13.2(44) Provide built-in LED valance lighting as required for task-oriented and Staff areas such as: medication rooms, anterooms, nourishment areas, lounges, dictation, and Care Team Stations. All upper cabinets above a workstation, work surface, sink or countertop will be provided with valance lighting underneath.

7.8.13.2(45) Provide lighting above each mirror in washrooms, change compartments, locker rooms, etc., located to minimize shadows on occupants facing the mirror.

7.8.13.2(46) Provide lighting to achieve the specified illuminance levels throughout when partitions are closed, including toilet partitions, shower curtains, and change compartment partitions.

7.8.13.2(47) Install exam lights, providing minimum 750 lux lighting levels at the work surface, to meet the requirements of Appendix 3A [Clinical Specifications and Functional Space Requirements], including all Patient exam, treatment and recovery areas, and Clinical Skills Rooms.

7.8.13.2(48) For each Imaging-MRI room:

- 7.8.13.2(48)(a) Ensure only non-ferrous components, fittings, fixtures and fasteners are used;
- 7.8.13.2(48)(b) Install only DC-powered LED lighting fixtures suitable for use in an MRI room, controlled from the control room with remote drivers and a minimum of two DC dimming circuits;
- 7.8.13.2(48)(c) Provide flush ceiling-mounted vision panels complete with replaceable graphics, minimum 1.8 m by 2.4 m, located over the bed in front of the magnet. Project Co to provide a set of custom graphics.
- 7.8.13.2(48)(d) Install EMI filters on all wiring entering the room; and

7.8.13.2(48)(e) Provide a custom LED warning sign at the entry to the MRI area, electrically interlocked with the MRI equipment. Wording to be as determined with the Owner.

7.8.13.2(49) Provide tunable colour luminaires and controls in general area lighting in selected spaces in the Facility, as follows

7.8.13.2(49)(a) Tuneable white in Risk Category 14 areas as described in Appendix 3N [Safety and Risk Reduction Matrix];

7.8.13.2(49)(b) Tuneable white in NICU;

7.8.13.2(49)(c) Tuneable full spectrum colour in Sensory Modulation Rooms;

7.8.13.2(49)(d) Tuneable systems will have dynamic, programmable colour and/or colour temperature variability and will be integrated with the luminaire dimming functions, including the following features:

7.8.13.2.49.(d).1 Local controls will be capable of selecting between at least five (5) programmable preset scenes;

7.8.13.2.49.(d).2 Colour temperature and lighting intensity program changes will fade smoothly across a programmable time period as long as five (5) minutes to prevent abrupt changes in illumination; and

7.8.13.2.49.(d).3 Colour temperature range will be adjustable from 2700 K to 5000 K;

7.8.13.2(49)(e) Scenes will be configurable with the following parameters:

7.8.13.2.49.(e).1 Automatic astronomic control to follow shifts in outdoor daylight colour temperature and light intensity;

7.8.13.2.49.(e).2 Automatic control with colour temperature and light intensity shifts following a fixed 24-hour schedule;

7.8.13.2.49.(e).3 Manual control to a specific preset colour temperature and light intensity;

7.8.13.2.49.(e).4 Manual override/tuning through a controls interface at the Care Team Station; and

7.8.13.2.49.(e).5 For full-spectrum colour tuning, automatic colour shift programs and manual colour tuning;

7.8.13.2(49)(f) Tuning controls will be integrated into the addressable lighting control system and use colour shifts within each luminaire to create the tuning effect. Colour mixing between multiple luminaires is not permitted.

7.8.14 Lighting Control System

7.8.14.1 Basic Requirements

7.8.14.1(1) Provide a networked digital addressable lighting control system throughout the Facility for lighting control of all luminaires except where non-addressable controls are permitted.

7.8.14.1(2) Lighting control system will provide flexibility to adjust lighting to suit functions and activities and permit simple, integrated control of lighting. Controls will be easily operated and located in each area to suit the function of the space. Each room and area will have separate lighting control.

7.8.14.1(3) Lighting controls connections will be hard-wired, without exception. Lighting control system will be compatible with wireless control transmitters and wireless control devices to allow wireless control to be easily implemented in future renovation projects.

7.8.14.1(4) Luminaires for each space will be circuited from a single junction box per power branch and per control circuit in the corridor outside the entrance to the space, to minimize the disruption of future lighting renovations on adjacent spaces. Daisy-chaining circuits between rooms is not permitted.

7.8.14.1(5) Lighting controls will comprise a significant part of the energy management of the Facility reducing energy consumption as well as permitting simple and integrated control of lighting both locally and remotely;

7.8.14.1(6) Lighting controls are to meet or exceed ASHRAE 90.1-2016 requirements.

7.8.14.1(7) Utilize a combination of natural light, high-efficiency luminaires, dimming, occupancy sensing and daylight harvesting controls to maximize energy savings.

7.8.14.1(8) Provide daylight sensors and luminaires to maximize daylight use throughout the Facility. Install and design in accordance with manufacturers' recommendations. Optimize daylight sensor response and control operation during Commissioning.

7.8.14.1(9) Connect the lighting control system to the BMS for transfer of lighting sensor and energy use data and provide intuitive graphic interface software that can be used on BMS operator terminals to allow for Facility Management Staff to view luminaire on/off/dimming states and energy use, and override programmed settings, occupancy sensor, daylight sensor, or manual control setting.

7.8.14.1(10) Protect lighting controls from unauthorized operation when required to be located in areas accessible to the public.

7.8.14.1(11) In open areas, common areas, and Patient Care Areas, zone and subdivide lighting to permit energy management and appropriate control and variation of light levels.

7.8.14.1(12) Consult with the Owner when designing the lighting operation (controllability, zones, and timing) of the Facility.

7.8.14.2 Performance Criteria

7.8.14.2(1) Lighting control system:

7.8.14.2(1)(a) Will be extra-low voltage type;

7.8.14.2(1)(b) Will be networked to each luminaire and control device (e.g., switches, dimmers, occupancy sensors, and daylight sensors);

7.8.14.2(1)(c) Will have at least one (1) individual address for each luminaire and control device, using DALI-2 compatible drivers and components certified by DiiA, except:

7.8.14.2.1.(c).1 For luminaires without DALI-2 certified drivers available and located in parking or service spaces, fixtures in the same control zone may be controlled as a group by a DALI-2 certified addressable control module; and

7.8.14.2.1.(c).2 For luminaires without DALI-2 certified drivers available and located in other space types, up to four (4) fixtures in the same control zone may be controlled as a group by a single DALI-2 certified addressable control module

7.8.14.2(1)(d) Will have local on/off control and local dimming control of the lighting in each room, space, and lighting control zone, unless noted otherwise;

7.8.14.2(1)(e) Will allow Owner-programmable control of a single luminaire, or a group of luminaires, from any single

control device or multiple control devices in the Facility;

7.8.14.2(1)(f) Will allow on/off control and adjustable light levels of luminaires, individually or as programmable groups, from a central location in the Facility;

7.8.14.2(1)(g) Will resume the previous control settings for all zones after a power outage to the luminaires or controllers.

7.8.14.2(1)(h) Will initiate an 'emergency mode' that adjusts luminaires to full light output on failure of their associated controllers. In critical spaces including Operating Rooms and Interventional Suites, provide a local or automatic override means to prevent over-illumination if a controller fails during a procedure.

7.8.14.2(1)(i) Will have a maximum on- or off-delay of 0.1 seconds for local control devices and 2 seconds for controls routed through remote network interfaces (e.g. via BMS workstations).

7.8.14.2(1)(j) Will have an interactive, secure web-based GUI independent of networks outside of the hospital, showing floor plans and lighting layouts that will:

- 7.8.14.2.1.(j).1 Allow programming, including assignment of luminaires into groups for control;
- 7.8.14.2.1.(j).2 Allow programmable setting of maximum light level of each luminaire;
- 7.8.14.2.1.(j).3 Indicate status of each luminaire and control device, and extent of coverage for each sensor; and
- 7.8.14.2.1.(j).4 Provide lighting energy and demand reporting for each luminaire, circuit, zone, and department.

7.8.14.2(1)(k) Will allow daylight harvesting and time clock scheduling;

7.8.14.2(1)(l) Will have a BACnet/IP interface with the BMS, load management, and IBMP systems for bi-directional communication and be able to:

- 7.8.14.2.1.(l).1 Communicate real-time status for each sensor and luminaire;
- 7.8.14.2.1.(l).2 Provide lighting energy and demand reporting for each luminaire, circuit, zone, and department;

7.8.14.2.1.(l).3 Load-shed groups of luminaires via switching or dimming, based on programmed priority sequences and input from the load management system;

7.8.14.2.1.(l).4 Initiate ‘emergency mode’ that adjusts luminaires to full light output; and

7.8.14.2.1.(l).5 Send alerts to the IBMP for malfunctioning luminaires, sensors or controllers, or loss of power on any lighting circuit. Alerts for loss of power on the same panel, CDP or power branch will be grouped together to minimize duplication of alerts.

7.8.14.2(2) Ensure that the Facility, including all buildings and on-site lighted areas, will have a lighting control system divided into buildings and logical zones and be subdivided to permit energy management and allow Staff control of light levels for all interior and exterior lighting.

7.8.14.2(3) Reserve 20% of the continuous load capacity of each lighting circuit and 20% of the maximum number of devices/addresses on each lighting controller as spare for future lighting renovations.

7.8.14.2(4) Lighting systems will maximize the use of daylight and lighting control devices to maintain lighting levels and use the least amount of energy to provide the required illumination and will be in conformance with ASHRAE 90.1 energy use requirements.

7.8.14.2(5) Provide and commission all required communications infrastructure and gateways between the BMS, load management and IBMP systems and the lighting controllers.

7.8.14.2(6) Provide ability for all lighting program scheduling to be done through the web-based GUI.

7.8.14.2(7) Identify on/off/dimming status of lighting control zones on the operator screen.

7.8.14.2(8) Provide override at Care Team Stations for all associated lighting zones in corridors/alcoves, common spaces/rooms, and exterior areas in the same department that have controls accessible by Patients.

7.8.14.2(9) Provide local controls for each Patient wing at the associated Staff workstation and security control areas. The master controls will be divided into logical zones to allow Staff the flexibility to control lighting levels within the Patient areas, including two illumination levels at outdoor spaces.

7.8.14.2(10) Provide time program control of Patient care department lighting to provide automatic night time shut-off. Provide manual override control in the Care Team Stations.

7.8.14.2(11) Utilize the lighting control system with time scheduled programming for corridor lighting levels. Light levels in corridors to maintain minimum 50 lux measured on the floors at all times, including scheduled nighttime reduced level. Provide local dimming control for corridors from Care Team Stations and reception desks as applicable. Provide occupancy sensors in corridors to increase lighting levels when Patient presence is detected at night time to alert Staff to activity in the corridor.

7.8.14.2(12) All lighting in public and administration areas to be capable of being switched from a central location.

7.8.14.2(13) All rooms will have local switching, unless specified otherwise.

7.8.14.2(14) All Alcoves-Touchdown/Charting will have local switching and dimming control of the lighting within the alcove itself and the associated Patient rooms.

7.8.14.2(15) Except for exit signs, circuit breakers will not be used to switch lighting circuits.

7.8.14.2(16) Provide door switch lighting control for enclosed closet lighting.

7.8.14.2(17) Provide occupancy sensor lighting control for luminaires in open alcoves that are separate from the primary corridor lighting.

7.8.14.2(18) Provide occupancy sensors for full coverage of all interior spaces, to facilitate ongoing energy conservation measures by system operators and for potential security or Facility optimization applications.

7.8.14.2(19) Provide 10%–100% dimming range for all lighting, unless specified otherwise.

7.8.14.2(20) Provide 1 %–100% dimming range for spaces with diagnostic imaging equipment or related monitors, NICU, and Sensory Modulation Rooms.

7.8.14.2(21) Provide programmable scene lighting control in rooms requiring simple control of multiple functional lighting zones, including lecture theatres and conference/meeting rooms.

7.8.14.2(22) In waiting areas, reduce lighting levels by 50% within 20 minutes of all occupants leaving the space.

7.8.14.2(23) All interior open areas will be provided with independent switching controls with a minimum of one switch per 90 NSM.

7.8.14.2(24) Conference meeting rooms will have separately switched 1 %–100% dimmable low-level presentation lighting.

7.8.14.2(25) With the exception of Secure Rooms, all Patient Care Area luminaires will be controlled from local momentary contact switches within the area. Switches will be of a construction grade/duty type suitable for institutional use.

7.8.14.2(26) Secure Room luminaires will be controlled by the applicable Staff from within the anteroom using switches located adjacent to the latch side of the door into the Secure Room.

7.8.14.2(27) Provide 24-hr lighting within all stairwells and exit corridors without local switching. Luminaires will have automatic bi-level dimming with occupancy sensor control to maximize energy savings. In the event of emergency power or sensor failure, lights will default to 100% on.

7.8.14.2(28) All exterior luminaires will be switched from the Facility lighting control system via programmed astronomical time signals or photocell inputs to produce four (4) channels of control as follows:

7.8.14.2(28)(a) Channel 1 - Dusk to Dawn;

7.8.14.2(28)(b) Channel 2 - Dusk to Preset;

7.8.14.2(28)(c) Channel 3 - Preset to Preset; and

7.8.14.2(28)(d) Channel 4 - Preset to Dawn.

7.8.14.2(29) The exterior lighting system will be divided into logical zones. Include the following zones as the minimum:

7.8.14.2(29)(a) Private Roadways (per roadway);

7.8.14.2(29)(b) Surface Parking Areas (per parking area);

7.8.14.2(29)(c) Outdoor spaces Night Illumination and Enhanced Security Illumination (separate);

7.8.14.2(29)(d) Pathway/Walkway lighting;

7.8.14.2(29)(e) Facility entrances, including exterior stairs and ramps; and

7.8.14.2(29)(f) “ALL ON” single point control.

7.8.14.2(30) Lighting control will provide flexibility required to adjust lighting to minimal levels during predetermined night time hours to achieve energy savings while maintaining required uniformity to provide and support video surveillance system functionality.

7.8.14.2(31) Integrate controls in lecture theatres, conference rooms, videoconference rooms and meeting rooms with equipment controls and control stations in the room so as to permit the conference manager to vary the lighting as required for different activities. Detailed requirements for lighting and controls in multimedia rooms are further described in Section 7.9 Communications (Division 27).

7.8.14.2(32) Provide manually operated lighting controls that can be completely cleaned and disinfected without requiring any disassembly, and which will not deteriorate or be otherwise adversely affected by frequent cleaning and disinfection.

7.8.14.2(33) Install specifically rated lighting controls for the application/condition in locations where they may be subjected to excessive moisture or to chemicals that might cause deterioration.

7.8.14.2(34) Provide control of parking garage lighting in accordance with ASHRAE 90.1. Parking garage lighting control will meet the following requirements:

7.8.14.2(34)(a) Lighting output of each luminaire will be automatically reduced by a minimum of 30% when there is no activity detected within a lighting zone for 20 minutes. Lighting zones are will be maximum 334 NSM. Provide occupancy sensors zoned such that lights are turned fully on ahead of traffic and people. Do not provide each fixture with individual occupancy sensor control. Lighting in parking garage will only be reduced at each fixture; do not shut lighting off;

7.8.14.2(34)(b) Lighting for covered vehicle entrances and exits with no parking will be separately controlled to automatically reduce the lighting output of each luminaire by at least 50% from sunset to sunrise;

7.8.14.2(34)(c) The power to each luminaire within 1.9 NSM of any perimeter wall structure that has a net opening-to-wall ratio of at least 40 % and no exterior obstructions within 1.9 NSM will be automatically reduced in response to daylight; and

7.8.14.2(34)(d) All parking garage lighting will return to full lighting level output upon activation of any panic alarm station within the parking garage, upon activation of second stage fire alarm or while a loss of power is experienced by one of the parking garage lighting power sources.

7.8.14.2(35) Provide scheduled shutoff for the outpatient areas. Provide adjustable programming, initially configured for one (1) hour before daily scheduled clinic opening and one (1) hour after clinic closing. Provide manual override control, limited to two (2) hours per activation during scheduled shut-off time. Lighting is not required to be on scheduled shutoff in spaces where Patient care is rendered or lighting in spaces where automatic shutoff would endanger the safety or security of the room or Facility occupants.

7.8.15 Daylight Harvesting

7.8.15.1 Basic Requirements

7.8.15.1(1) Maximize the use of daylight to maintain lighting levels while reducing energy consumption with a combination of natural light, luminaires and controls.

7.8.15.2 Performance Requirements

7.8.15.2(1) Provide local photocell sensors to optimize energy use and provide a stable illumination level utilizing natural and artificial light.

7.8.15.2(2) Provide continuous daylight harvesting controls utilizing dimmable light fixtures in spaces where automatic daylight responsive controls are required by ASHRAE 90.1.

7.8.15.2(3) Where daylighting control is installed in Patient accessible areas, provide for manual and time/mode controlled-switches disabling the daylighting control.

7.8.15.2(4) Where daylighting control is installed in corridors and other means of egress, the controls are to be configured such that luminaires revert to 100% output while a loss of power is experienced by one of the power sources serving these areas.

7.8.16 Occupancy Sensors

7.8.16.1 Basic Requirements

7.8.16.1(1) Use dual-technology (passive infrared and ultrasonic) occupancy sensors to automatically turn off lighting in areas that are

unoccupied to reduce energy consumption. Vacancy sensor (manual-on/auto-off) functionality will be the preferred programming option for energy efficiency and will be used except where automatic on is specified for safety/convenience or required by code.

7.8.16.2 Performance Requirements

7.8.16.2(1) Occupancy sensors will be capable of detecting presence in the floor area to be controlled.

7.8.16.2(2) Provide zoned occupancy sensors in Patient corridors and common spaces in all departments. The occupancy sensors will be Vandal Resistant in high risk areas, ceiling mounted or fixture-integrated, and Vandal Resistant where noted in Appendix 3N [Safety and Risk Reduction Matrix]. The occupancy sensors will be enabled and disabled by switches located in the Care Team Station. The zoned occupancy sensors will switch on or brighten lights in the related zone when they are dimmed.

7.8.16.2(3) Provide occupancy sensors for full interior coverage of the Facility.

7.8.16.2(4) In clean supply and Soiled Utility rooms, and all rooms with occupancy sensor control in high-risk areas, provide occupancy (auto-on) functionality instead of vacancy (with manual on) functionality. Lighting required to be automatically on for Staff safety, e.g. awareness that a Patient is in the room.

7.8.17 Mechanical Equipment Connections

7.8.17.1 Basic Requirements

7.8.17.1(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.

7.8.17.2 Performance Criteria

7.8.17.2(1) Utilize institutional- or industrial-quality conductors, connectors, conduit systems, fittings and hardware for mechanical equipment connections, to provide for high levels of reliability, durability and ease of Equipment maintenance.

7.8.17.2(2) Where variable frequency drives are utilized on resistance-grounded systems, they will be rated for the full line-to-line voltage

requirements, equipped with effective ground fault protection and compatible with resistance grounded systems.

7.8.17.2(3) Design connections made to motors, motor driven equipment, and other vibrating equipment with sufficient flexibility to minimize vibration transmission to other building components.

7.8.17.2(4) Design connections to mechanical equipment to easily permit removal and replacement of the equipment.

7.8.17.2(5) Size MCCs and MCC feeders to accommodate the initial mechanical equipment load, with 33 % of the equipment capacity reserved as spare, as well as one (1) prepared space the size of a full-size NEMA 1 starter compartment per vertical MCC section.

7.8.17.2(6) Group motor starters into MCCs wherever three (3) or more 3-phase motors requiring starters are located within 30 m of each other, on the same power branch and the same storey.

7.8.18 Clock System

7.8.18.1 Basic Requirements

7.8.18.1(1) Provide a synchronized wireless clock system to assure accurate consistent time is available at key clinical and support spaces in the Facility. Provide a network time server for synchronization of all clocks throughout the Health Campus.

7.8.18.1(2) The system will provide automatic correction for daylight savings time and self-correct if power fails.

7.8.18.1(3) Supply master time controllers and all clocks by a recognized industry leader with all components by the same manufacturer.

7.8.18.2 Performance Criteria

7.8.18.2(1) Provide 120 V-powered synchronized clocks that receive correction signals from the network time server. Clocks to have polycarbonate lens.

7.8.18.2(2) Provide a deep recessed outlet box and connector, concealed behind the clock, to accommodate the clock power connection. Cord length to be suitable for this application. Clocks to be powered from vital, on circuits shared with the room lighting.

7.8.18.2(3) The finish and appearance of the clocks are to complement the architectural finishes and be semi-flush mount type within rooms.

7.8.18.2(4) All clocks in Mental Health Area and all locations where Tamper Resistant fasteners and fittings are required by Appendix 3N

[Safety and Risk Reduction Matrix] will have a clear high-impact polycarbonate guard complete with Tamper Resistant fastenings with centre pin rejection screws.

7.8.18.2(5) Locate analog clocks in rooms and areas to meet the clinical and support functions, including:

7.8.18.2(5)(a) Lobbies (main and elevator) and atriums;

7.8.18.2(5)(b) Staff locker rooms, family rooms, reception desks, Staff workstation rooms; and

7.8.18.2(5)(c) Treatment rooms, consultation/therapy rooms, Patient therapy rooms, waiting areas, life skills assessment, Dining/Activity Areas and lounges.

7.8.18.2(6) Locate digital elapsed time (countdown/count up) clocks in procedure and birthing rooms, including:

7.8.18.2(6)(a) Operating rooms and interventional suites, Exam/Treatment Room-Resuscitation, minor and major procedure rooms; and

7.8.18.2(6)(b) Patient Rooms - SRMC.

7.8.18.2(7) Provide clocks that indicate AM/PM and date for areas where it is not obvious if it is day or night, including:

7.8.18.2(7)(a) Mental Health Area circulation corridors (not in individual Patient rooms).

7.8.18.2(8) In addition to the locations noted above, provide clocks in the types, quantities and locations indicated in Appendix 3O [Electrical IM/IT Matrix].

7.8.18.2(9) Provide local transmitters such that the system is capable of providing sufficient coverage throughout the entire Health Campus.

7.8.18.2(10) Install main transmitter and satellite transmitters located for correct system operation. Connect transmitter to UPS power, complete with handle lock on device on the circuit breaker. Manufacturer to confirm transmitter locations and power requirements for the whole Health Campus, including areas designated for Future Expansion, by completing site survey. Transmitters will not cause interference with other wireless or radio functions on the Health Campus.

7.8.19 Seismic Requirements for Electrical Systems

7.8.19.1 Basic Requirements

7.8.19.1(1) Provide seismic restraint for all electrical equipment and components of electrical systems. Design the electrical systems and its associated equipment, restraints and anchorage to comply with the VBBL for a post-disaster Facility.

7.8.19.1(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.

7.8.19.1(3) Provide seismic restraint systems and methods that coordinate with the Facility's architecture and finishes. Wherever practicable, conceal components of seismic restraints from public view. Where concealment is not practicable, provide systems that complement the Facility's architecture and finishes.

7.8.19.1(4) Electrical equipment will be designed, tested and installed for functional resilience under the ground acceleration criteria and seismic importance factors for non-structural equipment restraints as identified in the VBBL for the geographic location of installation.

7.8.19.2 Performance Criteria

7.8.19.2(1) The following equipment will be designed, certified and installed in accordance with the International Building Code (IBC) chapters 16 and 17, with special seismic certification obtained in accordance with the shake table testing standard ICC-ES AC-156:

7.8.19.2(1)(a) Generators, including ancillary systems such as battery chargers and fuel transfer controls;

7.8.19.2(1)(b) Automatic transfer switches;

7.8.19.2(1)(c) UPS systems;

7.8.19.2(1)(d) Switchgear;

7.8.19.2(1)(e) CDPs;

7.8.19.2(1)(f) MCCs;

7.8.19.2(1)(g) Fire alarm control panels, annunciators, and CACF;

7.8.19.2(1)(h) Main transformers (12.47 kV-600 V or 12.47 kV-480 V); and

7.8.19.2(1)(i) Distribution transformers.

7.8.19.2(2) Provide seismic restraint for all electrical equipment and components of electrical systems that have the potential to cause injury or damage during or following a seismic event.

7.8.19.2(3) Use seismic restraint systems that are designed by Project Co's Structural Engineer-of-Record 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 who is a designated structural engineer having "Struct Eng" standing with EGBC. Provide signed and sealed drawings as well as typewritten field reports from Project Co's Structural Engineer-of-Record. 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.

7.9 Communications (Division 27)

7.9.1 Overview

7.9.1.1 General

7.9.1.1(1) Communication systems are key enablers for modern health care service delivery and are intended to improve Facility operations, reduce maintenance and promote operational efficiencies.

7.9.1.1(2) Communication system responsibilities of the Owner and Project Co are summarized in Appendix 3E [Systems Responsibility Matrix].

7.9.1.1(3) These specifications are not a final specification, but serve as a starting point in a process of collaborative design between the Owner and Project Co. Any deviations from the Agreement will be tracked by Project Co and confirmed by the Owner in writing prior to undertaking the work(s).

7.9.1.1(4) In the event of a conflict between applicable industry standards, Owner standards or this Schedule, the more stringent standard or requirement will apply.

7.9.1.1(5) Project Co will use the latest proven and reliable materials and equipment and the most current versions of any control or operating software available at the time of Construction.

7.9.1.1(6) Project Co will not, without the Owner's prior written agreement, install or use any software that resides on, accesses or otherwise interacts with any Owner network.

7.9.1.1(7) The Facility will include adequate space, communications infrastructure, wall backing, cable management, power, and TOs with Data Drops for all equipment and networks.

7.9.1.1(8) Project Co will provide a minimum 1-year system warranty providing 100% replacement parts and 100% diagnostic labour coverage with a first-available on-site response time for all Division 27 systems. All manufacturers' warranties will be transferred to the Owner upon completion of the Project.

7.9.1.1(9) Data Drop quantities described in Appendix 3O [Electrical IM/IT Matrix] and elsewhere in this Agreement are the minimum to be used to calculate quantities required for the systems described. Project Co will supply additional Data Drops to provide network connectivity for any additional requirements identified by the Owner acting reasonably.

7.9.1.1(10) Project Co will provide standard operating procedures and customized training plans for each system as determined in consultation with the Owner. Project Co will program the systems as determined in consultation with the Owner.

7.9.1.1(11) Division 27 Cash Allowances

7.9.1.1(11)(a) The following cash allowance scopes have been identified by the Owner within this document and Appendix 3E [Systems Responsibility Matrix]:

7.9.1.1.11.(a).1 IM/IT wireless network;

7.9.1.1.11.(a).2 Audio-visual systems; and

7.9.1.1.11.(a).3 Distributed Antenna System.

7.9.1.1(11)(b) Project Co will work collaboratively with the Owner to design system equipment and obtain scope and budget approval from the Owner.

7.9.1.1(11)(c) Project Co will design and coordinate all systems infrastructure to accommodate systems equipment with maximum design and installation flexibility with no impact to the Project schedule.

7.9.1.1(11)(d) Project Co will use the process defined in Section 3 of Schedule 2E [Equipment and Furniture] for the procurement and payment of Division 27 Cash Allowances. All sub-sections (3.1 to 3.21) of Section 3 of Schedule 2E [Equipment and Furniture] are to be used for the procurement and payment of Division 27 Cash Allowances. In addition, Section 8.13 Insurance applies to the Division 27 Cash Allowance items.

7.9.1.1(11)(e) The cost of any setup, installation, training, or Commissioning work that the equipment vendor will perform for these systems will be paid out of the cash allowance.

7.9.1.1(11)(f) Project Co will carry the cost of any coordination, Commissioning, training or other works for these systems not directly related to works being performed by the equipment vendor.

7.9.1.2 Information Management Guidelines

7.9.1.2(1) The management of the Owner's employees' and Patients' information is the responsibility of the Owner.

7.9.1.2(2) Clinical information management in the Facility will be provided by the Owner unless described otherwise.

7.9.1.3 Information Technology Guidelines

7.9.1.3(1) The Owner will be consulted in the areas where Facility Design and Construction impacts any aspect of the IT infrastructure.

7.9.1.3(2) Project Co will:

7.9.1.3(2)(a) consult with the Owner's IT representatives regarding design requirements in a collaborative manner;

7.9.1.3(2)(b) ensure that all new technology, systems, and equipment are compatible and seamlessly interfaced with the existing systems and equipment used by the Owner;

7.9.1.3(2)(c) ensure that the Facility's IT and communication infrastructure is not encumbered with outmoded materials, equipment, systems and processes; and

7.9.1.3(2)(d) train the Owner's IM/IT specialist(s) on the configuration, setup, and testing of the communications systems equipment in the Facility.

7.9.1.3(3) If there is a technical reason that a server is required to be on site, then it will be located in the Facility. All other servers will be hosted in an offsite data centre that is situated outside of the Facility.

7.9.1.3(4) Project Co will undertake the Design and Construction of separate physical networks and systems in accordance with equipment vendor specifications and where the Owner's requirements

dictate. This includes the provision of physically separate infrastructure for the following networks and systems:

7.9.1.3(4)(a) IM/IT data network (wired and wireless);

7.9.1.3(4)(b) Patient physiological monitoring network (wired and wireless);

7.9.1.3(4)(c) Guest infotainment network;

7.9.1.3(4)(d) Distributed antenna system;

7.9.1.3(4)(e) Location services;

7.9.1.3(4)(f) FMO network (Refer to Integrated Automation Division 25);

7.9.1.3(4)(g) A vendor network for non-Owner vendors and POS terminals;

7.9.1.3(4)(h) Nurse call; and

7.9.1.3(4)(i) Fire alarm.

7.9.1.3(5) The above list is preliminary and does not limit Project Co's obligation to provide infrastructure for additional networks required for the Facility.

7.9.1.3(6) Project Co will consult with the Owner and meet all of the Owner's policies and standards for all connections to networks in the Facility.

7.9.1.3(7) The Owner will provide and manage all firewalls and security software for the Owner's networks.

7.9.1.3(8) Project Co will supply all baluns, converters, and PoE extenders required to provide functioning system components in elevators.

7.9.1.3(9) All communications infrastructure, equipment and software supplied and installed by Project Co will:

7.9.1.3(9)(a) have high availability and redundancy that meets or exceeds the industry standards for use in and support of acute care hospital applications;

7.9.1.3(9)(b) be easy to operate, maintain and scale;

7.9.1.3(9)(c) support advancement towards an integrated Health Campus that continuously contributes to operational efficiencies through standardization, provision of a

consistent end-user experience, improved workflow and access to information;

7.9.1.3(9)(d) function in a safe manner and not unduly impact Patient care and the operation of the Facility; and

7.9.1.3(9)(e) be robust and resilient, enabling the network to remain operational during and after disasters or in the event of a major network event such as an equipment failure or a fibre cut.

7.9.1.4 Project Co Design Process

7.9.1.4(1) Except as expressly stated otherwise, Project Co will be responsible for designing, supplying and installing all physical infrastructure required to support the communication systems within the Facility. This physical infrastructure includes:

7.9.1.4(1)(a) spaces;

7.9.1.4(1)(b) pathways;

7.9.1.4(1)(c) power;

7.9.1.4(1)(d) structured cabling;

7.9.1.4(1)(e) mounting; and

7.9.1.4(1)(f) structural supports.

7.9.1.4(2) Physical infrastructure design provided by Project Co will:

7.9.1.4(2)(a) have high availability and redundancy that meets or exceeds the industry standards for use in and support of acute care hospital applications;

7.9.1.4(2)(b) be easy to operate, maintain and scale;

7.9.1.4(2)(c) support advancement towards an integrated Facility that continuously contributes to operational efficiencies through standardization, improved workflow and access to information;

7.9.1.4(2)(d) function in a safe manner and not unduly impact Patient care and the operation of the Facility;

7.9.1.4(2)(e) be robust and resilient, enabling the network to remain operational during and after disasters or in the event of a major network event such as a Core Network Equipment failure or a fibre cut; and

7.9.1.4(2)(f) accommodate separate physical networks in accordance with equipment vendor specifications or where operational requirements dictate.

7.9.1.4(3) Project Co will provide all necessary IT systems Project management, technical expertise, infrastructure design, installation coordination, labour, materials, equipment, services and other items required to fulfill its scope of work.

7.9.1.4(4) Project Co's IT technical team will be available to the Owner throughout the Design and Construction phases of the Project.

7.9.1.4(5) Establish a technology coordination committee with the Owner. The technology coordination committee will meet regularly (minimum once per month) to review the design and installation of the IT and communications infrastructure in the Facility.

7.9.1.4(6) Appoint and make available to the Owner a technology coordination lead within 30 days of the Effective Date to chair the technology coordination committee. The technology coordination lead will coordinate meeting dates, establish agendas, record minutes and maintain an action register throughout all phases of the Project.

7.9.1.4(7) The technology coordination lead will be experienced in the deployment of IT and communications infrastructure through design, construction, equipment fit out and Commissioning and integration with other systems.

7.9.1.4(8) Provide sufficient lead time to develop and obtain agreement of designs and will ensure that every aspect of the deployment of the IT and communications infrastructure, including those tasks performed by the Owner, are identified and factored into the construction schedule in an efficient, collaborative and seamless manner.

7.9.1.4(9) Maintain and update the Project schedule and inform the Owner of any schedule changes through weekly meetings or other mechanisms as deemed appropriate.

7.9.1.4(10) Work with the Owner during the design process to define locations for Owner-supplied end-use equipment and ensure that adequate space, infrastructure, power, and wired network data outlets are provided for the Owner-supplied end-use equipment.

7.9.1.5 Procurement Process

7.9.1.5(1) Project Co provided systems will be reviewed and accepted by the Owner prior to purchase or installation.

7.9.1.5(2) Project Co proposed systems will be proven technologies currently used in similar acute care hospital applications. Provide system references to the Owner where requested. The Owner reserves the right to reject proposed systems where system performance has not been proven in similar environments.

7.9.1.5(3) All systems will be the latest version of the infrastructure, equipment, and software available at the time of procurement. Project Co will not procure any systems prior to 12 months in advance of Service Commencement without written approval from the Owner.

7.9.1.5(4) Provide all information required to ensure the Owner is not bound to any undesired proprietary solution or technology licensing. Ensure any software customizations from vendors are clearly documented.

7.9.1.5(5) Where software licensing is applicable, Project Co will supply a complete enterprise software package for Project Co supplied systems. Where available, provide perpetual software licenses for all systems provided by Project Co. Software as a service packages with ongoing payments will not be purchased without written approval from the Owner.

7.9.1.5(6) If a system procured by Project Co for use in the Facility represents a net new addition to the overall Owner systems inventory, Project Co will ensure that any contract it enters into for that system includes provisions:

- 7.9.1.5(6)(a) permitting assignment of the contract to the Owner on favourable terms and conditions, as included in the contract between Project Co and the system vendor; and
- 7.9.1.5(6)(b) allowing use of the system to be expanded beyond the Facility to other Owner sites, provided that the associated increase of scope charges are paid.

7.9.1.5(7) Project Co will ensure that all of its contracts for communications systems:

- 7.9.1.5(7)(a) have a defined service level commitment that supports the Owner service level expectation as detailed in this Schedule; and
- 7.9.1.5(7)(b) have a privacy and security schedule that aligns with the British Columbia Freedom of Information and Protection of Privacy Act / Personal Information

Protection and Electronic Documents Act legislation as applicable.

7.9.1.5(8) 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 Owner applications or equipment.

7.9.2 IM/IT Common Works

7.9.2.1 Basic Requirements

7.9.2.1(1) System Overview

7.9.2.1(1)(a) This system is comprised of the supporting physical IM/IT infrastructure and spaces that enable a functional network environment.

7.9.2.1(2) Applicable Area

7.9.2.1(2)(a) Applies to the Facility.

7.9.2.1(3) System Responsibilities

7.9.2.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.2.1(3)(b) Owner will:

7.9.2.1.3.(b).1 Provide latest PHSA Communications Infrastructure Standards and Specifications for Project Co system selection and design; and

7.9.2.1.3.(b).2 Provide design feedback to Project Co.

7.9.2.1(3)(c) Project Co will:

7.9.2.1.3.(c).1 Design, supply and install all system infrastructure as determined in consultation with the Owner; and

7.9.2.1.3.(c).2 Commission all system infrastructure in consultation with the Owner.

7.9.2.2 Performance Criteria

7.9.2.2(1) Communication Spaces

7.9.2.2(1)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying and installing Communications spaces.

7.9.2.2(1)(b) “Communications Rooms” includes the following room types: Entrance Facility Room (EF), main equipment room (MER), antenna headend equipment room (HE), and telecommunication room (TR).

7.9.2.2(1)(c) Project Co will develop the size of all Communications Rooms in consultation with the Owner to ensure that the room sizing meets the Owner’s needs for Future Expansion.

7.9.2.2(1)(d) Locate Communications Rooms to minimize the possibility of rooms being adversely impacted simultaneously (including impact resulting from flood, fire, vandalism, mechanical or structural failure). Provide dedicated protection infrastructure and measures to mitigate these risks.

7.9.2.2(1)(e) Most server applications will be hosted in an offsite data center, which is situated outside of the Health Campus. If there is a technical reason requiring a server to be on-site, it will have 2N redundancy and located in MERs in the Facility. All other servers will be hosted at an offsite data centre. Provide two (2) MERs (A & B) within the Facility located on different floors and horizontally separated by a minimum of 50 m.

7.9.2.2(1)(f) If the Energy Centre is detached, an additional MER is required in consultation with the Owner.

7.9.2.2(1)(g) Provide two (2) EFs in the Facility to accommodate physically diverse, redundant telecommunications services into the Facility. One EF will reside within the Facility and one will reside in the Energy Centre.

7.9.2.2.1.(g).1 If the Energy Centre is attached to, or part of, the Facility, EFs will be horizontally separated by a minimum of 30 m and located within separate fire compartments.

7.9.2.2(1)(h) Except where noted, Project Co will vertically stack Communications Rooms on all floors throughout the Facility. If an additional TR is required on any floor, spatially separate the rooms on the plan and position these in different architectural fire-compartments;

7.9.2.2.1.(h).1 The Owner will permit one (1) offset transition per vertical Communications Riser when

transitioning from a podium level to a tower level;

7.9.2.2.1.(h).2 The Owner will permit one (1) offset transition per vertical Communications Riser where the Facility transitions from above ground structure into parking levels;

7.9.2.2.1.(h).3 Where a vertical offset in a Communications Riser occurs, the maximum allowable horizontal distance between connected Communications Rooms in the riser stack will be 25 m;

7.9.2.2.1.(h).4 In all instances where a Communications Room offset in a riser stack has been permitted, Project Co will provide a complete Communications Pathway system including connection of all floor penetrations with 100 mm conduit, junction boxes, and cable tray between connected Communications Rooms. Project Co will minimize the horizontal distance of the Communications Pathway, and ensure that the Communications Pathway is easily accessible for maintenance and will provide additional conduit, junction boxes, access panels, fire-rated enclosures and communications closets as required by the Owner to facilitate maintenance access.

7.9.2.2(1)(i) Project Co will not place Communications Rooms in any areas of the Facility that would be considered by the Owner to be a confined space of any kind, or in any space with recognizable hazards requiring specific worker safety precautions and protocols;

7.9.2.2(1)(j) Communications Rooms will not be located adjacent to areas or spaces that are restricted by building components (such as stairwells, exterior walls, structural shear walls, vertical shafts, Electrical Rooms or major electrical or mechanical equipment) that limit expansion, unless as reviewed on a case-by-case basis by the Owner, with the following exception:

7.9.2.2.1.(j).1 a maximum of two walls may be adjacent to areas or spaces that are restricted by building components that limit expansion, provided that no more than one of those walls (adjacent to restricted areas or spaces) is in the direction of the rack row alignment.

7.9.2.2(1)(k) Communications Rooms will always be directly accessible from a common corridor or hallway that connects to an elevator. The access path, which includes all entrances, corridors, doorways openings and elevators from Facility's loading dock to any Communications Room, will be:

- 7.9.2.2.1.(k).1 well lit;
- 7.9.2.2.1.(k).2 unobstructed;
- 7.9.2.2.1.(k).3 capable of supporting the smooth operation of mechanical handling aid such as a pallet jack, hand truck and cart;
- 7.9.2.2.1.(k).4 capable of safely moving equipment as large 1.20 m deep, 2.60 m high, plus the typical height of a mechanical handling aid, and 914 mm wide; and
- 7.9.2.2.1.(k).5 Capable of supporting a weight of 2273 kg (5000 lb).

7.9.2.2(1)(l) Communications Rooms require a minimum one (1)-hour fire rating, and MERs require a two (2)-hour fire rating;

7.9.2.2(1)(m) Project Co will supply and install heat and smoke detection and a double interlock pre-action sprinkler system in all Communications Rooms, as follows:

- 7.9.2.2.1.(m).1 Sprinkler heads will be mechanically protected in all cases;
- 7.9.2.2.1.(m).2 In order to avoid the placement of sprinkler heads above equipment racks or server cabinets, additional sprinkler heads will be supplied and installed to provide the required coverage in the room;
- 7.9.2.2.1.(m).3 If there are no alternatives other than to place a sprinkler head above an equipment rack or a server cabinet, then it is the responsibility of Project Co to identify all instances of this situation for the Owner's review and approval. Upon receipt of the Owner's approval, Project Co will supply and install drip trays under the sprinkler head(s) that are appropriately drained and supplied with a complete leak detection system that is monitorable through the BMS system by the Owner;
- 7.9.2.2.1.(m).4 If an inspector's test connection is required, it will be located outside the Communications Room. This includes all additional drains,

valves, piping, maintenance space and accessories required; and

7.9.2.2.1.(m).5 Refer to Section 7.3 Fire Suppression (Division 21) for further details of fire suppression requirements.

7.9.2.2(1)(n) Communications Room walls will be to underside of slab. All walls will be lined with rigidly installed 19 mm, AAA G1S plywood painted with two coats of light-coloured paint applied to all sides. Sanding between coats is mandatory. The plywood panels will extend from floor level to a height of 2.4 m

7.9.2.2(1)(o) The minimum clear height in a Communications Room will be 2.7 m without obstructions. The height between the finished floor and the lowest point of the ceiling will be no less than 3.05 m to accommodate taller frames and overhead pathways and other infrastructure required to service the room;

7.9.2.2(1)(p) There will be no suspended ceiling installed in any Communications Room;

7.9.2.2(1)(q) Electrical equipment, such as transformers or UPS batteries, will not be installed in Communications Rooms;

7.9.2.2(1)(r) For each Communications Room, provide finished flooring in compliance with the PHSA Communications Infrastructure Standards.

7.9.2.2(1)(s) The doors for Communications Rooms will be a minimum size of 1.07 m wide and 2.6 m high and will swing 180º out to gain valuable floor and wall space inside the room for equipment and cable installs, and to provide working space for personnel pulling entrance and riser cables.

7.9.2.2.1.(s).1 If the door must swing into the Communications Room, the size of the room will be increased by the width of the door to compensate for lost space. All doors will be equipped with door sweeps.

7.9.2.2.1.(s).2 Where a Communications Room is directly accessible from the Facility's exterior or from underground parking levels, the room will have a curb to prevent water ingress, and door

hinges are to be recessed or hidden with a full-length astragal installed.

7.9.2.2(1)(t) Seismic specifications for telecommunications and IT infrastructure and related facilities will accommodate applicable seismic requirements in accordance with the Governmental Authority.

7.9.2.2(1)(u) Communications Rooms will be clean, secure, and environmentally controlled ten (10) months prior to Service Commencement to facilitate the installation of IM/IT network equipment for the enhanced Commissioning of Building Systems. Project Co will supply any temporary equipment, such as dehumidifiers, air conditioners, and UPS units, required to provide a stable and Owner-accepted environment that allows for the installation and operation of production IM/IT systems ten (10) months prior to Service Commencement.

7.9.2.2(1)(v) Project Co will supply and install dedicated scalable, reliable and N+1 redundant cooling capacity in a consistent manner in all the Communications Rooms to permit all equipment racks to be fully populated.

7.9.2.2.1.(v).1 HVAC systems serving Communications Rooms will maintain a temperature between 18–24°C (dry bulb temperature) with a relative humidity between 25 % and 60 %. Anything outside these ranges will generate an alarm that will be visible on the Facility's building management system;

7.9.2.2.1.(v).2 Design the HVAC system to maintain these requirements 24/7, 365 days per year;

7.9.2.2.1.(v).3 Supply and install separate, in-room controls for the HVAC systems serving all Communications Rooms in order to enable the correct amount of cooling capacity and humidity control to be delivered to each Communications Room;

7.9.2.2.1.(v).4 Each Communications Room will be provided with supply and return air through dedicated ducts that serve only the Communications Room and an adjacent Electrical Room in order to ensure that the environment inside each Communications Room is not influenced by external factors;

7.9.2.2.1.(v).5 The air pressure inside a Communications Room will be positive to force the air out of the room to mitigate dust accumulation. Provide a minimum of one (1) complete air change per hour; and

7.9.2.2.1.(v).6 Refer to Section 7.8.8 UPS Systems and Section 7.5 Heating, Ventilating and Air Conditioning (Division 23) for further details.

7.9.2.2(1)(w) Communications Rooms will have proper sealing of doors or any other gaps to maintain positive air pressure in the interior of the room and to provide additional prevention against the ingress of dust and debris which may impact equipment performance and lifespan as well as result in cable failures and degradation of service. Project Co will supply and install filters (minimum acceptable rating MERV 8) on any mechanical system supplying air into Communications Rooms.

7.9.2.2(1)(x) Entrance Facility rooms:

7.9.2.2.1.(x).1 The telecommunications carriers, e.g. Telephone Company, Internet Service Providers, etc., will demarcate and deliver their services in the Entrance Facility Room;

7.9.2.2.1.(x).2 The point of demarcation is analogous to a "border" between equipment and facilities owned by the telecommunications carriers and similar infrastructure that is owned by the Owner;

7.9.2.2.1.(x).3 Project Co will undertake the Design and Construction of the Entrance Facility Rooms in accordance with the requirements stated herein and in the PHSA Communications Infrastructure Standards and Specifications;

7.9.2.2.1.(x).4 The Entrance Facility Rooms will contain:

(x).4.1 terminations of copper and optical fibre cables, coming from outside the Facility, owned by the telecommunications carriers; and

(x).4.2 electronic equipment owned by the telecommunications carriers that is required to provide their services to the Facility.

7.9.2.2.1.(x).5 The EFs will be:

(x).5.1 located on the ground level of the Facility and above the 5.0 m FCL;

(x).5.2 separated from any MER by a minimum of 20 m; and

(x).5.3 located in a different architectural fire-compartment than any MER.

7.9.2.2.1.(x).6 Project Co will connect each EF and each MER through the backbone communications pathway system. Refer to Section 7.9.2.2(7) for further details.

7.9.2.2.1.(x).7 Provide a pre-action sprinkler system within each space.

7.9.2.2(1)(y) Main Equipment Rooms:

7.9.2.2.1.(y).1 The primary functions of the MERs are to:

(y).1.1 Contain core telecommunications equipment, servers, connecting hardware, cables, pathways, splice closures, grounding and bonding facilities and appropriate protection apparatus;

(y).1.2 Contain the main cross-connect or intermediate cross-connects used in the backbone cabling hierarchy; and

(y).1.3 Provide for the routing of the equipment cabling, and or cords, from the main cross-connect or intermediate cross-connect to the telecommunications equipment; and

(y).1.4 Provide a location for the physical servers that have the technical reason to be located on site.

7.9.2.2.1.(y).2 Project Co will undertake the Design, Construction and fit out of the MERs in accordance with the requirements stated in this Schedule and in the PHSA Communications Infrastructure Standards and Specifications, and as determined in consultation with the Owner.

7.9.2.2.1.(y).3 The MERs will be:

(y).3.1 located above ground level;

(y).3.2 a minimum size of 6.1 m wide x 9.2 m in length; and

(y).3.3 fully equipped with equipment racks and server racks.

7.9.2.2.1.(y).4 Project Co will connect each MER to each EF, each TR and each HE in the Facility through the backbone communications pathway

system. Refer to Section 7.9.2.2(7) for further details.

7.9.2.2.1.(y).5 Provide a clean agent gas-based fire suppression system and pre-action sprinkler system within each space.

7.9.2.2(1)(z) Telecommunications Rooms:

7.9.2.2.1.(z).1 The functions of a TR are to:

(z).1.1 Contain the terminations of horizontal and backbone cables to connecting hardware; and

(z).1.2 Provide a controlled environment to contain telecommunications equipment, connecting hardware and splice closures.

7.9.2.2.1.(z).2 Each TR's connection to the work area is achieved through the horizontal pathways and cabling subsystem;

7.9.2.2.1.(z).3 The maximum target area that any TR can service is the maximum permissible permanent link length of 80 m for horizontal structured copper cabling orthogonal to building lines.

7.9.2.2.1.(z).4 The systems that are permissible by the Owner to be contained within a TR include IM/IT networks, FMO network equipment (whose purpose is to provide Ethernet connectivity), security systems, locating systems, public address, clock systems, intercoms, nurse call, clinical equipment systems, multimedia systems, and DAS;

7.9.2.2.1.(z).5 The Owner reserves the right to refuse the installation of any equipment and its associated infrastructure in a Communications Room that falls outside of the systems listed above. In the event permission is not provided, Project Co will provide suitable alternative locations in the Facility to accommodate equipment and its associated infrastructure for systems outside the defined list;

7.9.2.2.1.(z).6 Project Co will undertake the Design, Construction and fit-out of the TRs in accordance with the requirements stated in this Schedule and in the PHSA Communications Infrastructure Standards and Specifications.

7.9.2.2.1.(z).7 The minimum size of a TR is 3.7 m wide x 4.9 m in length, and it will contain a minimum of four (4) Owner equipment racks and space for at least one (1) future rack, or as determined in consultation with the Owner;

7.9.2.2.1.(z).8 TRs will be located on the same floor as the work areas they serve and will not serve multiple floors, with the following exceptions;

(z).8.1 TRs in the underground parking may serve up to four (4) floors of the underground parking provided that the 80 m channel link length requirements for horizontal cabling are met and a minimum 50% spare capacity for future growth is provided in the cabling pathway; and

(z).8.2 TRs serving multiple floors will not be used as a termination point for horizontal cabling that serves non-parking areas.

7.9.2.2.1.(z).9 Where TRs serve more than one (1) floor, Project Co will provide:

(z).9.1 separate pathways for horizontal and backbone cabling, including separate junction boxes where used;

(z).9.2 termination of horizontal cabling on patch panels dedicated by floor, such that horizontal cables originating on different levels do not terminate on the same patch panel;

(z).9.3 water-tight duct and conduit sealing where risers penetrate the floor;

(z).9.4 a minimum of three (3) 100 mm riser conduit and sleeves for backbone cabling;

(z).9.5 a minimum of five (5) 100 mm riser conduit and sleeves for horizontal cabling; and

(z).9.6 vehicular protection, such as bollards, for vertical riser conduits.

7.9.2.2.1.(z).10 A growth factor of 25 % will be included when determining the TR room size. At minimum, floor space will be allocated for one future equipment rack, as follows:

(z).10.1 Room sizing and the calculation of spare capacity for growth will consider

floor and rack space as well as useable wall mounting area;

(z).10.2 Useable wall mounting area does not include wall space above 2.7 m AFF or wall space that, if used, would compromise operational clearances; and

(z).10.3 The calculation of available spare capacity for growth will be based on an accurate depiction of the quantity and dimensions of all components identified in the layouts of each TR provided in the Design of the Facility. To validate dimensions, Project Co will provide shop drawings of each component to be installed in a TR at the Owner's request.

7.9.2.2.1.(z).11 Project Co will, where necessary, enlarge the size of the TRs above the minimum dimension specified to provide additional equipment rack and wall space to meet the requirements of all systems contained within a given TR while still maintaining a 25 % growth factor;

7.9.2.2.1.(z).12 Project Co will connect each TR in the Facility to each MER via the backbone communications pathway system and fibre optic cabling;

7.9.2.2.1.(z).13 Project Co will ensure all horizontal and backbone communication cabling for a given floor or area terminates at a TR on the same floor, except where permitted by the Owner;

7.9.2.2.1.(z).14 Subject to compliance with the maximum permanent link length, the maximum quantity of Data Drops per TR is 1,200 unless otherwise reviewed by the Owner; and

7.9.2.2.1.(z).15 Provide a pre-action sprinkler system within each space.

7.9.2.2(1)(aa) Antenna Headend Equipment room:

7.9.2.2.1.(aa).1 The antenna headend equipment room will accommodate all radio frequency-based (RF) special systems and headend equipment racks required for site wide wireless systems (such as clock GPS, FMO and security 2-way radio systems, SAT Com, ECOMM 911), intra-site wireless communications systems and telecommunications carrier macro cellular

antenna systems. Refer to Section 7.9.12 Distributed Antenna System for further requirements relating to the DAS;

7.9.2.2.1.(aa).2 Project Co will locate the antenna headend equipment room on the rooftop of the Facility in close proximity to antenna locations.

7.9.2.2.1.(aa).3 The minimum size of the antenna headend equipment room is 3.7 m wide x 7.7 m in length;

7.9.2.2.1.(aa).4 The antenna headend equipment room will be capable of housing six (6) telco equipment racks (711 mm wide x 914 mm deep) and two (2) equipment racks allocated for site wide wireless systems;

7.9.2.2.1.(aa).5 The design of the antenna headend equipment will also account for 152 mm vertical cable managers between each telco and equipment rack, and at the end of the line-up;

7.9.2.2.1.(aa).6 Project Co will connect the antenna headend equipment room to the Backbone and Rooftop Communications Pathway systems as prescribed in Sections 7.9.2.2(7) and 7.9.2.2(8) respectively; and

7.9.2.2.1.(aa).7 Provide a pre-action sprinkler system within each space.

7.9.2.2(1)(bb) Ancillary Communications Spaces

7.9.2.2.1.(bb).1 The Facility will have a number of technical support areas that will contain equipment racks for local clinical, OR integration, and AV equipment. These spaces will require cooling, power, humidity controls, and IM/IT Infrastructure to support a small number of equipment or server racks.

7.9.2.2.1.(bb).2 These spaces include the following locations, at a minimum, and in any other locations that will contain equipment racks for local clinical, OR integration, and/or AV equipment:

(bb).2.1 Technical Room-Imaging;

(bb).2.2 Alcove-Local Equipment adjacent to ORs or Interventional Suites; and

(bb).2.3 Control-AV.

7.9.2.2.1.(bb).3 It is anticipated that:

(bb).3.1 each Technical Room-Imaging will accommodate two (2) server cabinets for AV equipment;

(bb).3.2 each Alcove-Local Equipment will contain a single server cabinet housing OR integration Equipment for the Interventional Suite/Operating Room it is associated with; and

(bb).3.3 the Control-AV room within the Media Services department will accommodate at minimum three (3) server racks for AV equipment.

7.9.2.2.1.(bb).4 In each of these spaces, Project Co will supply and install drip trays under all sprinkler heads that are appropriately drained and supplied with a complete leak detection system that is monitorable through the BMS system by the Owner.

7.9.2.2(1)(cc) Project Co will coordinate the requirements of these rooms with the Owner and will provide the power, cooling, humidity controls and IM/IT Infrastructure required to support the equipment installed within these rooms.

7.9.2.2(2) Site Utilities

7.9.2.2(2)(a) Project Co will provide multiple sets of 100 mm underground ducts around the perimeter of the Facility for telecommunications carrier cabling. Project Co will provide and install all required manholes, pull and junction boxes, service vaults, and connections required. Refer to, adapt and improve drawing contained in Appendix 3D [Site Services Diagram].

7.9.2.2(2)(b) At each point where the telecommunications services are to enter the Facility, Project Co will install an appropriately sized, precast service box with six (6) 100 mm PVC conduits connected to the Facility. Project Co will connect each service vault to the four (4) 100 mm underground ducts via junction boxes and 100 mm conduit. Refer to the underground communications pathway system requirements in Section 7.9.2.2(9) for additional details regarding underground duct requirements.

7.9.2.2(2)(c) Project Co will coordinate the Design of the Facility with the Owner's telecommunications service providers to achieve two (2) physically diverse, redundant telecommunications services to the

Facility. The redundant services will not share a common duct bank or fire compartment before entry into two (2) separate EFs.

7.9.2.2(2)(d) For additional redundancy, the telecommunications services will originate from separate telecommunications provider central offices.

7.9.2.2(2)(e) Project Co will coordinate the tie-in points for the underground ducts with the telecommunications service providers.

7.9.2.2(3) Communications Pathway Systems

7.9.2.2(3)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying and installing telecommunications pathways.

7.9.2.2(3)(b) Project Co will undertake the Design and Construction of a Communications Pathway system in the Facility and on the Site that includes cable tray, conduits, underground ducts, sleeves, pull and junction boxes, underground pre-cast service vaults and boxes and all other miscellaneous accessories and products required for the routing, segregation, organization, support and protection of structured cabling and extra-low voltage communications systems wiring. This includes manufactured dropouts, cable spools and pre-manufactured bends

7.9.2.2(3)(c) All structured cabling will be run in conduit, and cable tray even in fully accessible ceiling areas. Non-continuous support systems such as J-hooks are not permitted. Equipment cords run above accessible ceilings for the express purpose of connecting to wireless access points or DAS antennas can be attached to cable trays or other fixtures above the ceiling using non-continuous support systems to allow flexibility for positioning.

7.9.2.2(3)(d) Where an access point is located in a different room or area than the TO it is designated to connect to and where the ceilings are consistently accessible along the entire route between the access point and the TO, Project Co will supply and install sleeves and fire-stopping (regardless of the fire rating of the

wall) in any full height wall to enable patch cords to be installed.

7.9.2.2(3)(e) Patch cords and cables installed in inaccessible or exposed ceilings for the express purpose of connecting to access points, external antennas or other wireless equipment will be installed in conduit unless otherwise reviewed by the Owner.

7.9.2.2(3)(f) Each drop conduit to a communications outlet will be connected to the nearest cable tray with a minimum 27 mm conduit. Conduit will be attached to the edge of the tray with a conduit bracket designed for this purpose. If this is not possible, conduit will be stubbed within 150 mm above the tray and terminate in a bonding type bushing.

7.9.2.2(3)(g) Install all conduits in finished areas within finished walls and above finished ceilings except in mechanical and Electrical Rooms and the parking levels. Surface raceways may be installed where required and reviewed by the Owner.

7.9.2.2(3)(h) Project Co will coordinate the Design and Construction of the communications pathway systems detailed in this Schedule with:

- 7.9.2.2.3.(h).1 the Facility's architectural and structural elements as well as all other systems including mechanical (including plumbing), electrical, and pneumatic tube systems; and
- 7.9.2.2.3.(h).2 site services and Utilities, landscaping, earthworks and all other exterior alterations and improvements.

7.9.2.2(3)(i) Project Co will undertake the Design and Construction of the communications pathway system to:

- 7.9.2.2.3.(i).1 provide ease of access, such that all components of the Communications Pathway system will not be obstructed and be accessible by a maximum 2.5 m tall ladder in all instances;
- 7.9.2.2.3.(i).2 minimize occupant disruption when the Communications Pathway system is accessed; and
- 7.9.2.2.3.(i).3 provide minimum 50% spare capacity for expansion and change.

7.9.2.2(3)(j) Project Co will ensure the communications pathway system is:

- 7.9.2.2.3.(j).1 isolated from sources of EMI as well as high magnetic fields, radiation and high temperatures;
- 7.9.2.2.3.(j).2 installed at parallel or right angles to building lines in order to keep cable run length at an absolute minimum;
- 7.9.2.2.3.(j).3 installed without burrs, sharp edges or projections;
- 7.9.2.2.3.(j).4 installed with sweeping bends in accordance with TIA standards;
- 7.9.2.2.3.(j).5 inaccessible to Patients and the general public;
- 7.9.2.2.3.(j).6 not routed through electrical or mechanical rooms, except for the express purpose of servicing these rooms; and
- 7.9.2.2.3.(j).7 not in conflict with other building elements including architectural, structural, mechanical and electrical components.

7.9.2.2(3)(k) Project Co will:

- 7.9.2.2.3.(k).1 Fire-stop communications pathway system and cable penetrations of any kind resulting from the installation of structured cabling and extra-low voltage communications systems wiring using approved fire-stop systems. This applies to all types of full-height walls for the purpose of either restoring the fire rating of the wall or for infection control and acoustic reasons. Refer to the PHSA Communications Infrastructure Standards and Specifications for a list of approved fire-stop systems;
- 7.9.2.2.3.(k).2 Bond and ground all conduits, cable trays, racks and other infrastructure as set out in the PHSA Communications Infrastructure Standards and Specifications;
- 7.9.2.2.3.(k).3 Identify the communications pathway system using unique colour bands. Colouring scheme will comply with the Owner's standard:
  - (k).3.1 Major colour to be 100 mm wide and minor colour to be 50 mm wide;
  - (k).3.2 Identify raceways with coloured bands at intervals of 6 m, plus at the point where the raceway enters a wall or floor, e.g. raceway is identified on both

sides of a penetration to facilitate tracing of raceway; and

(k).3.3 Colour-code all junction/pull boxes using spray paint on the cover.

7.9.2.2.3.(k).4 Provide lamacoid labels identifying the origin and destination of each connecting conduit on the inside covers of all pull boxes used for outside plant and intra-building backbone cables;

7.9.2.2.3.(k).5 Ensure that the communications pathways system is constructed to compensate for building movement when crossing expansion joints in the Facility and between buildings in the Facility.

7.9.2.2(4) Communications Cable Tray

7.9.2.2(4)(a) Project Co will undertake the Design and Construction of the communications cable trays and associated components in the Facility for structured cabling and extra-low voltage communications systems wiring;

7.9.2.2(4)(b) The types of communications cable tray are as follows:

7.9.2.2.4.(b).1 Basket cable tray is to be supplied and installed:

(b).1.1 In all Facility hallways and corridors, connecting all Communications Rooms on each floor, unless otherwise reviewed by the Owner;

(b).1.2 In the MERs, EFs, HEs, and TRs, where it will be installed around the perimeter walls and extended over equipment racks and server cabinets; and

(b).1.3 For use as vertical risers to provide cable strain relief.

7.9.2.2.4.(b).2 Fully enclosed cable tray will be used on parking levels or other spaces exposed to the public;

7.9.2.2(4)(c) The size for all types of communications cable tray will be:

7.9.2.2.4.(c).1 Minimum depth will be 100 mm;

7.9.2.2.4.(c).2 Minimum width will be 610 mm, except where reviewed by the Owner; and

7.9.2.2.4.(c).3 The fill ratio for communications cable tray is to be 25 % maximum at Service Commencement.

7.9.2.2(4)(d) When a communications cable tray interfaces with a group of 103 mm sleeves or conduits, its width and or height will be adjusted above the minimum dimensions where necessary to encompass all sleeves and conduits in the group;

7.9.2.2(4)(e) Project Co will maintain the following clearances when designing and installing communications cable tray in the Facility, as follows:

7.9.2.2.4.(e).1 a minimum of 1.22 m from any motor;

7.9.2.2.4.(e).2 a minimum of 50 mm from light fixtures (150 mm if the lighting fixture is fluorescent);

7.9.2.2.4.(e).3 a minimum of 150 mm from any source of EMI;

7.9.2.2.4.(e).4 a minimum of 305 mm of continuous clearance on at least one side of a communications cable tray along its entire length wherever it is installed in the Facility to enable installation and maintenance of structured cabling and extra-low voltage communications systems wiring;

7.9.2.2.4.(e).5 a minimum of 600 mm horizontal clearance on one side of cable trays mounted adjacent to one another or to walls or other obstructions;

7.9.2.2.4.(e).6 provide a minimum clearance of 300 mm above, 150 mm in front, and 75 mm below piping, conduits, ductwork, etc. The Owner may consider conflicts with other services on a case-by-case basis. Subject to review by the Owner, in those cases the clearance above will be no less than 150 mm for no more than 600 mm out of any 3000 mm length of cable tray;

7.9.2.2.4.(e).7 the bottom of the communications cable tray will be between 200 mm and 305 mm above an accessible finished ceiling; and

7.9.2.2.4.(e).8 communications cable tray will be mounted at 2.7 m AFF in all Communications Rooms.

7.9.2.2(4)(f) Project Co will supply and install manufactured cable dropouts where cables exit and enter all horizontal communications cable trays in the Facility, as follows:

7.9.2.2.4.(f).1 Provide tray manufacturer's cable dropout fittings that clip over the side of the communications cable tray without the need to cut into the cable tray; and

7.9.2.2.4.(f).2 Undertake the Design and Construction of the communications cable tray in a manner that enables the cable dropouts to be placed to empty cables directly and fully into vertical cable management channels, GigaBIX cable management modules and other sections of communications cable tray.

7.9.2.2(4)(g) Where required by the Owner to segregate cables for different networks or systems, Project Co will supply and install dividers inside the communications cable tray. Where dividers are used, fill calculations will apply to each divided section of the communications cable tray.

7.9.2.2(5) Communications Sleeves

7.9.2.2(5)(a) Where communications cable trays are required to pass through any full-height walls or floors regardless of their location and fire rating, Project Co will supply and install 103 mm Hilti speed sleeves in the Facility;

7.9.2.2(5)(b) The quantity of 103 mm Hilti speed sleeves supplied and installed will accommodate the capacity of the communications cable tray;

7.9.2.2(5)(c) The communications cable tray will end 600 mm from any group of horizontal 103 mm Hilti speed sleeves passing through a wall;

7.9.2.2(5)(d) Unobstructed clearance will be provided around a group of 103 mm Hilti speed sleeves passing through a wall for serviceability. This includes the provision of 450 mm of unobstructed clearance from the side of any group of 103 mm Hilti speed sleeves;

7.9.2.2(5)(e) Project Co will use the Hilti ganging wall plate when installing two or more Hilti speed sleeves; and

7.9.2.2(5)(f) For backbone riser sleeves, the Project Co will use a combination of Hilti CP 680 cast-in-place fire stop devices complete with CP-653-4" speed sleeves inserted into them.

7.9.2.2(6) Communications Conduits

7.9.2.2(6)(a) Project Co will undertake the Design and Construction of all conduits and associated components in the Facility for structured cabling and extra-low voltage communications systems wiring;

7.9.2.2(6)(b) Conduits will be EMT or rigid steel. PVC is only permissible where EMT or rigid steel is not permissible;

7.9.2.2(6)(c) Regardless of size, each conduit will have a pull string inserted and tied off at each end;

7.9.2.2(6)(d) Project Co will not encase EMT in concrete unless such installation is permitted by code and is reviewed by the Owner as being necessary to achieve a concealed installation in finished spaces such as exposed Architectural Concrete stairwells. Refer to Section 7.8 Electrical (Division 26) for additional requirements relating to the encasement of conduits in concrete;

7.9.2.2(6)(e) Project Co will individually connect each TO in the Facility to the nearest communications cable tray with a minimum 27 mm conduit, as follows:

- 7.9.2.2.6.(e).1 in the case of basket tray, conduits will terminate in a bonding-type bushing 150 mm above the tray's sidewall;
- 7.9.2.2.6.(e).2 in the case of totally enclosed cable tray, conduits will be terminated in the tray's sidewall; and
- 7.9.2.2.6.(e).3 in the case of ladder tray, conduits will be attached to the edge of the tray with a bracket designed for this purpose.

7.9.2.2(6)(f) All conduit will be sized to not exceed a 28 % fill ratio with no more than accumulative total of two (2) 90º bends. Where there are no bends, the fill ratio can be increased to 40 %;

7.9.2.2(6)(g) Sections between pull points will not exceed 30 m. In conduit runs that total more than 30 m, insert pull boxes so that no segment between pull points exceeds the 30 m limit;

7.9.2.2(6)(h) Pull boxes will be placed in straight sections of conduit and will not be used in lieu of a bend; and

7.9.2.2(6)(i) All conduits with an internal diameter of 50 mm or less will have sweeping bends with inside radius being no less than six (6) times the internal diameter of the conduit. For conduit 50 mm or larger, the bend radius will be no less than ten (10) times the internal conduit diameter.

7.9.2.2(6)(j) Fittings such as LB type joints are not acceptable. Smart LB joints are acceptable, provided the minimum bend-radius requirement is met.

7.9.2.2(7) Backbone Communications Pathway System

7.9.2.2(7)(a) Project Co will undertake the Design and Construction of a backbone communications pathway system within the Facility that provides two (2) physically diverse routes between:

7.9.2.2.7.(a).1 the two MERs;

7.9.2.2.7.(a).2 each MER and each TR; and

7.9.2.2.7.(a).3 each MER and each Entrance Facility Room.

7.9.2.2(7)(b) The primary and diverse routes will be separated by a minimum of 20 metres along the entire route and be run in separate fire compartments where possible.

7.9.2.2(7)(c) Project Co will undertake the Design and Construction of a backbone Communications Pathway system within the Facility that provides a vertical riser connecting each vertical stack of TRs to each MER.

7.9.2.2(7)(d) Project Co will supply and install a minimum of four (4) 103 mm Hilti speed sleeves and/or conduits (or combination thereof) in each backbone riser and will add one (1) additional 103 mm Hilti speed sleeve or conduit for every two (2) additional Communications Rooms serviced from a riser stack. Supply the same amounts of sleeves/conduits in each Communications Room in the same riser stack.

7.9.2.2(7)(e) To support the campus fibre ring, Project Co will undertake the Design and Construction of a backbone communications pathway system in the Facility that provides a connection from the two EFs within the Facility to two (2) separate communications junction boxes located on the first parking level within the Facility, as follows:

7.9.2.2.7.(e).1 each EF will only connect to one (1) junction box;

7.9.2.2.7.(e).2 one (1) junction box will be located near the future site of the Research Building;

7.9.2.2.7.(e).3 one junction box will be located near the future Office Building;

7.9.2.2.7.(e).4 two (2) 103 mm communications conduits or enclosed cable tray will be installed connecting each junction boxes to their respective EF connection point; and

7.9.2.2.7.(e).5 junction boxes will be at minimum 600 mm by 600 mm and will be mounted to the ceiling of the parking level and as required by the PHSA Communications Infrastructure Standards and Specifications and ANSI/TIA-569E.

7.9.2.2(7)(f) To support the extension of outside plant cables between the Entrance Facility Rooms and MERs, Project will undertake the Design and Construction of four (4) 103 mm EMT conduits between these rooms.

7.9.2.2(7)(g) Four (4) 103 mm EMT conduits will be supplied and installed by Project Co to connect the antenna headend equipment to the backbone communications riser system.

7.9.2.2(8) Rooftop Communications Pathway System

7.9.2.2(8)(a) Project Co will undertake the Design and Construction of a rooftop communications pathway system that will provide contiguous and continuous support of cabling installed from the antenna headend equipment room to antennas and wireless equipment placed on the roof of the Facility.

7.9.2.2(8)(b) The composition of the rooftop communications pathway system in terms of routing, type and quantities of pathways to be supplied and installed by Project Co will meet the Owner's and telecommunications carriers' requirements for the various types of:

7.9.2.2.8.(b).1 Wireless systems planned for the roof of the Facility; and

7.9.2.2.8.(b).2 Fire ratings associated with the cables to be installed between the HE and antennas and wireless equipment placed on the roof of the Facility.

7.9.2.2(8)(c) The Design of the rooftop communications pathway system will be such that the pathways will be installed below the roof deck and rise up to the roof level through multiple roof penetration housings positioned in close proximity to where rooftop antennas and wireless equipment are to be located.

7.9.2.2(8)(d) Rooftop penetration housings will:

- 7.9.2.2.8.(d).1 accommodate the number of conduits and cables required at each location;
- 7.9.2.2.8.(d).2 be lockable;
- 7.9.2.2.8.(d).3 be installed with a curb;
- 7.9.2.2.8.(d).4 meet all requirements for resistance to wind, water penetration and snow loads applicable to the local climatic conditions and required by the VBBL;
- 7.9.2.2.8.(d).5 be made of suitable materials for an outside environment. At a minimum, provide 2 mm thick aluminum housing and curb with a UV-protected powder coated finish of 0.05 mm, and stainless-steel fasteners;
- 7.9.2.2.8.(d).6 include gasketed lid to housing and housing to curb connections joints to ensure compliance to ICC 2015 Air Permeance Levels;
- 7.9.2.2.8.(d).7 meet building envelope and energy requirements stated in this Agreement;
- 7.9.2.2.8.(d).8 be large enough to accommodate cable bend radiuses and provide the space and access for installation and maintenance of cables; and
- 7.9.2.2.8.(d).9 come with watertight exit seals for conduits and cables and all other accessories required for a turnkey solution.

7.9.2.2(8)(e) To meet the requirement to provide contiguous and continuous support of cabling, the Owner will permit Project Co to extend the rooftop communications pathway system for short distances on the roof from penetration housings to antenna and wireless equipment locations.

- 7.9.2.2.8.(e).1 These short extensions will, wherever possible, be kept off the roof deck and attached to structures such as the parapet wall; and
- 7.9.2.2.8.(e).2 Where attachment to structure is not possible, these short extensions of the rooftop communications pathway system will be supported off the roof deck and elevated at a

height acceptable to the Owner using a non-penetrative support system that is UV and wind resistant, rust proof and can support the snow load applicable to the local climatic conditions. Where this solution is employed, Project Co will also be required to supply and install non-penetrative free-standing step over systems to ensure safe and free movement over the rooftop communications pathway system as required by the Owner.

7.9.2.2(8)(f) Bond all telecommunications equipment located on the roof level, including antennas, satellite receivers, and wireless access points, to the lightning protection system.

7.9.2.2(8)(g) Where installed in conduit, Telecommunications cables that penetrate the rooftop will be installed with lightning surge arresters.

7.9.2.2(8)(h) For all pathways that are exposed to the outside environment, Project Co will use suitable materials such as aluminum or hot galvanized steel and include expansion joints at regular intervals to ensure the rooftop communications pathway system responds appropriately to the wide range of temperatures that exist on rooftops.

7.9.2.2(9) Underground Communications Pathway System

7.9.2.2(9)(a) Project Co will undertake the Design and Construction of a dedicated underground communications pathway system to connect the Facility to:

7.9.2.2.9.(a).1 the Mobile Medical Unit (MMU);

7.9.2.2.9.(a).2 all Wi-Fi access points, cameras, and other connected network equipment and devices required on Site; and

7.9.2.2.9.(a).3 each streetlight pole placed on the Site within the property boundaries of the Health Campus.

7.9.2.2(9)(b) Provide two (2) 50 mm underground ducts to the designated locations for the MMUs and terminate them in service pedestals that are supplied and installed by Project Co; refer to Section 5.3. Each service pedestal will:

7.9.2.2.9.(b).1 be co-located in the designated MMU parking areas and positioned to ensure the connections to the MMU trailers are kept as short as possible;

7.9.2.2.9.(b).2 have a minimum NEMA rating of 4, and all aspects of its construction will be durable and resistant to corrosion and UV radiation as well as to vandalism and tampering;

7.9.2.2.9.(b).3 be equipped with an integral means for sealing and for using sealing fittings and connectors. This also applies to each internal compartment, pathway and cable entry point;

7.9.2.2.9.(b).4 come with lockable, Tamper Resistant access doors that are weather proof and provide easy access to all communications and power connections;

7.9.2.2.9.(b).5 be protected from vehicles by bollards where there is risk of vehicular damage;

7.9.2.2.9.(b).6 be monitored by the IP video surveillance system; and

7.9.2.2.9.(b).7 come equipped with sufficient internal pathways and compartments to segregate the different services being provided:

(b).7.1 Communications compartments will be provided with internal wire management and be sized for the splicing, termination and connection of fiber and UTP cabling as well as for the installation of grounding and bonding, media converters and surge protection devices.

7.9.2.2(9)(c) The underground communications pathway system will be designed to support the initial and anticipated telecommunications needs. In determining the total number and size of ducts required, Project Co will consider:

7.9.2.2.9.(c).1 growth;

7.9.2.2.9.(c).2 difficulty of adding pathways in the future; and

7.9.2.2.9.(c).3 type and size of cable to be installed.

7.9.2.2(9)(d) All underground ducts will be:

7.9.2.2.9.(d).1 PVC DB2, orange in colour;

7.9.2.2.9.(d).2 installed with lightning protection conductors in conduit;

7.9.2.2.9.(d).3 connected to the nearest communications TR inside the Facility with appropriate lightning protection upon entering the Facility;

7.9.2.2.9.(d).4 sized to not exceed a 28 % fill ratio with no more than two 90º bends. Where there are no bends, the fill ratio can be increased to 40 %;

7.9.2.2.9.(d).5 joined and cemented in accordance with the manufacturer's instructions;

7.9.2.2.9.(d).6 properly drained in accordance with building and electrical codes;

7.9.2.2.9.(d).7 checked by pulling a mandrel, sized for each duct from both directions to remove obstructions;

7.9.2.2.9.(d).8 cleaned by passing a wire brush mandrel and/or rubber duct swab (or approved alternative) of appropriate size back and forth until all foreign materials and water are removed;

7.9.2.2.9.(d).9 separated from electric power ducts by a minimum of 300 mm; and

7.9.2.2.9.(d).10 installed with a minimum of one (1) metre of cover from the top of the duct bank to grade.

7.9.2.2(9)(e) Project Co will place a mule tape in all underground ducts. The mule tape will be Greenlee 4435 or approved equal.

7.9.2.2(9)(f) Supply and install a 152 mm wide warning marker tape in the trench on the centreline of each duct approximately 300 mm below final grade.

7.9.2.2(9)(g) Project Co will supply and install a precast service box when any section of duct has more than 180º of bends.

7.9.2.2.9.(g).1 Ducts will enter and exit service boxes in a straight-line method; and

7.9.2.2.9.(g).2 Service box lid will have the word "Communications" in permanent raised or stamped letters.

7.9.2.2(10) Communications Power

7.9.2.2(10)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying and installing telecommunications power.

7.9.2.2(10)(b) In the MERs and TRs, Project Co will supply and install two (2) L21-30R twist lock receptacles per equipment rack and server cabinet; one (1) from the central IM/IT UPS distribution panel in the room and one from the vital distribution panel in the room.

7.9.2.2(10)(c) In the EFs, Project Co will allow for the provision of two L21-30R twist lock receptacles per equipment rack space fed from vital and UPS distribution panels in the room. Exact receptacle configuration will be confirmed by the Owner during Design.

7.9.2.2(10)(d) In the antenna headend equipment room, the Project Co will allow for the provision of two (2) L21-30R twist-lock receptacles for each equipment rack allocated for site wide wireless systems where one receptacle is fed from the central IM/IT UPS distribution panel in the room and the other receptacle is fed from the vital distribution panel in the room. Exact receptacle configuration will be provided by the Owner during Design.

7.9.2.2(10)(e) Project Co will supply and install convenience electrical outlets with 15/20-A T-slot receptacles along the perimeter wall of all Communications Rooms at a maximum spacing of one outlet every 3 m.

7.9.2.2.10.(e).1 Each convenience electrical outlet will be recessed into the wall cavity.

7.9.2.2.10.(e).2 Connect 50% of outlets to vital power and the remainder to conditional power. Each receptacle to be on a dedicated circuit. All receptacles will be set flush-mounted and centred at 300 mm AFF. Refer to Section 7.8 Electrical (Division 26) for further details.

7.9.2.2(10)(f) Each TR rack will include redundant ePDUs, each connected to separate L21-30R 208-V (3-phase) circuits, one on UPS, the other on Vital power.

7.9.2.2(10)(g) Each equipment rack in the MERs will include two (2) ePDUs, each connected to separate L21-30R 208V (3-phase) circuits, one (1) on UPS, the other on Vital power.

7.9.2.2(10)(h) Each server rack in the MERs will include two (2) ePDUs each connected to dedicated L21-30R-208V

(3-phase) circuits, one on UPS, the other on Vital power.

7.9.2.2(10)(i) PDU's will have the following requirements:

7.9.2.2.10.(i).1 input: L21-30P 3-metre cord;

7.9.2.2.10.(i).2 one (1) 5-20R receptacle;

7.9.2.2.10.(i).3 thirty (30) C13 receptacles;

7.9.2.2.10.(i).4 six (6) C19 receptacles;

7.9.2.2(10)(j) Project Co will provide N+1 redundancy for UPS and vital power feeds for each rack in a Communications Room.

7.9.2.2(11) Communications Grounding and Bonding

7.9.2.2(11)(a) The telecommunications grounding backbone system contains grounding bus bars, grounding conductors, bonding conductors, and connecting devices (including pressure connectors, lugs, clamps, or exothermic welds). These components provide a low-impedance path to ground for stray voltages or spurious signals present on telecommunications media and equipment.

7.9.2.2(11)(b) Project Co will undertake the Design and Construction of a complete telecommunication grounding and bonding infrastructure in the Facility that meets the requirements detailed in the PHSA Communications Infrastructure Standards and Specifications.

7.9.2.2(12) Communications Equipment Racks

7.9.2.2(12)(a) Project Co will supply and install equipment racks required in all of the Facility Communications Rooms. Equipment racks will:

7.9.2.2.12.(a).1 be free standing four (4)-post equipment rack, black in colour and gang-able with the following dimensions: 610 mm wide x 914 mm deep height x 2.13 m high;

7.9.2.2.12.(a).2 come with RU markings (RU1 at top and RU44 at bottom) on front and rear posts and rails;

7.9.2.2.12.(a).3 be independently tested and certified to meet or exceed established Seismic Zone 4 NEBS Telcordia GR-63-CORE standards and specifications;

7.9.2.2.12.(a).4 provide 483 mm rack mount capability for rack-mountable components; and

7.9.2.2.12.(a).5 provide 1.96 m of vertical mounting space. (44 rack units).

7.9.2.2(12)(b) Refer to the PHSA Communications Infrastructure Standards and Specifications for product details, approved manufacturers and model numbers.

7.9.2.2(12)(c) Project Co will supply and install equipment racks in the following locations (and quantities) at a minimum and other locations as determined by the Owner in order that network equipment necessary to be located outside of a Communications Room will be installed within equipment racks if reasonably appropriate:

7.9.2.2.12.(c).1 EF – Two (2) equipment racks per room;
7.9.2.2.12.(c).2 MER – Six (6) equipment racks per room;
7.9.2.2.12.(c).3 TR – Four (4) equipment racks per room; and
7.9.2.2.12.(c).4 Antenna HE room – Eight (8) equipment racks.

7.9.2.2(12)(d) Additional equipment racks (including vertical and horizontal cable management and ePDUs) over and above the minimum quantities noted above will be supplied and installed by Project Co to:

7.9.2.2.12.(d).1 provide more space to accommodate all the rack mountable equipment associated with any network or system required in the Facility that is permitted to be located in a Communications Room; and/or
7.9.2.2.12.(d).2 achieve the growth factor required in a Communications Room.

7.9.2.2(12)(e) When additional equipment racks are required over and above the minimum quantities noted above, Project Co will:

7.9.2.2.12.(e).1 enlarge the Communications Room to accommodate all the additional equipment racks (including vertical cable management) and meet all required clearances;
7.9.2.2.12.(e).2 supply and install additional power and cooling capacity for each additional equipment rack in accordance with the requirements in this Agreement; and
7.9.2.2.12.(e).3 adjust any other related infrastructure required to accommodate additional equipment racks and/or an enlarged Communications Room.

7.9.2.2(12)(f) Project Co will ensure:

7.9.2.2.12.(f).1 the maximum number of Data Drops per equipment rack will be 240 or as set out in the PHSA Communications Infrastructure Standards at the time when the Facility becomes operational;

7.9.2.2.12.(f).2 the location of the equipment racks will provide physical and environmental protection for IM/IT network and extra-low voltage communications systems equipment. This protection addresses threats including temperature, humidity, vibration, exposure to ultraviolet radiation, ingress of dust, fluids or other contaminants, physical damage (accidental or malicious), security, electromagnetic interference and the presence of other hazards and impediments;

7.9.2.2.12.(f).3 the location of the equipment racks will allow for adequate access to safely allow repair, expansion, installation and maintenance of the structured cabling infrastructure, extra-low voltage communications system wiring and IM/IT network and extra-low voltage communications systems equipment;

7.9.2.2.12.(f).4 access clearances of one (1) metre in the front, end of row, and behind the rear of the equipment racks is to be provided. Where several rows of racks are located side by side, the row spacing will be a minimum of one (1) metre. A minimum clearance of 50 mm will be maintained between the side of an equipment rack's vertical manager and the wall.

(f).4.1 All clearances are to be measured from the face of any equipment mounted to the wall (as opposed to the wall itself) and from the front or side of the vertical cable managers;

7.9.2.2.12.(f).5 all installations of equipment racks will be reviewed by Project Co's Structural Engineer-of-Record for certification as being seismically restrained in accordance with the requirements for a post-disaster building; and

7.9.2.2.12.(f).6 Equipment racks will be grounded in accordance with the PHSA Communications Infrastructure Standard.

7.9.2.2(12)(g) Project Co will supply and install vertical and horizontal cable management. Vertical and

horizontal cable management requirements are as follows:

7.9.2.2.12.(g).1 all vertical cable managers will be 2.13 m in height;

7.9.2.2.12.(g).2 where two (2) or more equipment racks are mounted side by side, the equipment racks will have a double-sided 254 mm to 305 mm wide vertical cable managers installed in between them and ganged with metal bolts and washers. This size of vertical cable manager will also be installed where one of the adjacent equipment racks is designated as future or planned and is not physically being installed under the scope of this Project;

7.9.2.2.12.(g).3 supply and install double sided 152 mm wide vertical cable managers at either end of the line-up;

7.9.2.2.12.(g).4 all vertical cable managers are to be equipped with three slack management spool kits; and

7.9.2.2.12.(g).5 supply and install two (2) rack-mounted horizontal wire managers for the top and bottom of each equipment rack. Each horizontal wire manager will be two (2) rack units in height and will come with fingers, rear access and cover plate.

7.9.2.2(12)(h) For each equipment rack, Project Co will supply and install two (2) redundant ePDUs connected to L21-30R circuits, one fed from the centralized IM/IT UPS power and one from the vital power. The requirements for each ePDU is as follows:

7.9.2.2.12.(h).1 appropriate inputs and outputs to support the rack mounted network equipment;

7.9.2.2.12.(h).2 LCD metered with Ethernet Connection and Environmental Probe; and

7.9.2.2.12.(h).3 supply and install all required mounting hardware necessary to attach each ePDU to the vertical post of an equipment rack.

7.9.2.2(12)(i) In the MERs, Project Co will install front and rear blanking plates in all empty rack units of equipment racks, as well as vertical cable managers, to facilitate directional airflow through the racks.

7.9.2.2(13) Communications Server Cabinets

7.9.2.2(13)(a) Project Co will supply and install ten (10) server cabinets in each MER. The requirements for the server cabinets are as follows:

- 7.9.2.2.13.(a).1 The server cabinets will be equal to or better than a Belden X2S48-1S0002;
- 7.9.2.2.13.(a).2 Server cabinets will be 610 mm wide by 1.22 m deep;
- 7.9.2.2.13.(a).3 Steel construction painted black medium texture. 48RU high complete with engraved U markings starting with 1U at the top to 48U at the bottom;
- 7.9.2.2.13.(a).4 Perforated (78 % open area) front door with a KS100 Server Cabinet locking swing handle;
- 7.9.2.2.13.(a).5 Perforated (78 % open area) rear door with KS100 locking swing handle;
- 7.9.2.2.13.(a).6 Solid bottom panel;
- 7.9.2.2.13.(a).7 Top panel with solid front and two (2) 150 mm by 100 mm Panduit Cool Boots (or equivalent) in the rear;
- 7.9.2.2.13.(a).8 Two (2) pairs of adjustable 11 GA EIA rails with square M6 clips nuts, fifty (50) M6 mounting hardware;
- 7.9.2.2.13.(a).9 The server cabinets will be independently tested and certified to meet or exceed established Seismic Zone 4 NEBS Telcordia GR-63-CORE standards and specifications;
- 7.9.2.2.13.(a).10 Two (2) side panels painted black medium texture, with lock;
- 7.9.2.2.13.(a).11 Two (2) 48U vertical wire managers (100 mm wide) One on each of the sides at the rear of the server cabinets;
- 7.9.2.2.13.(a).12 48U vertical PDU manager support bracket 89 mm (3.5”) wide to support both PDU on the same side; and
- 7.9.2.2.13.(a).13 Refer to the PHSA Communications Infrastructure Standards and Specifications for product details, approved manufacturers and model numbers.

7.9.2.2(13)(b) Mount Polygon Slack managers to the top exterior of each server cabinets. Use an adhesive to attach the ring with Velcro. Use the slack manager to store three (3) meters of fiber optic trunk cabling.

7.9.2.2(13)(c) Project Co will utilize a hot-aisle containment system for capturing and exhausting heat produced by all server cabinets.

7.9.2.2(13)(d) The server cabinets will be placed on heavy-duty seismic ISO-Base platforms provided and installed by Project Co. The ISO-Base platforms will be equal to or better than Heavy-Duty ISO-Base Planks.

- 7.9.2.2.13.(d).1 Modular ISO-Base planks are to be secured to standard ISO-Base planks via frame connectors to support a walkable 6 mm (¼") platform that extends down the middle of the row;
- 7.9.2.2.13.(d).2 ISO-Base to be outfitted with bonded dish liners to reduce vertical vibration;
- 7.9.2.2.13.(d).3 Maximum weight of a server cabinet when fully loaded is 1134 kg (2500 lb);
- 7.9.2.2.13.(d).4 ISO-Base to support the sliding door assembly at both ends of the hot aisle containment row. The entire row will move as a complete unit. There must be 305 mm (12") of unobstructed space in the horizontal plane to allow the row to move during a seismic event;
- 7.9.2.2.13.(d).5 All power and communication cabling must have sufficient slack loop in the cable drop to the top of the server cabinet to allow for the server cabinets to move 305 mm (12") horizontally in any direction during a seismic event; and
- 7.9.2.2.13.(d).6 Project Co will provide manufacturer's Structural (Seismic) Engineer's sign off upon completion of the project.

7.9.2.2(13)(e) Project Co will ensure that:

- 7.9.2.2.13.(e).1 the location of the server cabinets will provide physical and environmental protection for IM/IT network and extra-low voltage communications systems equipment. This protection address threats including temperature, humidity, vibration, exposure to ultraviolet radiation, ingress of dust, fluids or other contaminants, physical damage (accidental or malicious), security, electromagnetic interference and the presence of other hazards and impediments;
- 7.9.2.2.13.(e).2 the location of the server cabinets will allow for adequate access to safely allow repair, expansion, installation and maintenance of the structured cabling infrastructure, extra-low voltage communications system wiring and

IM/IT network and extra-low voltage communications systems equipment;

7.9.2.2.13.(e).3 access clearance of one (1) metre in the front and behind the rear of the server cabinet is to be provided. A minimum clearance of 50 mm will be maintained between the side of the server cabinet and the wall. All clearances are to be measured from the face of any equipment mounted to the wall (as opposed to the wall itself) and from the front or side of the vertical cable managers;

7.9.2.2.13.(e).4 all server cabinets, unless otherwise specified, will be mounted on seismic isolation bases, as described in Section 7.9.2.2(13)(d). The platforms will be bolted together and seismically anchored.

7.9.2.2.13.(e).5 the installation of the server cabinets will be reviewed by Project Co's Structural Engineer-of-Record for certification as being seismically restrained in accordance with the requirements for a post-disaster building; and

7.9.2.2.13.(e).6 the server cabinets will be grounded in accordance with PHSA Communications Infrastructure Standards and Specifications.

7.9.2.2(13)(f) For each server cabinet, Project Co will supply and install two redundant ePDUs (Power Distribution Units) connected to L21-30R circuits, one fed from the centralized IM/IT UPS power and one from the vital power. The requirements for each ePDU are as follows:

7.9.2.2.13.(f).1 appropriate inputs and outputs to support the rack-mounted network equipment;

7.9.2.2.13.(f).2 LCD metered with Ethernet connection and environmental probe; and

7.9.2.2.13.(f).3 supply and install all required mounting hardware necessary to attach each ePDU inside the server cabinet.

7.9.3 IM/IT Structured Cabling

7.9.3.1 Basic Requirements

7.9.3.1(1) System Overview

7.9.3.1(1)(a) Structured cabling is defined as Facility telecommunications cabling infrastructure that

consists of a number of standardized smaller elements called subsystems.

7.9.3.1(1)(b) This system includes the following subsystems:

7.9.3.1.1.(b).1 Interbuilding structured cabling;

7.9.3.1.1.(b).2 Intrabuilding structured cabling backbone;

7.9.3.1.1.(b).3 Intrabuilding structured cabling horizontal; and

7.9.3.1.1.(b).4 Structured cabling patching.

7.9.3.1(2) Applicable Area

7.9.3.1(2)(a) Applies to the Facility.

7.9.3.1(3) System Responsibilities

7.9.3.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.3.1(3)(b) Owner will:

7.9.3.1.3.(b).1 Provide the latest PHSA Communications Infrastructure Standards and Specifications for Project Co system selection and design.

7.9.3.1.3.(b).2 Provide design feedback to Project Co.

7.9.3.1(3)(c) Project Co will:

7.9.3.1.3.(c).1 Select and design all systems in accordance with the PHSA Communications Infrastructure Standards and as determined in consultation with the Owner.

7.9.3.1.3.(c).2 Design, supply and install all system infrastructure.

(c).2.1 All cabling infrastructure to be designed by a Project Co RCDD with experience in similar acute care hospital Design and Construction.

7.9.3.1.3.(c).3 Commission all system infrastructure in consultation with the Owner.

7.9.3.1.3.(c).4 Design each room in the Facility such that Data Drops are distributed throughout the room as required to support clinical functionality and convenient use of equipment by Facility Users and in consultation with the Owner.

7.9.3.1.3.(c).5 In consultation with the Owner, assign each room and space in the Facility a work area Data Drop density (“high”, “medium” or “low”) in accordance with the ANSI/TIA-1179 Healthcare Facility Telecommunications

Cabling Standard Table 1. Refer to Appendix 3O [Electrical IM/IT Matrix] for minimum data quantities of selected rooms.

7.9.3.1.3.(c).6 Create, in consultation with the Owner, an operational plan for the cable infrastructure, including a management strategy and resource requirements for maintenance.

7.9.3.2 Performance Criteria

7.9.3.2(1) General

7.9.3.2(1)(a) Structured cabling infrastructure is similar to that of other fundamental building Utilities such as heating, water and electricity. As with other Utilities, interruptions to service will have a serious impact to Facility operations. Because of this, and the additional fact that the useful life of a cabling infrastructure should last several decades, it is essential that the design and installation be done with due care and attention ensuring capacity when and where required as well as protection against obsolescence and physical risks.

7.9.3.2(1)(b) All materials and equipment used will be CSA- or UL-approved (as appropriate) and installed in accordance with manufacturer's specifications and recommendations.

7.9.3.2(1)(c) All components of the structured cabling infrastructure installed on the interior and exterior of the Facility and on the Site in general will be protected from water, moisture, ultraviolet exposure, dust, corrosive agents and all other hazards that could impact the operation, performance, connectivity and or life span of the structured cabling infrastructure.

7.9.3.2(1)(d) All manufacturer's warranties as it relates to the structured cabling infrastructure will be transferable to the Owner at the completion of the project. Refer to the PHSA Communications Infrastructure Standards and Specifications for warranty requirements.

7.9.3.2(1)(e) Fiber optical cabling types installed by Project Co will be OM5 for multimode cabling and OS2 for single-mode cabling.

7.9.3.2(2) Interbuilding Structured Cabling

7.9.3.2(2)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying and installing all structured cabling.

7.9.3.2(2)(b) Provide a campus fibre ring topology adapted and improved upon the indicative electrical document 'Technical Memo TM-15' provided by the Owner.

7.9.3.2(2)(c) The campus cabling system will provide a ring topology to connect MER-A, MER-B and future MERs built on the Site.

7.9.3.2(2)(d) The demarcation for the campus fibre ring will be within the Entrance Facility rooms. Project Co will provide fibre patch panels, patch cords, and all required equipment to allow for fibre termination and patching within the EFs.

7.9.3.2(3) Intrabuilding Structured Cabling Backbone

7.9.3.2(3)(a) Project Co will adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying and installing all structured cabling.

7.9.3.2(3)(b) The cabling design will provide separate physical networks, backbone cable, and pathway diversity of at minimum 20 m, in accordance with Good Industry Practice or equipment vendor specifications and in consultation with the Owner, as required for the telecommunications systems and equipment installed or used in the Facility.

7.9.3.2(3)(c) Provide 6-strand single-mode fibre from each EF to the Control-AV room in the Education and Learning department.

7.9.3.2(3)(d) Provide 96-strand single-mode and 24-strand multi-mode cables from each EF to each MER within the Facility.

7.9.3.2(3)(e) Provide 48-strand single-mode and 24-strand multi-mode cables run from each MER to the HE room via diverse pathways separated by 20 m within the Facility.

7.9.3.2(3)(f) Provide a minimum of 48-strand single-mode and 24-strand multi-mode cables run from each MER to each TR via diverse pathways separated by 20 m within the Facility. For TRs with more than five (5) planned equipment racks, provide an additional 8-strand single-mode and 4-strand multi-mode cable per additional rack.

7.9.3.2(3)(g) Provide a copper backbone cabling infrastructure consisting of 25 pair CAT5E cables run from each MER to each TR via diverse pathways separated by 20 m within the Facility.

7.9.3.2(3)(h) Provide a minimum of 128F single-mode and 128F multi-mode backbone fibre connecting the Facility MERs, via diverse pathways separated by 20 m:

7.9.3.2.3.(h).1 64F single-mode and 64F multi-mode in the primary pathway; and

7.9.3.2.3.(h).2 64F single-mode and 64F multi-mode in the secondary pathway.

7.9.3.2(3)(i) Provide 200 pair CAT5E connecting the Facility MERs via diverse pathways separated by 20 m.

7.9.3.2.3.(i).1 100 pair CAT5E in the primary pathway; and

7.9.3.2.3.(i).2 100 pair CAT5E in the secondary pathway.

7.9.3.2(3)(j) Provide 200 pair CAT5E from the primary EF to the primary MER and 200 pair CAT5E from the secondary EF to the secondary MER.

7.9.3.2(4) Intrabuilding Structured Cabling Horizontal

7.9.3.2(4)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying and installing all structured cabling.

7.9.3.2(4)(b) CAT5E will be used for voice cabling in the Facility. Terminate and label CAT5E as per the PHSA Communications Infrastructure Standards and Specifications for voice cabling.

7.9.3.2(4)(c) The cabling design will provide separate physical networks, in accordance with Good Industry Practice or equipment vendor specifications and in consultation with the Owner, as required for the telecommunications systems and equipment installed or used in the Facility.

7.9.3.2(4)(d) Project Co will undertake the Design and Construction of a complete horizontal Category 6A subsystem for the Facility. This includes the supply, installation, termination, testing, Commissioning, and labelling of all components of the subsystem.

7.9.3.2(4)(e) The maximum permanent link length of any horizontal cable will not exceed 80 m (262') within the entire physical area served by a Communications Room. For horizontal distances, cable will be measured at right angles to the Facility. Risers or vertical distances will also be used to add to the length of the cable.

7.9.3.2(4)(f) In extenuating circumstances and where permitted by the Owner, where the permanent link length of 80 m is exceeded to any TO located on the exterior of the Facility, the underground parking, or exterior Site locations, Project Co will supply and install a powered fibre system equivalent to CommScope's Powered Fibre Cable system that consists of:

- 7.9.3.2.4.(f).1 hybrid fibre / copper cable (either single mode or multimode will be used depending on the distance between the TO and the TR or MER);
- 7.9.3.2.4.(f).2 small form-factor pluggable transceivers;
- 7.9.3.2.4.(f).3 PoE extender;
- 7.9.3.2.4.(f).4 safety and overload protection;
- 7.9.3.2.4.(f).5 power supply;
- 7.9.3.2.4.(f).6 power transmission management; and
- 7.9.3.2.4.(f).7 cable/fibre management.

7.9.3.2(4)(g) The configuration of the horizontal cabling subsystem will be a star structure with separate dedicated Category 6A Data Drops run in a continuous fashion with no splices from the TR or MER to the work area TOs on the same floor.

7.9.3.2(4)(h) The horizontal cabling subsystem supplied and installed by Project Co will include horizontal Category 6A cables, TOs, jacks, mechanical terminations, patch panels and patch cords;

7.9.3.2(4)(i) Project Co will supply and install surge protectors in Communications Rooms for each horizontal Category 6A Data Drop entering the Facility from the exterior. Refer to the PHSA Communications Infrastructure Standards and Specifications for further details.

7.9.3.2(4)(j) Project Co will install appropriate waveguides for all structured cabling that passes through electromagnetic shielding.

7.9.3.2(4)(k) All Telecommunications Outlets included in the Facility will:

- 7.9.3.2.4.(k).1 include a minimum of two (2) Data Drops, except where otherwise noted, with each Data Drop comprising a complete Category 6A structured cabling connection between the RJ45 outlet jack and the port on a network switch;
- 7.9.3.2.4.(k).2 comply with all requirements set out in the PHSA Communications Infrastructure Standards and Specifications;
- 7.9.3.2.4.(k).3 include a minimum 4-port cover plate with RJ45 jacks as required to terminate the supplied cabling, plus blank filler plates on unused outlets; and
- 7.9.3.2.4.(k).4 use Category 6A termination technique.

7.9.3.2(4)(l) All horizontal and structured cabling jacketing will be colour coded as follows:

- 7.9.3.2.4.(l).1 IM/IT network data/VoIP/videoconferencing – BLUE
- 7.9.3.2.4.(l).2 IM/IT network wireless access points - BLUE
- 7.9.3.2.4.(l).3 IP video surveillance – BLUE
- 7.9.3.2.4.(l).4 Guest infotainment – BLUE
- 7.9.3.2.4.(l).5 Nurse call – PURPLE
- 7.9.3.2.4.(l).6 Patient physiological monitoring – GREEN
- 7.9.3.2.4.(l).7 RTLS – WHITE

7.9.3.2(4)(m) RJ45 jack colour will match the cable jacket colour of the network it is serving.

7.9.3.2(4)(n) Project Co will refer to the ANSI/TIA-1179 Healthcare Facility Telecommunications Cabling Standard in conjunction with Appendix 3O [Electrical IM/IT Matrix] and the requirements in this Agreement to establish the minimum quantity of Category 6A Data Drops that Project Co will install in the Facility;

7.9.3.2(4)(o) Refer to Appendix 3O [Electrical IM/IT Matrix] for additional information regarding minimum Data Drop quantities for specified room types. Data quantities specified within Appendix 3O [Electrical IM/IT Matrix] apply only to the IM/IT data network, the

Patient physiological monitoring network, and the guest infotainment network.

7.9.3.2.4.(o).1 Data ports for wireless access points for these networks are excluded from the quantities listed in Appendix 3O [Electrical IM/IT Matrix].

7.9.3.2.4.(o).2 Additional Data Drops will be required in addition to the quantities specified for all other systems.

7.9.3.2.4.(o).3 Data Drop locations specified in Appendix 3O [Electrical IM/IT Matrix] are preliminary and all final locations and quantities of Data Drops and TOs are to be confirmed with the Owner.

7.9.3.2(4)(p) Appendix 3O [Electrical IM/IT Matrix] assigns TIA-1179 low, medium, and high data densities for the specified room types. In cases where there is a disagreement between the TIA-1179 Standard and Appendix 3O [Electrical IM/IT Matrix], Appendix 3O will be used.

7.9.3.2(4)(q) If ANSI/TIA-1179 Healthcare Facility Telecommunications Cabling Standard or Appendix 3O [Electrical IM/IT Matrix] does not clearly identify a Data Drop density for a specific type of room or area in the Facility, then Project Co will determine the Data Drop quantities for that space in consultation with the Owner;

7.9.3.2(4)(r) Notwithstanding the quantities defined in ANSI/TIA-1179, provide a minimum quantity of Data Drops as defined below:

7.9.3.2.4.(r).1 No Data Work Areas – no data outlets are required for the following work area types: Alcove-Hand Hygiene Sink, Alcove-Cleaning Station, Alcove-Nourishment, Locker Rooms, Secure Rooms and Washrooms and Shower Rooms;

7.9.3.2.4.(r).2 Low Density Work Area – provide four (4) Data Drops, except:

(r).2.1 Alcove-Touchdown/Charting – provide six (6) Data Drops;

(r).2.2 In all other Alcoves, except those noted in 7.9.3.2.4.(r).1, provide two (2) Data Drops.

7.9.3.2.4.(r).3 Medium Density Work Area – provide ten (10) Data Drops, except:

(r).3.1 Nourishment Rooms – Provide four (4) Data Drops.

7.9.3.2.4.(r).4 High Density Work Area – provide fifteen (15) Data Drops.

7.9.3.2(4)(s) Provide additional Data Drops in excess of the minimum quantity required:

7.9.3.2.4.(s).1 to support all of the networks, systems and equipment, including the IM/IT Wi-Fi and Telemetry systems, digital signage, Patient registration kiosks, security systems, AGVs, the Pneumatic Tube system, and other equipment to be installed or used in the Facility;

7.9.3.2.4.(s).2 to support future automated inventory control system at 1.83 m (6 ft.) height in each Store-Clean Supplies and in other spaces in consultation with the Owner.

7.9.3.2.4.(s).3 to support the Clinical requirements and equipment defined in Appendix 3A [Clinical Specifications and Functional Space Requirements];

7.9.3.2.4.(s).4 by Good Industry Practice to provide convenience, flexibility or use and operational support throughout the Facility;

7.9.3.2.4.(s).5 to ensure there is one unused Data Drop for each TO installed in the Facility with the exception of those TOs associated with wall-mounted telephones, intercom door stations, bedpan disinfectors, IP Video Surveillance cameras and wireless access points; and

7.9.3.2.4.(s).6 to comply with any other provisions of this Agreement that require Data Drops.

7.9.3.2(4)(t) Project Co will coordinate the Data Drop requirements for large work areas, such as shared offices or Laboratory areas with Appendix 2E, Attachment 1 [Equipment and Furniture] to ensure there is an adequate quantity of Data Drops to support all equipment that requires a network connection.

7.9.3.2(4)(u) Project Co will design each room in the Facility such that Data Drops are distributed throughout the room as required to support clinical functionality and convenient use of equipment by Users and in accordance with Good Industry Practice.

7.9.3.2(4)(v)	Co-locate, at each Telecommunications Outlet location, an appropriate number and type of power receptacles and coordinate this requirement with Project Co's electrical engineer.
7.9.3.2(4)(w)	Provide a Data Drop for all public phones, minimum one (1) per lobby area per department in the Facility.
7.9.3.2(4)(x)	For each printer with fax capabilities in the Facility, provide a minimum of three (3) Data Drops. Provide two (2) Data Drops for printers without fax capabilities.
7.9.3.2(4)(y)	For each workstation in the Facility, provide a minimum of two (2) Data Drops.
7.9.3.2(4)(z)	Provide one (1) Data Drop outside each multimedia room, Patient room, Patient treatment area, and exam/procedure room to support a small digital screen.
7.9.3.2(4)(aa)	Within MDRD spaces, provide Data Drops in modular ceiling plates above each workstation, located so that cables and cords do not impact circulation or span and drape between workstations.
7.9.3.2(4)(bb)	Provide two additional Data Drops in Store-Clean Supplies rooms at 1.8 m AFF, co-located with power to support the Owners inventory management system.
7.9.3.2(4)(cc)	Provide a minimum of two (2) coaxial cables in each elevator travelling cable and coordinate this requirement directly with the elevator vendor.
7.9.3.2(4)(dd)	Provide floor TOs and floor power to connect floor mounted self-registration systems, digital Wayfinding systems including digital signage, Wayfinding kiosks and Patient registration kiosks, as determined in consultation with the Owner. At a minimum, provide two (2) Data Drops and two (2) power outlets per floor-mounted device.
7.9.3.2(4)(ee)	Provide TOs and power to connect wall-mounted displays, including digital signage screens, self-registration systems, digital Wayfinding systems, guest infotainment, and any other digital displays, as determined in consultation with the Owner. At a

	minimum, provide two (2) Data Drops and two (2) power outlets per wall-mounted display.
7.9.3.2(4)(ff)	Project Co will coordinate the structured cabling requirements for any vendor networks on behalf of the Owner.
7.9.3.2(4)(gg)	Provide two (2) Data Drops for each Pneumatic Tube Station and Pneumatic Tube Transfer Station.
7.9.3.2(4)(hh)	Provide 12-strand single-mode fibre and 12-pair CAT5E copper cables from each Technical Room-Imaging associated with two (2) Interventional Suites to the Control-AV room in the Education and Learning department. Cables will have unique labeling, jacketing, and corrugated jacketing/ ducting colours to differentiate them from other fibre optic and copper cabling in the Facility.
7.9.3.2(4)(ii)	Provide 12-strand single-mode fibre and 12-pair CAT5E copper cables from four (4) Technical Room-Imaging associated with selected Operating Rooms to the Control-AV room in the Education and Learning department. Cables will have unique labeling, jacketing, and corrugated jacketing/ ducting colours to differentiate them from other fibre optic and copper cabling in the Facility.
7.9.3.2(4)(jj)	Provide CAT6A and 6-strand single-mode and 6-strand multi-mode cables from each Technical Room-Imaging associated with an Interventional Suite or Operating Room to the nearest TRs for redundancy.
7.9.3.2(4)(kk)	Where there is more than one (1) TR on the same floor, communications serving zone boundary lines will be established so that horizontal cables will not cross the lines to another zone to be served by another TR.
7.9.3.2(4)(ll)	Provide an additional 500 spare Data Drops with an average permanent link length of 80 m to be terminated, installed and tested in locations as directed by the Owner.
7.9.3.2(4)(mm)	Track and summarize total quantities and types of Data Drops allocated throughout the project and provide updated estimates to the Owner at each formal design submission.

7.9.3.2(5) Structured Cabling Patching

7.9.3.2(5)(a) Project Co will supply and install all fibre and copper patch panels, including cover, LC connectors, and all other components required to terminate, splice, store, and identify the cables.

7.9.3.2(5)(b) Project Co will supply and install all Category 6A, multimode and single mode fibre patch cords as well as any copper cross-connect wire jumpers of the correct length for all equipment in sufficient quantity to make each device, network and system in the Facility fully operational.

7.9.3.2(5)(c) Within each MER, Project Co will provide diverse patch cabling consisting of single-mode fibre, multi-mode fibre, and CAT6A patch cables between MER core networking equipment and each server appliance.

7.9.3.2(5)(d) Project Co will supply an additional 10% spare Category 6A, single mode, and multimode patch cords in excess of the quantity required above.

7.9.3.2(5)(e) In addition to the cables required for the Owner's IT and communications networks, Project Co will provide any additional cables necessary to support all of the other networks and systems to be installed or used in the Facility as described in this document.

7.9.4 IM/IT Wireless Network

7.9.4.1 Basic Requirements

7.9.4.1(1) System Overview

7.9.4.1(1)(a) The IM/IT Wireless Network is a dedicated IEEE 802.11 wireless network operating in the 2.4 Ghz and 5 Ghz frequency bands.

7.9.4.1(2) Applicable Area

7.9.4.1(2)(a) Applies to all Facility interiors and select outdoor spaces.

7.9.4.1(3) System Responsibilities

7.9.4.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.4.1(3)(b) Refer to Section 3 of Schedule 2E [Equipment and Furniture] for the procurement and payment of Division 27 Cash Allowances.

7.9.4.1(3)(c) Owner will:

- 7.9.4.1.3.(c).1 Select the system.
- 7.9.4.1.3.(c).2 Provide design feedback to Project Co.

7.9.4.1(3)(d) Project Co will:

- 7.9.4.1.3.(d).1 Design, supply, install, and commission all system infrastructure.
- 7.9.4.1.3.(d).2 Design the system equipment.
- 7.9.4.1.3.(d).3 Supply, install, program, commission and integrate all system equipment and software through the IM/IT Wi-Fi network cash allowance as determined in consultation with the Owner.
- 7.9.4.1.3.(d).4 Perform wireless site surveys to confirm signal strength throughout the Facility meets the Owner's requirements once the WAPs are active. Project Co is responsible for relocations and additions of WAPs and Structured cabling as a result of these surveys.
- 7.9.4.1.3.(d).5 Supply and install all supporting infrastructure, including mounting hardware, enclosures, and all physical connections of the equipment.
- 7.9.4.1.3.(d).6 Supply and install all patch cords required for all systems and equipment requiring connectivity to the Owner's IM/IT data network.

7.9.4.2 Performance Criteria

7.9.4.2(1) General

7.9.4.2(1)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications when designing, supplying and installing structured cabling.

7.9.4.2(1)(b) The Wireless (Wi-Fi) Network is a mission critical infrastructure. As such, the system will be designed and installed to provide superior coverage, capacity and reliability, with a cabling infrastructure capable of supporting modern wireless services.

7.9.4.2(1)(c) Project Co will not be allowed to install wireless and wired network hardware until the Owner has

inspected the interior conditions of the Facility buildings and provided written approval to proceed with the installation.

7.9.4.2(1)(d) Wireless network hardware provided for the interior of the Facility buildings will not be installed until the buildings are enclosed, weather tight, temperature and humidity conditions are approximately the same as final conditions expected, wireless cabling grid is installed and tested, most construction activities are complete, and surfaces have been swept and treated for dust control.

7.9.4.2(1)(e) Where ceilings are less than 4 m, wireless access points will be flush mount to the ceiling or attached to the ceiling tile using approved mounts. In high ceiling areas such as atriums, wall-mounted wireless access points will be acceptable.

7.9.4.2(1)(f) Upon receipt of wireless and wired network hardware and components, Project Co will be financially responsible for any damage or disappearance of Owner provided material due to improper handling and storage, negligence, fire, theft and environmental conditions during construction.

7.9.4.2(1)(g) Wireless Telecommunication Outlets will always be easily accessible and not in locations that require lifts or specialized equipment to reach:

7.9.4.2.1.(g).1 wireless TOs will be mounted in the ceiling space within 600 mm of the finished or T-bar ceiling.

7.9.4.2(1)(h) When installing wireless access points, Project Co will ensure that they are positioned away from sources of EMI, such that the signal is not impeded by these sources.

7.9.4.2.1.(h).1 Position wireless access points a minimum of 500 mm from LED drivers and lighting fixtures.

7.9.4.2(1)(i) Coordinate locations of antenna access points, mounting hardware and telecommunications enclosures required to support the dedicated, independent wireless infrastructure associated with the IM/IT Wireless Network. This includes identifying all infrastructure on reflected ceiling plans uniquely and providing clash detection with other ceiling

infrastructure including lighting, antennas, ceiling lifts and all other ceiling systems.

7.9.4.2(2) Structured Cabling Indoor

7.9.4.2(2)(a) Provide a horizontal Category 6A cabling grid throughout the Facility ceiling spaces to connect wireless access points. At each point on the grid, provide a Telecommunications Outlet with two Cat6A Data Drops.

7.9.4.2(2)(b) The Category 6A cabling grid is defined as a collection of uniform cells where each cell is a square.

7.9.4.2.2.(b).1 The size of each square is 9 m x 9 m. The Owner permits Project Co to adjust the size of grid squares to 15 m x 15 m in the parking areas and mechanical/Electrical Rooms of the Facility only;

7.9.4.2.2.(b).2 TOs with two Category 6A Data Drops are to be supplied and installed by Project Co in the ceiling spaces of the Facility at the centre of each square cell; and

7.9.4.2.2.(b).3 Where only a portion of a square cell resides within the interior of the building (such as at the building's perimeter), a TO with two Category 6A Data Drops will still be supplied and installed by Project Co in the interior of the building for that partial cell.

7.9.4.2(2)(c) Grid sizing is subject to adjustment based on predictive analysis and relocations by Project Co based on RF surveys to achieve 100% coverage and contiguous signal strength.

7.9.4.2(2)(d) At the TRs, the Category 6A Data Drops that comprise the cabling grid in a given serving zone will be terminated evenly across all patch panels to enable patching to different network switches.

7.9.4.2(2)(e) Additional wireless Telecommunications Outlets over and above what is provided by the 9 m x 9 m grid will be installed in areas where wireless signal transmission is anticipated to be impeded by thick concrete or lead lined walls, and areas where the density of WAPs requires additional TOs.

7.9.4.2(2)(f)	Every elevator lobby will have a wireless network TO installed in the ceiling space.
7.9.4.2(2)(g)	Project Co will ensure that each elevator in the Facility has a wireless access point antenna installed in the elevator shaft. If a code exemption is required to achieve this, Project Co will coordinate with the appropriate consultants, elevator vendor, and the Owner to ensure the code exemption is acquired prior to WAP installation.
7.9.4.2(2)(h)	If required to achieve full coverage of the elevator shaft, a WAP antenna will be installed in the top and bottom of the shaft.
7.9.4.2(2)(i)	To ensure 100% contiguous and ubiquitous wireless coverage, the wireless cabling grid will cover all areas within the Facility buildings, including utility spaces (mechanical, electrical, elevator machine, TRs), stairwells, parking levels, service links and tunnels.
7.9.4.2(2)(j)	Additional wireless communications outlets over and above what is provided by the 9 m x 9 m grid will be installed in large multimedia and gathering spaces in accordance with TIA-4966.
7.9.4.2(2)(k)	Provide one wireless communications outlet equipped with two Category 6A Data Drops for every 25 seats in large gathering areas and multimedia rooms as defined in Section 7.9.6 Audio-Visual Systems.
7.9.4.2(2)(l)	Data Drops in wireless TOs will only be used for WAPs that are part of the IM/IT Wireless Network. Wireless access points or devices for other systems will not be connected to these TOs without written permission from the Owner. If any other device is permitted by the Owner to be connected to these TOs, faceplate jacks will be colour coded to clearly differentiate IM/IT Wireless Network jacks from other systems.
7.9.4.2(2)(m)	For the safety of Patients and Staff, Project Co will be required to supply, install and label ceiling (hard cap and tile) enclosures to accommodate wireless hardware in areas of the Facility specified by the Owner. These enclosures will hide wireless

hardware from view and prevent unauthorized access to the access point and the connecting cabling.

7.9.4.2.2.(m).1 The enclosures provided will allow RF transmissions to penetrate with little or no attenuation and match the surrounding ceiling colour.

7.9.4.2.2.(m).2 Prior to purchase of the enclosures, Project Co will submit shop drawings to the Owner for approval and, if required, provide samples to the Owner for RF testing purposes and to check for interoperability with wireless hardware.

7.9.4.2.2.(m).3 At a minimum, these enclosures will be required in all Mental Health Areas of the Facility

7.9.4.2(3) Structured Cabling Outdoor

7.9.4.2(3)(a) Data Drops will also be provided outside the Facility to enable installation of access points to provide exterior wireless coverage to the Health Campus. Coverage areas are to include the ground level within a 15 m perimeter of the Facility, Secure Outdoor Spaces, all exterior plazas and amenity spaces, patios, MMU parking area, sidewalks, walkways and lanes.

7.9.4.2(3)(b) The location and quantity of exterior wireless communication outlets are to be determined in consultation with the Owner.

7.9.4.2(3)(c) Provide lightning arrestors and associated grounding on all outdoor access point locations, antennae, or IP endpoint device connected to structured cabling. Project Co will also be required to supply and install surge protectors in Communications Rooms for each horizontal Category 6A cable run entering Facility buildings.

7.9.4.2(3)(d) To protect wireless hardware from the environment, theft or vandalism, Project Co will be required to supply, install and label indoor/outdoor NEMA rated access point enclosures in certain areas within the Facility and for all outdoor WAPs.

7.9.4.2.3.(d).1 The enclosures will be able to protect wireless hardware from wet and dirty environments, UV stabilized for exposure to directly sunlight,

virtually transparent to wireless signals, lockable and work with all variations of Owner provided wireless hardware.

7.9.4.2.3.(d).2 Prior to purchase of the enclosures, Project Co will submit shop drawings to the Owner for approval and, if required, provide samples to the Owner for RF testing purposes and to check for interoperability with wireless hardware.

7.9.4.2(4) Design Criteria

7.9.4.2(4)(a) Project Co will perform a Wi-Fi predictive analysis based upon Facility models at the 90 % Phase to form the basis of the IM/IT Wireless Network design.

7.9.4.2(4)(b) Project Co will conduct at least one pre-deployment site survey as well as at least two post-deployment site surveys. The pre-deployment site survey will be performed shortly after all wireless equipment is installed. One post-deployment site survey will be conducted 30 days after Service Commencement and another at 120 days after the Facility is fully operational, and all sources of potential interference are active.

7.9.4.2(4)(c) All site surveys will provide measurements taking into account all uses of the Wireless Infrastructure including voice and location services and will align the wireless hardware with the strictest requirements for those devices. Site survey measurements will be taken with all doors closed in the area the survey is being conducted in. All site survey information will be documented thoroughly and provided electronically to the Owner.

7.9.4.2(4)(d) All site surveys will be mapped using Floor plans with detailed building information, including:

7.9.4.2.4.(d).1 doors assumed closed;

7.9.4.2.4.(d).2 all wall types;

7.9.4.2.4.(d).3 all glazing types; and

7.9.4.2.4.(d).4 large items such as lockers that may impede wireless signal transmission.

7.9.4.2(4)(e) The wireless network will support all services active in the Facility. Project Co will consult with the Owner during system configuration to confirm the system VLAN configuration.

7.9.4.2(4)(f) All wireless LAN deployments will be fully documented. Project Co will be responsible to document and provide the following components:

- 7.9.4.2.4.(f).1 Site floor plans with wireless cabling grid and access point locations, and cable numbers;
- 7.9.4.2.4.(f).2 All site survey floor plans with noise floor, data rate and signal strength overlays, preferably completed using Fluke Netscout or Owner approved equivalent site survey tool. Survey tool will be capable of accounting for floor-to-floor interference.
- 7.9.4.2.4.(f).3 List of wireless neighbours and rogue wireless activity for at least one (1) continuous week, prior to Service Commencement;
- 7.9.4.2.4.(f).4 Complete wireless network management tool configuration files and configuration report at completion of wireless network testing. Wireless network management tool will have floor plans imported and enable device location.

7.9.4.2(5) Moves, Adds, and Changes

7.9.4.2(5)(a) Project Co is required to move and/or add wireless network hardware as prescribed by the Owner after completion of pre and post occupancy wireless surveys.

7.9.4.2(5)(b) In addition to labour and equipment, Project Co is required to cover all costs associated with moving access points such as replacement of ceiling tiles and the installation of sleeves through walls, including all wall/ceiling patching and re-finishing of all surfaces.

7.9.5 IM/IT Data Network

7.9.5.1 Basic Requirements

7.9.5.1(1) System Overview

7.9.5.1(1)(a) This system is the Owner's dedicated IEEE 802.3 network that includes:

- 7.9.5.1.1.(a).1 routers;
- 7.9.5.1.1.(a).2 network security hardware;
- 7.9.5.1.1.(a).3 core switches; and
- 7.9.5.1.1.(a).4 aggregation switches.

7.9.5.1(2) Applicable Area

7.9.5.1(2)(a) Applies to the Facility.

7.9.5.1(3) System Responsibilities

7.9.5.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.5.1(3)(b) Owner will:

- 7.9.5.1.3.(b).1 Select, design, and supply all system equipment;
- 7.9.5.1.3.(b).2 Select, design, supply, install and configure all system software;
- 7.9.5.1.3.(b).3 Commission and integrate all equipment and software in coordination with Project Co; and
- 7.9.5.1.3.(b).4 Provide design feedback to Project Co.

7.9.5.1(3)(c) Project Co will:

- 7.9.5.1.3.(c).1 Select, design, supply, install and commission all system infrastructure as determined in consultation with the Owner.
- 7.9.5.1.3.(c).2 Install all system equipment in consultation with the Owner, including:
  - (c).2.1 supply and install mounting hardware and physical connection of all equipment to the ePDUs installed in equipment racks and server cabinets;
  - (c).2.2 supply and install the physical connection of all equipment to the Facility's intra-building fibre backbone infrastructure; and
  - (c).2.3 supply and install all patch cords required for all systems and equipment requiring connectivity to the Facility IM/IT data network.
- 7.9.5.1.3.(c).3 Commission all system components and demonstrate base network connectivity and functionality.

7.9.5.2 Performance Criteria

7.9.5.2(1) General

7.9.5.2(1)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications.

7.9.5.2(1)(b) Project Co will undertake the Design and Construction of all other communications infrastructure in the Facility required to support the

implementation of the Owner's IM/IT data network in accordance with the requirements stated in this Agreement;

7.9.5.2(1)(c) Network equipment and switches supplied for the Facility will not be installed until the Facility is enclosed, weather tight, temperature and humidity conditions are approximately the same as final conditions expected, fibre backbone is installed and tested, most construction activities are complete, and surfaces have been swept and treated for dust control.

7.9.5.2(1)(d) Project Co will not be allowed to install wireless and wired network hardware until the Owner has inspected the interior conditions of the Facility and provided written approval to proceed with the installation.

7.9.5.2(1)(e) Upon receipt of network equipment and switches, Project Co will be financially responsible for any damage or disappearance of Owner provided material due to improper handling and storage, negligence, fire, theft and environmental conditions during construction.

7.9.5.2(1)(f) Project Co will test network connectivity, perform and document resiliency testing including:

7.9.5.2.1.(f).1 time to failover;

7.9.5.2.1.(f).2 time to recover due to loss of power and loss of connectivity for core, access and aggregation layers including individual component failure.

7.9.5.2(1)(g) Prior to performing the test, Project Co will submit the testing procedures to be performed to the Owner for review and revisions.

7.9.5.2(1)(h) Project Co will provide as-installed documentation for the network including updating the Owner's management tool (such as Patch Manager and Nlyte) by populating structured cabling components including pathway fills, structured cabling and network components into the configuration management database solution. Owner will provide a template for Project Co use.

7.9.6 Audio-Visual Systems

7.9.6.1 Basic Requirements

7.9.6.1(1) System Overview

7.9.6.1(1)(a) This system is comprised of multimedia and videoconferencing equipment, speakers, displays and projectors, as well as their associated support and control devices.

7.9.6.1(1)(b) The system will have the ability to view video in adjacent conference rooms.

7.9.6.1(1)(c) This includes the following subsystems:

7.9.6.1.1.(c).1 Multimedia rooms;
7.9.6.1.1.(c).2 Guest infotainment;
7.9.6.1.1.(c).3 Digital signage; and
7.9.6.1.1.(c).4 UBC Spaces.

7.9.6.1(2) Applicable Area

7.9.6.1(2)(a) Applies to the Facility.

7.9.6.1(3) System Responsibilities

7.9.6.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.6.1(3)(b) Refer to Section 3 of Schedule 2E [Equipment and Furniture] for the procurement and payment of Division 27 Cash Allowances.

7.9.6.1(3)(c) Owner will:

7.9.6.1.3.(c).1 Specify and Select the equipment.
7.9.6.1.3.(c).2 Provide design feedback to Project Co.

7.9.6.1(3)(d) Project Co will:

7.9.6.1.3.(d).1 Select, design, supply, install and commission all system infrastructure as determined in consultation with the Owner.
7.9.6.1.3.(d).2 Cause all AV infrastructure and equipment to be designed by an AV professional with expertise and experience designing multimedia rooms in similar healthcare facilities. Project Co will carry the design fee for the AV systems as part of its bid;
7.9.6.1.3.(d).3 Coordinate the AV infrastructure designs for UBC supported spaces directly with the UBC AV representatives in compliance with UBC Faculty of Medicine (FoM) Design Guidelines

and Functional Requirements for Learning Spaces;

7.9.6.1.3.(d).4 Supply, install, program, and commission all equipment and software through the audio-visual systems cash allowance as determined in consultation with the Owner; and

7.9.6.1.3.(d).5 Integrate the system to the following systems:

(d).5.1 BMS;
(d).5.2 Lighting control;
(d).5.3 the IM/IT data network;
(d).5.4 Nurse Call;
(d).5.5 HVAC; and
(d).5.6 Motorized blinds.

7.9.6.2 Performance Criteria

7.9.6.2(1) General

7.9.6.2(1)(a) Project Co will provide all pathways, floor, ceiling and wall boxes, power, wiring, connection cables, patch cables, audio-visual interconnecting cabling (exclusive of any required proprietary manufacturer specific cables necessary to support Owner-selected AV equipment), connectors, terminals, wall and ceiling mounts/brackets, fasteners, hardware and accessories required for installing, interconnecting and operating the equipment as part of the IM/IT Infrastructure for the systems in this section. Required proprietary manufacturer-specific cabling is to be provided by the AV contractor selected through the Cash Allowance procurement process, as reviewed by the Owner.

7.9.6.2(1)(b) Project Co will coordinate all electrical, data and AV boxes with wall backing and display mounts such that the outlets are easily accessible once the displays are installed.

7.9.6.2(1)(c) Project Co will ensure its AV design specialist is involved in all aspects of the design of AV rooms, including Millwork, HVAC, lighting, structured cabling, and acoustical treatments. All system infrastructure will be designed as determined in consultation with the Owner.

7.9.6.2(1)(d) This section details which room types are designated as multimedia rooms and assigns each room a multimedia room template type. Project Co

	will design all rooms designated as multimedia rooms with the minimum required infrastructure detailed for each multimedia room type in this section, and provide additional conduit or junction boxes as required to meet the functional requirements of the space.
7.9.6.2(1)(e)	The design of the multimedia rooms will facilitate flexibility of the spaces through the provision of appropriately located connection boxes in floors, walls and ceilings that distribute data, audio, video, controls and communications signals, and electrical power throughout the room.
7.9.6.2(1)(f)	In locations where wall mounting a display is not feasible or appropriate for the application, displays will be ceiling mounted with structural mounting and supports in the ceiling space.
7.9.6.2(1)(g)	Walls will be suitably reinforced in locations where monitors, televisions, screens, cameras and speakers are to be mounted, and ceilings will be suitably reinforced in those locations from which such items are to be hung or suspended. Large-format displays will be a minimum of 48 inches diagonally.
7.9.6.2(1)(h)	Rated acoustic walls for multimedia rooms will be constructed so as to minimize unwanted acoustic transfer. Interior double stud "party" walls with two layers of GWB are to use offset studs with all intervening cavities filled with fibreglass or similar insulation. Provide wall and floor assemblies with Sound Transmission Class (STC) ratings of 55 for walls and 50 for ceilings. Project Co will coordinate the acoustical requirements of all multimedia rooms with the Acoustic and Vibration Consultant.
7.9.6.2(1)(i)	Ceilings in multimedia rooms will not be constructed of hard, acoustically reflective material. Acoustic ceiling tiles are required. Mechanical, electrical and other equipment that emits noise above dBA 25-30 will not be installed in multimedia room ceilings. Multimedia rooms will have appropriate acoustical conditions to optimize for presentations, videoconferencing and monitoring. Appropriate acoustical treatment will be installed to control

reverberation, minimize reflections, flutter echo and other acoustical issues.

7.9.6.2(1)(j) Provide adequate spaces and power outlets for all components, as well as floor boxes for power and data as directed by the Owner. Lids and covers of floor boxes will be flush with the finished floor, and not impede the flow of people or materials through the room.

7.9.6.2(1)(k) Cables will be terminated with appropriate connectors in high quality plates that are suitable for the décor and finishes of the room.

7.9.6.2(2) Types of multimedia rooms:

7.9.6.2(2)(a) In general, there are seven types of multimedia rooms:

7.9.6.2.2.(a).1 Type 1 rooms for Audio/Visual (AV) presentations and telemedicine applications. Typically used for telemedicine and videoconference applications in smaller room types. Presenters will be able to easily display audio and video content from a laptop or mobile device on to a permanently installed AV system including one HD digital display monitor with dual channel (stereo) speakers.

7.9.6.2.2.(a).2 Type 2 rooms designed and built for AV presentations plus Videoconferencing (VC). These rooms are used for AV and VC meetings and presentations, utilizing two permanently installed AV / VCHD digital display monitors, associated codecs, VC camera(s), system controls and amplified sound systems. A floor box will be provided to allow AV cabling, data and power cabling to the table.

7.9.6.2.2.(a).3 Type 3 rooms designed and built for AV plus VC in large conference and meeting rooms. These rooms are teaching spaces that are used for VC and non-VC meetings, clinical skills sessions, and AV presentations utilizing permanently installed AV / VC HD digital display monitors, VC camera systems, controls and amplified sound systems. Multiple floor boxes will be provided to allow data and power cabling to the tables.

7.9.6.2.2.(a).4	Type 4 rooms designed and built as large lecture theatres with over 100 seats. This room type will be used for a variety of purposes. It is designed and built predominately as a large videoconferencing room, also a space for large group meetings, and large group AV presentations. The Type 4 room has a local control and projection/equipment room adjacent and will be fully videoconference equipped and enabled for connecting with other VC endpoints and external facilities. Built-in AV equipment, VC systems, systems controls, HD projection screens, LED display wall, and sound systems will be provided for. Infrastructure requirements will be coordinated with the UBC Faculty of Medicine Design Guidelines and Functional Requirements for Learning Spaces.
7.9.6.2.2.(a).5	Type 5 rooms are shared use spaces for use by the Owner and UBC. This room type will be used for a variety of purposes and spaces with various functions. These rooms are teaching spaces that are used for VC and non-VC meetings, clinical skills sessions, and AV presentations utilizing permanently installed AV / VC HD digital display monitors, VC camera systems, controls and amplified sound systems. Infrastructure requirements will be coordinated with the UBC Faculty of Medicine Design Guidelines and Functional Requirements for Learning Spaces.
7.9.6.2.2.(a).6	Type 6 Multimedia room will be the Clinical Operations Centre. Refer to Section 3.20, Clinical Operations Centre for additional requirements.
7.9.6.2.2.(a).7	Type 7 Multimedia rooms will be the Chapel and the Ceremony Room within the All Nations Sacred Space. This type of room will be used to broadcast presentations via a camera and microphone system, as well as extend the audibility of the presentations outside the Chapel and All Nations Sacred Space.

7.9.6.2(2)(b)	In addition to the rooms listed above, all Gym spaces require a 200 mm x 200 mm electrical box installed at 450 mm AFF and stubbed into the

ceiling space with 2 x 50 mm conduit for an Owner supplied speaker system.

7.9.6.2(3) Multimedia Room Requirements

7.9.6.2(3)(a) For each room type, Project Co will design and coordinate all required infrastructure and equipment to provide a fully functional space.

7.9.6.2(3)(b) Project Co will design and coordinate the following multimedia rooms in compliance with UBC FoM Design Guidelines:

- 7.9.6.2.3.(b).1 N1.1 Conference/Meeting Room – Large – Dividable – 60NSM (1 room);
- 7.9.6.2.3.(b).2 N1.2 Study Room – Group – 24 NSM (2 rooms);
- 7.9.6.2.3.(b).3 N3.8 Control-Observation (1 room);
- 7.9.6.2.3.(b).4 N2.13 Conference/Meeting Room – XXLarge – Dividable – 100NSM (1 room);
- 7.9.6.2.3.(b).5 N2.14 Conference/Meeting Room – Xlarge – Dividable – 88NSM (2 rooms);
- 7.9.6.2.3.(b).6 N2.16 Conference/Meeting Room – Small – 24 NSM (1 room);
- 7.9.6.2.3.(b).7 N3.7 Observation/Seminar Room – 40 NSM (1 room); and
- 7.9.6.2.3.(b).8 N5.2 Study Room – Group – 24NSM (1 room).

7.9.6.2(3)(c) Where education cameras are required, Project Co will provide a TO to support the use-case for these cameras as determined in consultation with the Owner.

7.9.6.2(3)(d) Provide electrical box for keypad controller and if combined with Type 2 rooms, a floorbox for video input.

7.9.6.2(3)(e) Type 1 Multimedia Rooms

7.9.6.2.3.(e).1 Type 1 multimedia rooms include:

- (e).1.1 All Patient rooms;
- (e).1.2 Inter-Professional Team Room;
- (e).1.3 Exam Rooms;
- (e).1.4 Consult/Interview Rooms;
- (e).1.5 Operating and Interventional Rooms;
- (e).1.6 Care Team Station-Enclosed; and
- (e).1.7 Autopsy Room.

7.9.6.2.3.(e).2 At a minimum, Project Co will provide:

- (e).2.1 infrastructure and structural support for a large-format, wall-mounted display;

(e).2.2 two Data Drops and a quad-outlet on conditional power located behind the display;
(e).2.3 two Data Drops and a quad-outlet on conditional power located at 1.1 m AFF below the display;
(e).2.4 two 100 mm x 100 mm electrical boxes with AV cover plates, at the same location as the power and data outlets behind and below the display;
(e).2.5 32 mm conduit connecting the 100 mm x 100 mm electrical boxes; and
(e).2.6 32 mm conduit connected to the 100 mm x 100 mm electrical box behind the display and stubbed into the ceiling space
(e).2.7 Conduit and box for keypad/touch panel.

7.9.6.2(3)(f) Type 2 Multimedia Rooms:
7.9.6.2.3.(f).1 Type 2 multimedia rooms include:
(f).1.1 Multipurpose Room;
(f).1.2 Multipurpose Room-Large;
(f).1.3 Group Therapy Room;
(f).1.4 Conference/Meeting Room-Small; and
(f).1.5 Conference/Meeting Room-Xsmall.
7.9.6.2.3.(f).2 At a minimum, Project Co will provide:
(f).2.1 infrastructure and structural support for two large-format, wall-mounted displays;
(f).2.2 two Data Drops and a quad-outlet on conditional power located behind each display;
(f).2.3 two Data Drops and a quad-outlet on conditional power located at 1.1 m AFF below the display;
(f).2.4 two 100 mm x 100 mm electrical boxes with AV cover plates, at the same location as the power and data outlets behind the displays;
(f).2.5 one 100 mm x 100 mm electrical box with an AV cover plate, at the same elevation as the power and data outlets behind the displays and installed between the displays;
(f).2.6 one 100 mm x 100 mm electrical box with an AV cover plate, at the same

location as the power and data outlets below the displays;

(f).2.7 32 mm conduit connecting the 100 mm x 100 mm electrical boxes;

(f).2.8 32 mm conduit connected to the 100 mm x 100 mm electrical box between the displays and stubbed into the ceiling space;

(f).2.9 One dual-gang electrical box near the room entrance connected via 32 mm conduit to the 100 mm x 100 mm electrical box behind the displays.

(f).2.10 a floor box with separate conduit for power, AV cabling, and data; and

(f).2.11 25 mm conduit and junction boxes as required to connect the 100 mm x 100 mm electrical box behind the right display to the floor box.

7.9.6.2(3)(g) Type 3 Multimedia Rooms:

7.9.6.2.3.(g).1 Type 3 multimedia rooms include:

(g).1.1 Conference/Meeting Room-Medium;

(g).1.2 Conference/Meeting Room-Xlarge-Dividable;

(g).1.3 Conference/Meeting Room-XXlarge-Dividable;

(g).1.4 Conference/Meeting Room-Large Dividable;

(g).1.5 Conference/Meeting Room-Large-Dividable–Future Expansion;

(g).1.6 Conference/Meeting Room; and

(g).1.7 Observation/Seminar Room.

7.9.6.2.3.(g).2 At a minimum, Project Co will provide:

(g).2.1 infrastructure and structural support for two large-format, wall-mounted displays in each room or room partition;

(g).2.2 two Data Drops and a quad-outlet on conditional power located behind each display;

(g).2.3 two Data Drops and a quad-outlet on conditional power located at 1.1 m AFF below the display;

(g).2.4 one 400 mm x 400 mm electrical box behind right display;

(g).2.5 one 200 mm x 200 mm electrical box behind left display;

(g).2.6 a minimum of three floor boxes with separate conduit for power, AV cabling, and data;

(g).2.7 conduit and junction boxes as required to connect each floor box to the 400 mm x 400 mm electrical box with 2 x 32 mm conduit, in addition to conduit for power and data;

(g).2.8 2 x 32 mm conduit connecting the 200 mm x 200 mm and 400 mm x 400 mm electrical boxes;

(g).2.9 2 x 32 mm conduit connected to the 400 mm x 400 mm electrical box and stubbed into the ceiling space;

(g).2.10 One dual-gang electrical box near the room entrance connected via 32 mm conduit to the 100 mm x 100 mm electrical box behind the displays;

(g).2.11 In instances where two type 3 multimedia rooms share a removable wall, additional infrastructure will be provided to facilitate a combined room video conference experience. Minimum infrastructure requirements will include:

(g).2.11.1 floor boxes with separate conduit for power, AV cabling, and data;

(g).2.11.2 divisible rooms with a combined area greater than 42 NSM will require 6 floor boxes with 3 shared for AV;

(g).2.11.3 increase the size of the back box behind each divisible rooms' right display from 100 mm x 100 mm to 200 mm x 200 mm;

(g).2.11.4 one 300 mm x 300 mm electrical box at rack location. Rack to be located within 20 m cable route length to the right display location in each room;

(g).2.11.5 2 x 25 mm conduit between 300 mm x 300 mm box at rack location and each 200 mm x 200 mm behind right displays (4 conduits total);

(g).2.11.6 2 x 25 mm conduit between 300 mm x 300 mm box at rack location and a designated floor box in each divisible room (4 conduits total);

(g).2.11.7 1 x 25 mm conduit between the 300 mm x 300 mm box at rack location and ceiling space (above T-bar) in each divisible room (2 conduits total);

(g).2.11.8 1 x 100 mm x 100 mm box at 2.14 m AFF, 150 mm to the left and right of the partition wall opening, on the same wall as each split rooms' display wall;

(g).2.11.9 1 x 25 mm conduit connected from the right partition wall 100 mm x 100 mm box to the 300 mm x 300 mm rack box;

(g).2.11.10 1 x 25 mm conduit connected from the right partition wall 100 mm x 100 mm box to the left partition wall 100 mm x 100 mm box; and

(g).2.11.11 interconnect each divisible rooms 200 mm x 200 mm right display box with 2 x 32 mm conduits.

7.9.6.2(3)(h) Type 4 Multimedia Rooms:

7.9.6.2.3.(h).1 Type 4 multimedia rooms include:

(h).1.1 Conference-VC Lecture Theatre-Small with 70 seats;

(h).1.2 Conference-VC Lecture Theatre-Large with 120 seats;

7.9.6.2.3.(h).2 Project Co will coordinate the requirements of these rooms with the UBC Faculty of Medicine.

7.9.6.2.3.(h).3 At a minimum, Project Co will provide:

(h).3.1 A mock-up of the presenter's lectern.

(h).3.2 A sample of proposed multimedia room floor boxes and connection panels.

(h).3.3 A successful demonstration, in a room of similar size, of the videoconferencing microphone system proposed for the Type 4 room.

(h).3.4 Ability for all participants to simultaneously connect to 120v and USB Type C 20V @5 A power connectors contained in 30 or more distributed floor boxes. Project Co is to coordinate the precise distribution of the floor boxes in conjunction with the Owner. The floor box layout is to be based on the Furniture layouts developed for the room in both Videoconferencing mode and in AV presentation modes to allow easy and direct connection of cables.

(h).3.5 A raised modular dais or stage across the front presentation wall, high enough to provide clear sightlines from the presenter(s) to all seats in the room, and from all seats in the room to standing or seated presenters. The stage or dais will have a removable, transportable ramp with a rise no greater than 1:12 or other removable, transportable means of providing wheelchair access.

(h).3.6 Working space for two presenters at a custom-built fixed lectern on the dais, with clear sightlines to cameras, screens, monitors and all audience seats.

(h).3.7 Enough stage area between the front wall and the front of the dais to accommodate seating and tables and electrical/data connectivity for panel discussions of four to six people.

(h).3.8 Connections and cabling input sources such that presenters can display content from a PC, a laptop or mobile device and other sources. Controls, communications connections and input sources for auxiliary equipment will be available at the lectern.

(h).3.9 Infrastructure to support a permanently installed AV presentation system:

(h).3.9.1 The AV system will have the ability to screen live television feeds, DVD and Blu-ray DVD content, audio playback,

compressed and uncompressed digital video in all common forms including Mpeg-4, Mpeg-2, H.264, H.265, AVI, MKV, MOV, as well as streaming feeds and other content from the Internet.

(h).3.9.2 The AV system will have one motorized large front projection screen for AV presentations and the future use of direct view technology. Locate the centre of the screen with the centre line of the seated area and the centre projection port. Screen is to be high gain, and non-perforated. Screen motors controlled via the touch panels at the lectern and the Control Booth. This centre screen will be retracted during Videoconferencing sessions.

(h).3.9.3 The presentation wall may have an LED/LCD screen video wall in addition to the projector. Project co will provide structural support and electrical boxes with conduit to support several large format displays mounted to the presentation wall.

(h).3.9.4 Provide all required conduit and electrical boxes to ensure the space meets the functional requirements of the UBC FoM Design Guidelines.

(h).3.10 Infrastructure to support a permanently installed dual codec Videoconferencing system:

(h).3.10.1 two side-by-side projection screens for VC use. Screens will be sized by taking the distance to the furthest viewer and dividing it by 6.7 to get the height of the screen;

(h).3.10.2 there will be simultaneous display of electronic images including video, document

camera, computer-based digital slides, and computer presentations, as well as images/sources from the remote locations;

(h).3.10.3 four motorized high definition cameras with zoom lenses suitable for videoconference use in a large videoconference setting. Audience cameras are to automatically triangulate and pan/tilt/zoom to achieve audience microphones;

(h).3.10.4 two cameras will be installed at the front of the room between screens to capture students, and two cameras will be installed in the Control Booth to capture the presenter.

(h).3.11 A custom lectern that will be the primary systems control point housing an AV equipment rack, computer interfaces, the systems controls touch screen, a document camera, and other related technology and communications components, and connection points.

(h).3.12 Two preview/confidence HD Digital display monitors located in front of the first row of seating and within the sightline of a presenter who is facing the audience. They will be mounted in a secure Millwork housing. The purpose of these monitors is to provide the presenters with the ability to move freely about on the dais or stage while still seeing the selected source video and the videoconferencing participants in remote locations.

(h).3.13 Project Co will supply infrastructure to support a push-to-talk microphone system throughout the audience seating area. Allow for one desktop microphone for each pair of seats. Buttons and visual indicators on microphones are to connect to the AV rack location in the Control Booth.

7.9.6.2.3.(h).4 As part of the Type 4 multimedia room, Project Co will provide a Control Booth that meets the following requirements:

(h).4.1 The Control Booth is to be centred on the centre line of the Type 4 room facing the front wall.

(h).4.2 The Control Booth will accommodate three video projectors, and all AV and Videoconferencing processing and control equipment, racks and other related multimedia equipment, including at a minimum, two AV equipment racks.

(h).4.3 One openable viewing window with unobstructed views and three projection ports with unobstructed views to the screens are required between the Control Booth and the Type 4 room. All of them are to be double glazed. The projection ports will be seamless and have an anti-reflective coating. Port glass will not be installed parallel to the projector lens but will instead be tilted by at least 5-degrees to reduce audio reflections and so that visual reflections are cast onto the floor of the projection booth, not back into the projection lens or onto the ceiling.

(h).4.4 The Control Booth will have space for two operator positions to allow an operator to monitor and support the multimedia sessions, as well as an operator to control the video capture and streaming equipment and other technical duties.

(h).4.5 Conduit to support additional convenience connections for auxiliary multimedia equipment are to be provided at both the lectern and to the local Control Booth for use by presenters.

(h).4.6 Provide network connectivity in the Control Booth for reception of CATV or IPTV television signals or feeds.

(h).4.7 The ability to record live events within the room while simultaneously

streaming the event in real time via a network connection.

(h).4.8 As the Control Booth will also contain the equipment racks, active equipment and related videoconferencing control equipment for other multimedia rooms, Project Co will ensure that the power supply and cooling capacities of the Control Booth are appropriately sized for the equipment and the operators.

(h).4.9 Provide a 12 strand MM fibre from each Control Booth to the Control-AV Room in Media Services.

7.9.6.2(3)(i) Type 5 Multimedia Rooms

7.9.6.2.3.(i).1 Type 5 multimedia rooms include:

(i).1.1 Clinical Skills Room;

(i).1.2 Clinical Skills Room-Enhanced;

(i).1.3 Studio-Photo;

(i).1.4 Video Editing Rooms;

(i).1.5 Media Services Reception and Waiting Area;

(i).1.6 N4.6 Control-AV;

(i).1.7 N4.8 Office-Private; and

(i).1.8 Studio-Video.

7.9.6.2.3.(i).2 Project Co will coordinate the requirements of these rooms with the UBC Faculty of Medicine and PHC Media Services , except that N4.6 Control-AV does not need to be dividable.

7.9.6.2.3.(i).3 Provide all necessary infrastructure, including power, pathways, conduits, spaces and structured cabling, to support UBC's clinical academic program.

7.9.6.2.3.(i).4 Project Co will design these rooms as specified in the UBC FoM Design Guidelines. Adhere to all clinical and acoustical requirements found in 3A [Clinical Specifications and Functional Space Requirements] and 3C [Acoustic and Noise Control Measures].

7.9.6.2.3.(i).5 Clinical Skills Rooms are to be constructed in pairs separated by a wall with an observation window, with infrastructure for AV systems connecting the pair of rooms. In each Clinical Skills Room, Project Co will provide the following minimum infrastructure:

(i).5.1 infrastructure and structural support for a large-format, wall-mounted display;

(i).5.2 two Data Drops and a quad-outlet on conditional power located behind the display;

(i).5.3 two Data Drops and a quad-outlet on conditional power located at 1.10 m AFF below the display;

(i).5.4 two 100 mm x 100 mm electrical boxes with AV cover plates, at the same location as the power and data outlets behind and below the display;

(i).5.5 32 mm conduit connecting the 100 mm x 100 mm electrical boxes; and

(i).5.6 32 mm conduit connected to the 100 mm x 100 mm electrical box behind the display and connected to the 200 mm x 200 mm box in the Observation Room;

(i).5.7 one 200 mm x 200 mm electrical box on the same wall as the observation window;

(i).5.8 one single-gang electrical box on the same wall as the observation window stubbed into the ceiling space via 32 mm conduit;

(i).5.9 two single-gang electrical boxes on the headwall connected to the 200 mm x 200 mm box in the Observation Room via 25 mm conduit;

(i).5.10 one single-gang electrical box in the ceiling connected to the 200 mm x 200 mm box in the opposite room via 25 mm conduit;

(i).5.11 one single-gang electrical box above the observation window connected to the 200 mm x 200 mm box in the opposite room via 25 mm conduit;

(i).5.12 one single-gang electrical box below the observation window connected to the 200 mm x 200 mm box in the room via 25 mm conduit;

(i).5.13 two Data Drops within the ceiling space of the Clinical Skills Rooms; and

(i).5.14 additional power and data outlets as required by the UBC FoM Design Guidelines.

7.9.6.2.3.(i).6 Enhanced Clinical Skills Rooms are to be constructed adjacent to a dedicated Control Room, and a nearby meeting room for debriefing. In the Enhanced Clinical Skills Rooms and associated Observation Rooms, Project Co will provide the following minimum infrastructure:

(i).6.1 infrastructure and structural support for a large-format, wall-mounted display;

(i).6.2 two Data Drops and a quad-outlet on conditional power located behind the display;

(i).6.3 two Data Drops and a quad-outlet on conditional power located at 1.10 m AFF below the display;

(i).6.4 two 100 mm x 100 mm electrical boxes with AV cover plates, at the same location as the power and data outlets behind and below the display;

(i).6.5 32 mm conduit connecting the 100 mm x 100 mm electrical boxes; and

(i).6.6 32 mm conduit connected to the 100 mm x 100 mm electrical box behind the display and connected to the 400 mm x 400 mm box in the Control Room;

(i).6.7 one 400 mm x 400 mm electrical box in the Control Room;

(i).6.8 a single gang electrical box above the observation window connected to the 400 mm x 400 mm box via 32 mm conduit;

(i).6.9 three single-gang electrical boxes on the headwall connected to the 400 mm x 400 mm box in the Control Room via 25 mm conduit;

(i).6.10 three single-gang electrical boxes in the ceiling connected to the 400 mm x 400 mm box in the Control Room via 32 mm conduit;

(i).6.11 two single-gang electrical boxes in the ceiling of the nearby meeting room connected to the 400 mm x 400 mm box in the Control Room via 32 mm conduit;

(i).6.12 one single-gang electrical box in the Control Room ceiling connected to the

400 mm x 400 mm box via 25 mm conduit;

(i).6.13 two Data Drops within the ceiling space of the Enhanced Clinical Skills Rooms; and

(i).6.14 additional power and data outlets as required by the UBC FoM Design Guidelines.

7.9.6.2.3.(i).7 In the Reception and Waiting Area of the Media Services department, Project Co will provide:

(i).7.1 A 400 mm x 400 mm electrical box in Reception connected to a 400 mm x 400 mm electrical box in the Waiting Area by 2 x 32 mm conduit;

(i).7.2 A 200 mm x 200 mm electrical box in Reception connected to a 400 mm x 400 mm electrical box in the Waiting Area by 2 x 25 mm conduit;

7.9.6.2.3.(i).8 For each of the remaining Type 5 Multimedia Rooms, Project Co will provide at a minimum:

(i).8.1 Two (2) floor boxes with separate conduit for power and data;

(i).8.2 Six (6) 400 mm x 400 mm electrical boxes;

(i).8.3 Conduit and junction boxes as required to connect each floor box to the 400 mm x 400 mm electrical box with 2 x 32 mm conduit, in addition to conduit for power and data; and

(i).8.4 Infrastructure and backing to support large-format wall-mounted displays.

7.9.6.2(3)(j) Type 6 Multimedia Rooms

7.9.6.2.3.(j).1 Type 6 multimedia rooms include:

(j).1.1 Clinical Operations Centre.

7.9.6.2.3.(j).2 At a minimum, Project Co will provide:

(j).2.1 infrastructure and structural support for a video wall consisting of 16 x 55" wall-mounted displays;

(j).2.2 a quad-outlet on vital power for every two displays, located behind the displays;

(j).2.3 two Data Drops for every four displays, located behind the displays;

(j).2.4 one 200 mm x 200 mm electrical box for every four displays, located behind the displays;

(j).2.5 one 400 mm x 400 mm electrical box on the same wall as the video wall and located behind the AV rack;

(j).2.6 2 x 32 mm conduit connecting the 400 mm x 400 mm electrical box to each 200 mm x 200 mm electrical box behind the displays;

(j).2.7 four Data Drops and two quad-outlets on UPS power at the AV rack location;

(j).2.8 six floor boxes with separate conduit for power, AV cabling, and data;

(j).2.9 two floor boxes will serve the control desks and each will have 2 x 32 mm conduit connected to the 400 mm x 400 mm electrical box for AV cabling, in addition to conduit for power and data; and

(j).2.10 power outlets at the control desks will be on UPS.

7.9.6.2(3)(k) Type 7 Multimedia Rooms:

7.9.6.2.3.(k).1 At a minimum, Project Co will provide:

(k).1.1 infrastructure for a camera and microphone system for capturing in-room presentations;

(k).1.2 conduit and electrical boxes connecting all AV devices to an AV rack located within the rooms;

(k).1.3 four Data Drops and quad power located at the AV rack locations;

(k).1.4 conduit and electrical boxes to support a speaker system that can broadcast audio to the exterior of the Chapel and All Nations Space entrances.

7.9.6.2(4) Digital Signage Systems

7.9.6.2(4)(a) Provide infrastructure for the Real-Time Parking Count system. Refer to Section 4.26.16 for system performance requirements.

7.9.6.2(4)(b) Project Co will design, construct and prepare walls in various locations throughout the Facility specifically in order to enable mounting and interconnection of wall mounted displays, including

digital signage screens, self-registration systems, digital Wayfinding systems, guest infotainment, and any other wall-mounted displays. These screens will be used for a variety of purposes and may be installed in either a "portrait" or "landscape" orientation, depending on use.

7.9.6.2(4)(c) The Owner will identify those areas that will require such preparation. They will include:

- 7.9.6.2.4.(c).1 Facility entrances, vestibules;
- 7.9.6.2.4.(c).2 Parking Levels;
- 7.9.6.2.4.(c).3 Lobby Spaces including Lecture Theatre Lobby, Main Lobby, and Elevator Lobbies;
- 7.9.6.2.4.(c).4 Facility interconnection pathways, and hallways;
- 7.9.6.2.4.(c).5 Care Team Stations;
- 7.9.6.2.4.(c).6 Reception, registration, and triage areas;
- 7.9.6.2.4.(c).7 Areas where Staff congregate; and
- 7.9.6.2.4.(c).8 Each public waiting area and lounge, including those in each department.

7.9.6.2(4)(d) Project Co will work with the Owner to determine ideal viewing angles on a screen by screen basis in order to precisely locate mounting and connection points at each digital signage screen location.

7.9.6.2(4)(e) Project Co will construct walls in those locations with sufficient backing material to support the weight of the monitors and their accessories, including the digital media player and the mounting bracket for each screen.

7.9.6.2(4)(f) At each digital signage screen and wall-mounted display location provide one quadplex power outlet and two Category 6A Data Drops at the required elevation.

7.9.6.2(4)(g) In locations that the Owner requires a flush installation, the walls will be constructed with cavities and recessed power and data outlets to allow the digital signage screens and accessories to be recessed into the wall.

7.9.6.2(4)(h) Project Co will program the system in consultation with the Owner’s operational and functional requirements.

7.9.6.2(5) Guest Infotainment

7.9.6.2(5)(a) Project Co will install Owner provided wall-mounted displays and related components. This includes the provision of all television mounting brackets, in-room devices, and hardware.

7.9.6.2(5)(b) Coordinate with the designated Access Provider to bring backbone cabling services into the Facility and to extend those services from the Entrance Facility Rooms to the required Telecommunications Rooms. This includes the provision of a backbone riser, active equipment and passive components.

7.9.6.2(5)(c) A guest infotainment outlet consists of a quad-plex receptacle, and two Data Drops – one on the guest infotainment network, and one on the IM/IT data network. A guest infotainment outlet will serve a Patient entertainment display, a Patient education display, or a combined Patient entertainment/ education display. All cabling will be connected in the closest TR.

7.9.6.2(5)(d) Provide nurse call interfaces installed in electrical boxes co-located with guest infotainment outlets in all Patient Rooms and areas where Patients will be controlling the guest infotainment system via the nurse call system.

7.9.6.2(5)(e) Project Co will provide guest infotainment outlets in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff, Patients and public will have ready access to infotainment displays in any locations where they may reasonably be expected to be stationed:

- 7.9.6.2.5.(e).1 Patient bed location;
- 7.9.6.2.5.(e).2 Patient use areas in all Patient Care Areas/rooms/units of the Facility;
- 7.9.6.2.5.(e).3 Care Team Station;
- 7.9.6.2.5.(e).4 Staff lounge;
- 7.9.6.2.5.(e).5 Waiting room;
- 7.9.6.2.5.(e).6 Patient and family/visitor lounge;
- 7.9.6.2.5.(e).7 Main Entrance Lobby area (multiple outlets);
- 7.9.6.2.5.(e).8 Cafeteria (multiple outlets);
- 7.9.6.2.5.(e).9 Emergency Operations Centre (multiple outlets); and
- 7.9.6.2.5.(e).10 On-call room.

7.9.6.2(5)(f) At each guest infotainment outlet location, provide sufficient structural support and backing for a 55” or larger wall-mounted display.

7.9.6.2(5)(g) Provide two 15-amp, 120 V AC duplex receptacles on a dedicated circuit for guest infotainment equipment. Receptacles will be located on the infotainment backboard at a location and height that will be determined in consultation with the Owner. The guest infotainment system will use Conditional power.

7.9.6.2(6) UBC Spaces

7.9.6.2(6)(a) Project Co will coordinate the requirements of these spaces with the UBC Faculty of Medicine.

7.9.6.2(6)(b) Provide all necessary infrastructure, including power, pathways, conduits, spaces and structured cabling, to support UBC's clinical academic program.

7.9.6.2(6)(c) Ensure there is adequate conduit between the Clinical Skills Rooms and the Observation and Control Rooms to meet all the functional requirements of the spaces.

7.9.6.2(7) Integration Requirements

7.9.6.2(7)(a) Project Co will provide AV control systems interfaces to, and integration with, the fire alarm system and BMS for lighting, HVAC and audio overrides in all multimedia rooms in emergency situations.

7.9.6.2(7)(b) Project Co will provide interfaces for the AV systems to Millwork, lecterns, and the IM/IT data network to ensure all connectivity requirements are met.

7.9.6.2(7)(c) Project Co will provide AV control systems interface to, and integration with, the lighting controls, BMS, and motorized blinds for control of these systems from the AV control panel within the room.

7.9.7 IM/IT VoIP System

7.9.7.1 Basic Requirements

7.9.7.1(1) System Overview

7.9.7.1(1)(a) All phone system equipment for the Facility.

7.9.7.1(2) Applicable Area

7.9.7.1(2)(a) Applies to the Facility.

7.9.7.1(3) System Responsibilities

7.9.7.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.7.1(3)(b) Owner will:

- 7.9.7.1.3.(b).1 Design, supply and install all system equipment;
- 7.9.7.1.3.(b).2 Design, supply and install all system software;
- 7.9.7.1.3.(b).3 Commission all system equipment and software; and
- 7.9.7.1.3.(b).4 Provide design feedback to Project Co.

7.9.7.1(3)(c) Project Co will:

- 7.9.7.1.3.(c).1 Design, supply, and install all system infrastructure;
- 7.9.7.1.3.(c).2 Provide labor required to cross-connect and patch all analogue, fax VoIP and public access lines in the Facility; and
- 7.9.7.1.3.(c).3 Be responsible for integrating this system with the Project Co side of the following systems:
  - (c).3.1 Nurse call;
  - (c).3.2 Integration engine;
  - (c).3.3 Public address;
  - (c).3.4 Intrusion detection;
  - (c).3.5 Fire alarm; and
  - (c).3.6 Intercommunications.

7.9.7.2 Performance Criteria

7.9.7.2(1) General

7.9.7.2(1)(a) Adhere to all standards and specifications identified in the PHSA Communications Infrastructure Standards and Specifications.

7.9.7.2(1)(b) IM/IT VoIP network equipment will be located in the MERs.

7.9.7.2(1)(c) Project Co will provide the materials and labour required to cross-connect and patch all VoIP, analog, fax and public access lines in the Facility in

accordance with instructions and documentation provided by the Owner.

7.9.7.2(1)(d) The IM/IT VoIP system and infrastructure in the Facility will be equipped to provide VoIP, analog, fax and public access services.

7.9.7.2(1)(e) Project Co will undertake the Design and Construction of all other communications infrastructure in the Facility required to support the implementation of the Owner's IM/IT voice network in accordance with the requirements stated in this Agreement;

7.9.7.2(1)(f) Pay-telephones and courtesy phones will be located in the Facility's Main Entrance Lobby and other areas as specified by the Owner.

7.9.7.2(1)(g) Provide two (2) taxi phones in Main Entrance Lobby area.

7.9.7.2(1)(h) Where there is a computer and telephone co-located, such as at computer workstations, they will utilize the same Data Drop.

7.9.7.2.1.(h).1 Workstations for medical equipment, such as Diagnostic Imaging control workstations, will not share a Data Drop with a telephone.

7.9.7.2(2) Integration Requirements

7.9.7.2(2)(a) Project Co will work collaboratively with the Owner to integrate Project Co systems to the IM/IT VoIP system to provide voice calling and text alerts to wired and wireless Staff communication devices.

7.9.7.2.2.(a).1 This includes the programming of call groups, call escalation and call vectoring.

7.9.7.2(2)(b) Where there is integration between Project Co supplied systems and the IM/IT VoIP system that is achievable via programming on the IM/IT VoIP system, Project Co will provide the integration and programming for the IM/IT VoIP system.

7.9.8 Integration Engine

7.9.8.1 Basic Requirements

7.9.8.1(1) System Overview

7.9.8.1(1)(a) The integration engine is a software-based integration engine designed to integrate select systems throughout the Facility to provide additional functionality as required by the Owner.

7.9.8.1(2) Applicable Area

7.9.8.1(2)(a) Applies to the Facility.

7.9.8.1(3) System Responsibilities

7.9.8.1(3)(a) Owner will:

7.9.8.1.3.(a).1 Provide design feedback to Project Co.

7.9.8.1(3)(b) Project Co will:

7.9.8.1.3.(b).1 Select the system as reviewed by the Owner;

7.9.8.1.3.(b).2 Design, supply, install and program all system software as determined in consultation with the Owner;

7.9.8.1.3.(b).3 Commission all software as determined in consultation with the Owner;

7.9.8.1.3.(b).4 Integrate the system to the following systems:

(b).4.1 Nurse call;
(b).4.2 IBMP;
(b).4.3 Public address;
(b).4.4 Intrusion detection;
(b).4.5 Intercommunications;
(b).4.6 Wireless Staff duress;
(b).4.7 Fixed duress;
(b).4.8 IM/IT VoIP;
(b).4.9 Patient wandering;
(b).4.10 Electronic Health Record software;
(b).4.11 Location Services (RTLS);
(b).4.12 AGV;
(b).4.13 Access Control;
(b).4.14 IP Video Surveillance;
(b).4.15 Wireless Staff Communications; and
(b).4.16 Any other systems necessary to meet the functional requirements of this Project Agreement.

7.9.8.2 Performance Criteria

7.9.8.2(1) General

7.9.8.2(1)(a) Provide an integration engine capable of integrating systems as described in their respective sections and Appendix 3E [Systems Responsibility Matrix].

7.9.8.2(1)(b) Integration engine includes software middleware, direct connect, manufacturer supported applications programming interfaces (API), and is not just limited to a single middleware application but a suite software integrations.

7.9.8.2(1)(c) The integration engine will be capable of importing and exporting a variety of modern data formats including XML and JSON.

7.9.8.2(1)(d) The integration engine will be able to create rules and conditional logic dynamically configurable based on changing operating conditions.

7.9.8.2(1)(e) The integration engine will be capable of displaying alerts at their origins on a graphical map of the Facility, accessible via Owner workstations.

7.9.8.2(1)(f) The integration Engine will be capable of triggering nurse call events and notifications via inputs from other systems. Code white (duress) calls will annunciate on the local nurse call consoles in the department or unit from which the call originated.

7.9.8.2(1)(g) The integration engine will integrate with the wireless Staff communications system such that alerts, notifications, and calls can be initiated from other systems. Include programming of room names, call groups, and call routing into the system as determined in consultation with the Owner.

7.9.8.2(1)(h) Project Co will program the system with a database of room and location identifiers that can be tied to each event sent to the integration engine.

7.9.8.2(1)(i) The integration engine will integrate to the IBMP such that IBMP events can be pushed as messages through Staff systems connected to the integration engine, including:

7.9.8.2.1.(i).1 SMS text; and

7.9.8.2.1.(i).2 Email.

7.9.8.2(1)(j) The integration engine will be a commercial software product that is proven for health care integration applications in large acute care environments.

7.9.8.2(1)(k) The integration engine will support standard manufacturer’s API’s and SOAP UI.

7.9.8.2(1)(l) The integration engine will be multi-suite software compatible and will be capable of importing a variety of data formats including HL7 and FHIR standards.

7.9.8.2(1)(m) The integration engine will reside on the Owner provided servers. Project Co will provide the Owner with recommended server specifications and network loading requirements for hosting the integration engine.

7.9.8.2(1)(n) Consult with the Owner's clinical Staff and program the integration engine to meet the workflow call routing requirements for Interface to Project Co provided systems.

7.9.8.2(1)(o) Provide web browser-based HTML 5 software that can be accessed by users simultaneously from any Owner workstation with password authentication.

7.9.8.2(1)(p) The integration engine will integrate natively with the Owner’s EHR.

7.9.9 Patient Physiological and Vital Signs Monitoring System

7.9.9.1 Basic Requirements

7.9.9.1(1) System Overview

7.9.9.1(1)(a) The patient physiological monitoring system comprises the following:

- 7.9.9.1.1.(a).1 Fixed and mobile physiological and vital signs monitoring Equipment;
- 7.9.9.1.1.(a).2 Central and slave monitoring stations;
- 7.9.9.1.1.(a).3 Dedicated wired network infrastructure;
  - (a).3.1 Physically separate from the Owner’s IM/IT data network.
- 7.9.9.1.1.(a).4 Dedicated wireless (Telemetry) networking infrastructure and equipment;
  - (a).4.1 Physically separate from the Owner’s IM/IT Wi-Fi network.

7.9.9.1(1)(b) The system is entirely separate from and does not share infrastructure, equipment and/or software with:

- 7.9.9.1.1.(b).1 IM/IT data network; and/or
- 7.9.9.1.1.(b).2 IM/IT Wi-Fi network.

7.9.9.1(2) Applicable Area

7.9.9.1(2)(a) Applies to the Facility.

7.9.9.1(3) System Responsibilities

7.9.9.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.9.1(3)(b) Owner will:

- 7.9.9.1.3.(b).1 Select, design and supply all system headend equipment;
- 7.9.9.1.3.(b).2 Install all system headend equipment;
- 7.9.9.1.3.(b).3 Design, supply and install all system software;
- 7.9.9.1.3.(b).4 Commission system equipment and software; and
- 7.9.9.1.3.(b).5 Provide design feedback to Project Co.

7.9.9.1(3)(c) Project Co will:

- 7.9.9.1.3.(c).1 Select, design, supply, install and commission all system infrastructure as determined in consultation with the Owner;
- 7.9.9.1.3.(c).2 Design, install, and commission all system field equipment in consultation with the Owner, including:
  - (c).2.1 supply and install mounting hardware and physical connection of all Equipment;
  - (c).2.2 coordinate the design of the Telemetry wireless access points with the system vendor; and
  - (c).2.3 install Owner supplied access points, antennas, brackets and associated accessories and hardware in consultation with the Owner.
- 7.9.9.1.3.(c).3 Supply and install all cabling required for all systems and Equipment requiring connectivity to the Facility's Physiological Monitoring network; and
- 7.9.9.1.3.(c).4 Provide basic Commissioning for field equipment power and network connectivity.

7.9.9.2 Performance Criteria

7.9.9.2(1) General

7.9.9.2(1)(a) Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] for specific Owner functional and Equipment location requirements.

7.9.9.2(1)(b) Project Co will:

7.9.9.2.1.(b).1 provide all physical infrastructure required to install, cable, connect, pathway, power and support the Equipment supplied by the Owner;

7.9.9.2.1.(b).2 furnish the Owner and system vendor with all Design documentation in the format requested to complete a software based predictive Design of the Telemetry system. This includes floor plans, reflected ceiling plans, elevation and section drawings, Furniture and Equipment layouts and information on building materials and finishes;

7.9.9.2.1.(b).3 undertake the Design and Construction of a complete structured cabling system with dedicated patch panels for the Patient Monitoring system. TRs will contain equipment including synchronization units and network switches;

7.9.9.2.1.(b).4 provide dedicated equipment rack space complete with power supplies and wire management; and

7.9.9.2.1.(b).5 coordinate with the Owner and system vendor to determine locations of access points required to support the dedicated, independent wireless infrastructure associated with the patient physiological monitoring system. Project Co will install infrastructure and wireless access points.

7.9.9.2(2) Fixed and Mobile Physiological Monitoring Equipment

7.9.9.2(2)(a) Project Co will provide all physical infrastructure required to install, cable, connect, pathway, power and support the Equipment supplied by the Owner.

7.9.9.2(2)(b) Project Co will provide UPS receptacles for Equipment as directed by the Owner.

7.9.9.2(2)(c) Project Co will coordinate with the Owner and provide and install the mounting hardware for the Patient physiological monitors and vital signs monitors in the Care Team Stations, Patient rooms, surgical, and procedure rooms.

7.9.9.2(3) Dedicated Wired Network Infrastructure

7.9.9.2(3)(a) TR’s will contain the patient physiological monitoring system equipment including PoE switches, synchronization units and network switches. Project

Co will ensure that each TR has sufficient rack space to support all Physiological Monitoring network equipment associated with it, plus 50% spare capacity.

7.9.9.2(3)(b) Physiological Monitoring network equipment and patch panels will reside within a single rack, and not be spread across multiple racks.

7.9.9.2(3)(c) Project Co will provide additional Data Drops on the Physiological Monitoring network at each Care Team Station and other required areas throughout the Facility:

7.9.9.2.3.(c).1 provide four (4) Data Drops per Telemetry Central Monitor; and

7.9.9.2.3.(c).2 provide two (2) Data Drops per Telemetry Slave Monitor.

7.9.9.2(3)(d) Project Co will provide two (2) additional Data Drops on the Physiological Monitoring network at each charting workstation or alcove in the Critical Care Complex.

7.9.9.2(3)(e) Project Co will provide Data Drops on the Physiological Monitoring network at each headwall/ boom or other walls in rooms specified by the Owner.

7.9.9.2(3)(f) Project Co will provide dedicated rack space and complete structured cabling connections between the RJ45 outlet jack serving both the fixed Patient locations and the wireless access point, and the port on the network switch.

7.9.9.2.3.(f).1 .

7.9.9.2(4) Dedicated Wireless (Telemetry) Networking Infrastructure

7.9.9.2(4)(a) Project Co will provide detailed Facility Floor plans to the Telemetry vendor for its use in designing the Telemetry wireless access point layout. Project Co will ensure that the design of the system meets the vendors requirements.

7.9.9.2(4)(b) Wireless access points for the physiological monitoring system will be installed throughout the Facility in all areas where Patients may commonly be found. Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements]

for additional details regarding equipment locations and requirements.

7.9.9.2(4)(c) Provide a TO with a single Data Drop for each patient physiological monitoring system wireless access point.

7.9.9.2(4)(d) Telemetry wireless access points for the Physiological Monitoring system will be installed for complete indoor and outdoor coverage throughout the Facility, with the exception of the following:

- 7.9.9.2.4.(d).1 Underground parking;
- 7.9.9.2.4.(d).2 Mechanical and electrical rooms;
- 7.9.9.2.4.(d).3 Communications Rooms;
- 7.9.9.2.4.(d).4 Main Laboratory;
- 7.9.9.2.4.(d).5 Main Pharmacy;
- 7.9.9.2.4.(d).6 Morgue and Autopsy;
- 7.9.9.2.4.(d).7 Urban Health;
- 7.9.9.2.4.(d).8 Integrated Mental Health and Substance Use;
- 7.9.9.2.4.(d).9 On-Call Support;
- 7.9.9.2.4.(d).10 Media Services; and
- 7.9.9.2.4.(d).11 Operational Support departments.

7.9.9.2(4)(e) Coordinate locations of antenna access points, mounting hardware and telecommunications enclosures required to support the dedicated, independent wireless infrastructure associated with the patient physiological monitoring system. This includes identifying all infrastructure on reflected ceiling plans uniquely and providing clash detection with other ceiling infrastructure including lighting, antennas, ceiling lifts and all other ceiling systems.

7.9.9.2(4)(f) Telemetry wireless access points and Owner IM/IT Network wireless access points are to be physically separated by 2 m. Project Co will identify any conflicts between the two systems to the Owner.

7.9.9.2(4)(g) When installing Telemetry wireless access points, Project Co will ensure that they are positioned away from sources of EMI, such that the signal is not impeded by these sources.

- 7.9.9.2.4.(g).1 Position Telemetry wireless access points a minimum of 500 mm from LED drivers and lighting fixtures

7.9.9.2(4)(h) For the safety of Patients and Staff, Project Co will be required to supply, install and label ceiling (hard

cap and tile) enclosures to accommodate wireless hardware in areas of the Facility specified by the Owner. These enclosures will hide wireless hardware from view and prevent unauthorized access to the access point and the connecting cabling.

7.9.9.2.4.(h).1 The enclosures provided will allow RF transmissions to penetrate with little or no attenuation and match the surrounding ceiling colour;

7.9.9.2.4.(h).2 Prior to purchase of the enclosures, Project Co will submit shop drawings to the Owner for approval and, if required, provide samples to the Owner for RF testing purposes and to check for interoperability with wireless hardware;

7.9.9.2.4.(h).3 At a minimum, these enclosures will be required in all Mental Health Areas of the Facility.

7.9.9.2(4)(i) To protect wireless hardware from the environment, theft or vandalism, Project Co will be required to supply, install and label indoor/outdoor NEMA rated access point enclosures in certain areas within the Facility and for all outdoor WAPs.

7.9.9.2.4.(i).1 The enclosures will be able to protect wireless hardware from wet and dirty environments, ventilated, UV stabilized for exposure to directly sunlight, virtually transparent to wireless signals, lockable and work with all variations of Owner provided wireless hardware.

7.9.9.2.4.(i).2 Prior to purchase of the enclosures, Project Co will submit shop drawings to the Owner for approval and, if required, provide samples to the Owner for RF testing purposes and to check for interoperability with wireless hardware.

7.9.10 Public Address

7.9.10.1 Basic Requirements

7.9.10.1(1) The public address system consists of the speakers, power supplies, amplification equipment, and voice networking equipment required to provide a complete paging system within the Facility.

7.9.10.1(2) Applicable Area

7.9.10.1(2)(a) Applies to the Facility.

7.9.10.1(3) System Responsibilities

7.9.10.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.10.1(3)(b) Owner will:

7.9.10.1.3.(b).1 Provide design feedback to Project Co.

7.9.10.1(3)(c) Project Co will:

7.9.10.1.3.(c).1 Select the system in consultation with the Owner;

7.9.10.1.3.(c).2 Select, design, supply, install and commission all system infrastructure in consultation with the Owner;

7.9.10.1.3.(c).3 Design, supply and install all system equipment in consultation with the Owner;

7.9.10.1.3.(c).4 Design, supply and install all system software in consultation with the Owner;

7.9.10.1.3.(c).5 Commission all system infrastructure, equipment and software in consultation with the Owner; and

7.9.10.1.3.(c).6 Integrate the system to the following systems:

(c).6.1 IM/IT VoIP;

(c).6.2 Nurse call;

(c).6.3 Fixed duress;

(c).6.4 Wireless Staff duress; and

(c).6.5 Fire alarm.

7.9.10.2 Performance Criteria

7.9.10.2(1) General

7.9.10.2(1)(a) Project Co will provide a public address system compliant with CAN/ULC-S576, Standard for Mass Notification System Equipment and Accessories.

7.9.10.2(1)(b) The PA system will be separate from and act independently of the fire alarm system and its emergency voice communications system. Provide interconnects between the systems as required by all applicable regulatory standards or codes.

7.9.10.2(1)(c) Project Co will provide the infrastructure required for an IP based PA system in the Facility.

7.9.10.2(1)(d) Provide complete speaker coverage throughout the Facility, excluding Patient rooms, Secure Rooms, and On-Call Rooms so that pages can be heard throughout with high intelligibility and low loss of articulation of consonants. Ensure there is at least one speaker in each Medication Room throughout the Facility.

7.9.10.2(1)(e) Project Co will provide all equipment and integrations necessary for a fully operational public address system including:

7.9.10.2.1.(e).1 paging amplifiers;

(e).1.1 Project Co is to provide one additional spare paging amplifier over and above the number required to operate the Facility's PA system.

(e).1.2 size amplifiers to handle the total load plus 25 % spare capacity per channel.

7.9.10.2.1.(e).2 an interface to the public address system from the telephone system. The public address system integration will facilitate single-step dialling from a telephone handset directly to a paging zone;

(e).2.1 Voice paging will typically be performed via a telephone located at the switchboard. In addition, provide a hard-wired backup microphone in a location to be advised by the Owner in the event the phone system fails. This backup microphone will be able to page the entire Facility.

7.9.10.2.1.(e).3 speakers;

7.9.10.2.1.(e).4 end-of-line resistors for audio channel supervision;

7.9.10.2.1.(e).5 microphone(s); and

7.9.10.2.1.(e).6 mixers.

7.9.10.2(1)(f) Project Co will train the Owner's Maintenance and Operational Staff on how to use and maintain the PA system.

7.9.10.2(1)(g) The training will cover all of the items contained in the approved operating and maintenance manuals as well as a demonstrations of routine maintenance operations.

7.9.10.2(2) Performance Requirements

7.9.10.2(2)(a) Provide complete speaker coverage throughout 100% of the Facility, excluding areas noted in Section 7.9.10.2(1)(d), so that emergency voice pages can be heard everywhere in the Facility, with high intelligibility and low loss of articulation of consonants (%ALCONS). Include specifically situated speakers within each meeting room, services areas, the underground parking, rooftop and exterior areas, and the Energy Centre.

7.9.10.2(2)(b) Maximum of one second delay between accessing the system and the ability to transmit a page from either a local station or remotely.

7.9.10.2(2)(c) The system will be capable of supporting multiple paging zones within the Facility. The system will provide paging zones as follows, at a minimum, and other zones as determined in consultation with the Owner:

- 7.9.10.2.2.(c).1 a paging zone for each department within the Facility;
- 7.9.10.2.2.(c).2 a paging zone for each floor/level of the Facility;
- 7.9.10.2.2.(c).3 a paging zone for the Energy Centre;
- 7.9.10.2.2.(c).4 a paging zone for all clinical areas;
- 7.9.10.2.2.(c).5 a paging zone for all non-clinical areas; and
- 7.9.10.2.2.(c).6 the ability to page all zones at once.

7.9.10.2(2)(d) Provide sound levels as follows throughout the Facility:

- 7.9.10.2.2.(d).1 normal voice paging: 60 dB minimum.
- 7.9.10.2.2.(d).2 voice paging sound levels will be at least 10 dB above ambient noise levels in mechanical rooms and similar locations.

7.9.10.2(2)(e) Speakers:

- 7.9.10.2.2.(e).1 All speakers will be multi-tap.
- 7.9.10.2.2.(e).2 Provide flush Tamper Resistant ceiling speakers in finished areas.
- 7.9.10.2.2.(e).3 Provide enclosed ceiling speakers in unfinished areas.
- 7.9.10.2.2.(e).4 Provide trumpet type speakers in mechanical and other high ambient noise locations.

7.9.10.2(2)(f) Wire alternate speakers to different amplifiers such that a fault on one channel does not render paging in an area inaudible.

7.9.10.2(2)(g) Power supplies and other support equipment:

7.9.10.2.2.(g).1 Paging amplifiers are to be rack mounted within each TR.

7.9.10.2.2.(g).2 Wire alternate speakers to different amplifier channels such that a fault on one channel does not render paging in an area inaudible.

7.9.10.2.2.(g).3 Maximum of one second delay between accessing the system and the ability to transmit a page from either a local station or remotely.

7.9.10.2.2.(g).4 The amount of rack space provided will accommodate all the equipment required for PA system plus sufficient space for 25 % growth. Empty space dedicated for future growth of the PA system will be covered by blank panels.

7.9.10.2.2.(g).5 All PA system wiring will be run in conduit, and cable tray, even in fully accessible ceiling areas.

7.9.10.2(3) Integration Requirements:

7.9.10.2(3)(a) Project Co will integrate the public address system to the IM/IT VoIP system such that a voice page can be initiated with a maximum delay of 1 second between accessing the system and transmitting the page.

7.9.10.2(3)(b) Project Co will integrate the system to the fixed and wireless Staff duress systems such that pre-recorded pages can be initiated automatically by these systems. Project Co will record, program, and coordinate all such pages as required by the Owner.

7.9.10.2(3)(c) Project Co will integrate the system to the nurse call system such that pre-recorded pages can be initiated automatically by the nurse call system. Project Co will record, program, and coordinate all such pages as required by the Owner.

7.9.10.2(3)(d) Ensure the appropriate electronic interlocking with the fire alarm system, to ensure automatic priority is given to operating the fire alarm during initial time periods as required by VBBL.

7.9.11 Nurse Call System

7.9.11.1 Basic Requirements

7.9.11.1(1) System Overview

7.9.11.1(1)(a) The nurse call system in a health care facility is the front-line tool for delivering Patient care in health care facilities today. It is the primary means of communication between Patients and Staff and provides a visual indicator of Patient needs to Staff on the floor. As such, a Patient-centric design is critical to providing an effective nurse call system. Each Component area will have a full suite of nurse call devices, including Patient stations, video stations, call cords and audio washroom devices.

7.9.11.1(2) Applicable Area

7.9.11.1(2)(a) Applies to the Facility.

7.9.11.1(3) System Responsibilities

7.9.11.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.11.1(3)(b) Owner will:

7.9.11.1.3.(b).1 Select the system – the newest version of the Rauland Responder 5 Nurse Call system or acceptable alternative as determined in consultation with the Owner; and

7.9.11.1.3.(b).2 Provide design feedback to Project Co.

7.9.11.1(3)(c) Project Co will:

7.9.11.1.3.(c).1 Select, design, supply, install and commission all system infrastructure in consultation with the Owner;

7.9.11.1.3.(c).2 Design, supply and install all system equipment as determined in consultation with the Owner;

7.9.11.1.3.(c).3 Design, supply, configure, and install all system software in consultation with the Owner;

7.9.11.1.3.(c).4 Commission all system infrastructure, equipment and software in consultation with the Owner; and

7.9.11.1.3.(c).5 Integrate the system in consultation with the Owner including the following systems:

(c).5.1 Integration engine;

(c).5.2 Public address;

(c).5.3 IM/IT VoIP;

(c).5.4 Room lighting;

(c).5.5 Room blinds;
(c).5.6 Wireless Staff duress;
(c).5.7 Fixed duress;
(c).5.8 Electronic health record admit transfer discharge (ADT);
(c).5.9 Fire alarm (smoke detector relay) in each Patient room;
(c).5.10 Wireless Staff communication; and
(c).5.11 RTLS.

7.9.11.2 Performance Criteria

7.9.11.2(1) General

7.9.11.2(1)(a) The nurse call system in a hospital environment is a hub for wired and wireless clinical workflow communications.

7.9.11.2(1)(b) The nurse call system will be the primary communication system for Patients to contact Staff remotely when they require assistance.

7.9.11.2(1)(c) The nurse call system will be designed to promote efficient operation for Staff. Incorporate in the planning, design and installation the multiple virtual and physical Interfaces that are required to support a seamless fixed and mobile workflow system.

7.9.11.2(1)(d) The existing St. Paul's Hospital currently supports nurse call code calls from other sites within the region. This is achieved through a network connection to the Owner's existing sites, and will be required at the Facility.

7.9.11.2(1)(e) The nurse call system will be an IP-based full-duplex audio and visual system that will utilize the latest proven technologies and comply with all applicable system design and installation standards, including UL-1069, CSA C22.2 No. 205 and CSA Z32.

7.9.11.2(1)(f) The nurse call system will provide a full range of software applications as offered by the nurse call vendors most current systems intended for use in large acute care facilities. The applications will include system administration and supervision, Staff assignment and messaging, and Staff presence, workload and workflow management, and statistical reporting in a centralized database.

7.9.11.2(1)(g) Refer to Appendix 3O [Electrical IM/IT Matrix] for minimum room requirements for nurse call devices. Additional devices will be required as specified in this section and as determined by the Owner.

7.9.11.2(1)(h) All system equipment, excluding servers, will be from a single manufacturer and will be the same model number from that manufacturer.

7.9.11.2(1)(i) All nurse call network horizontal cabling runs to Communications Rooms will be bundled separately from and will not be intertwined with other horizontal cables.

7.9.11.2(1)(j) Project Co will ensure that large Clinical Spaces, such as procedure rooms and gyms, contain multiple nurse call devices with code/Staff assist buttons.

7.9.11.2(1)(k) Project Co will supply protective covers for all nurse call devices other than zone/dome lights, call cords, pillow speakers, pull cords, Staff duty stations, Staff consoles and touch screen Staff workflow stations.

7.9.11.2(1)(l) Devices with code blue or code pink buttons in public areas of the Facility will require a suitable physical barrier, or enclosure that enables Staff to prohibit access to the device.

7.9.11.2(2) Call Types

7.9.11.2(2)(a) Nurse call stations will be individually programmable to allow multiple call classification and priority levels. Nurse Call alarms will include the following, at a minimum, and other alarms as determined by the Owner in order that staff and patients are able to initiate emergency and workflow notifications:

7.9.11.2.2.(a).1 code blue (cardiac arrest);
7.9.11.2.2.(a).2 code pink (neonatal cardiac arrest);
7.9.11.2.2.(a).3 code red (fire);
7.9.11.2.2.(a).4 code white (violence);
7.9.11.2.2.(a).5 normal Patient call;
7.9.11.2.2.(a).6 priority Patient call;
7.9.11.2.2.(a).7 Staff emergency call;
7.9.11.2.2.(a).8 bathroom call;
7.9.11.2.2.(a).9 shower call;
7.9.11.2.2.(a).10 anaesthetic call;
7.9.11.2.2.(a).11 clean room call;

7.9.11.2.2.(a).12 porter call; and
7.9.11.2.2.(a).13 Patient monitoring alarms.

7.9.11.2(3) Staff Consoles

7.9.11.2(3)(a) Staff consoles will be colour, touch screen, user configurable, allow multiple screens, soft key enabled, hands-free full duplex capability with handset for private conversations.

7.9.11.2(3)(b) Staff consoles will have the means to disable nurse call buttons on an individual basis to prevent misuse by Patients.

7.9.11.2(3)(c) Staff consoles will have the capability to redirect all calls to other VoIP nurse consoles on a manual, automatically scheduled basis, call escalation, or console failure. Confirm programming through user group meetings.

7.9.11.2(3)(d) Project Co will supply and install Staff Consoles in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff will have ready access to Staff consoles in any locations where Staff may reasonably be expected to gather to monitor Patients or manage work:

7.9.11.2.3.(d).1 Care Team Stations;
7.9.11.2.3.(d).2 Operations Control Desk;
7.9.11.2.3.(d).3 Reception, registration, and triage areas; and
7.9.11.2.3.(d).4 Command Centre.

7.9.11.2(4) Zone / Dome Lights

7.9.11.2(4)(a) Provide multi-call classification dome and zone lights (minimum 4 LEDs) to annunciate calls at each room or bay with a nurse call device.

7.9.11.2(4)(b) Locate dome lights in a manner that allow Owner Staff the best possible view from the outside of the room where the nurse call device is located.

7.9.11.2(4)(c) Provide zone lights at all corridor intersections or as determined by the Owner to direct and lead Staff from anywhere within or outside the unit to the origin of the call.

7.9.11.2(5) Patient Stations

7.9.11.2(5)(a) Patient stations will be individually programmable to allow multiple call classification and priority levels. Patient stations will be capable of connecting nurse call devices (such as call cords) and an auxiliary alarm input. Provide the ability to disable any nurse call system input from any Staff console.

7.9.11.2(5)(b) Where smart beds are planned, the nurse call Patient station will fully interface with the full range of smart bed call and audio functions using standard 37-pin bed connectors. Project Co will be responsible for supplying any additional cords, adapters, or connectors required to facilitate this interface.

7.9.11.2(5)(c) Where there are multiple patient areas within a given location, Project Co will provide a Patient station for each bed, recliner, chair and stretcher.

7.9.11.2(5)(d) All Patient stations will have a separate jack input with the ability to interface with relay/dry contact medical equipment alarms for medical equipment monitoring and peripheral monitoring (such as bed exit).

7.9.11.2(5)(e) Project Co will supply and install Patient stations in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff and Patients will have immediate access to Patient stations in any locations where Patients may reasonably be expected to be left alone and/or receiving treatment:

- 7.9.11.2.5.(e).1 Patient Rooms (provide one Patient station per Patient bed in each location);
- 7.9.11.2.5.(e).2 Exam rooms and bays;
- 7.9.11.2.5.(e).3 Treatment rooms and bays;
- 7.9.11.2.5.(e).4 Assessment rooms and bays;
- 7.9.11.2.5.(e).5 Procedure rooms and bays;
- 7.9.11.2.5.(e).6 Clinical Skills Rooms;
- 7.9.11.2.5.(e).7 Patient recliner/treatment locations;
- 7.9.11.2.5.(e).8 Patient stretcher locations;
- 7.9.11.2.5.(e).9 Medical imaging rooms; and
- 7.9.11.2.5.(e).10 Any other Patient location with a bed, recliner, chair, exam table, and/or stretcher.

7.9.11.2(6) Call Cords, Pillow Speakers and Pull Cords

7.9.11.2(6)(a) Call Cords

7.9.11.2.6.(a).1 All call cords will be washable and compliant with the Owner's infection control policies. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs.

7.9.11.2.6.(a).2 Provide call cords for each Patient station that is not assigned a pillow speaker, as determined in consultation with the Owner.

7.9.11.2.6.(a).3 Provide additional spare call cords equal to 10% of the amount provided for Service Commencement.

7.9.11.2(6)(b) Pillow Speakers

7.9.11.2.6.(b).1 Provide enhanced pillow speakers for control of room lights/blinds within Patient spaces.

7.9.11.2.6.(b).2 Provide pillow speaker type call cords in any locations where the nurse call system is locally integrated with the guest infotainment, lighting and/or blinds.

7.9.11.2.6.(b).3 Provide additional spare pillow speakers equal to 10% of the amount provided for Service Commencement.

7.9.11.2(6)(c) Pull Cords and Pull Cord Stations

7.9.11.2.6.(c).1 Pull cords will be washable and compliant with the Owner’s infection control policies.

7.9.11.2.6.(c).2 Project Co will supply and install pull cord stations with audio and Staff assist buttons in the following locations, at a minimum, and in other locations as determined by the Owner in order that Patients will have immediate access to pull cord stations in any locations where Patients receive treatment and/or may reasonably be expected to be left unsupervised and the Owner determines that a patient station is not required:

- (c).2.1 Patient and public washrooms in each stall;
- (c).2.2 Shower areas;
- (c).2.3 Patient chairs and recliners;
- (c).2.4 Patient and family lounges;
- (c).2.5 Breastfeeding rooms; and
- (c).2.6 Change rooms, cubicles and all locations where a Patient may be changing.

7.9.11.2.6.(c).3 Provide pullcords for each pull cord station plus 10% spare.

7.9.11.2(7) Code Blue/Pink Stations

7.9.11.2(7)(a) Provide code blue (cardiac arrest) and code pink (neonatal/maternal cardiac arrest) buttons in locations determined by the Owner.

7.9.11.2(7)(b) Code buttons may be incorporated into Patient stations and Staff Assist/Code stations.

7.9.11.2(7)(c) Project Co will supply and install code blue buttons in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff have immediate access to code blue buttons in any locations where Patients receive treatment and/or may reasonably be expected to be situated:

7.9.11.2.7.(c).1 Clinical Spaces;
7.9.11.2.7.(c).2 Patient Care Areas;
7.9.11.2.7.(c).3 Medical imaging rooms;
7.9.11.2.7.(c).4 Care Team Stations;
7.9.11.2.7.(c).5 Operations Control Desk;
7.9.11.2.7.(c).6 Interview rooms;
7.9.11.2.7.(c).7 Reception, registration, and triage areas;
7.9.11.2.7.(c).8 Administrative areas;
7.9.11.2.7.(c).9 Patient therapy, gym, rehabilitation, and ADL rooms;
7.9.11.2.7.(c).10 Patient lounges and quiet rooms;
7.9.11.2.7.(c).11 Patient bays and rooms;
7.9.11.2.7.(c).12 Cadaver Preparation/Viewing room;
7.9.11.2.7.(c).13 Operating Rooms and Interventional Suites;
7.9.11.2.7.(c).14 Exam and procedure rooms;
7.9.11.2.7.(c).15 Multipurpose Rooms;
7.9.11.2.7.(c).16 Dining and activity rooms;
7.9.11.2.7.(c).17 Chapel and All Nations Sacred Space;
7.9.11.2.7.(c).18 Conference/Meeting Rooms used for therapy and rehabilitation meetings (both sides of dividable rooms); and
7.9.11.2.7.(c).19 Patient decontamination areas.

7.9.11.2(7)(d) Project Co will supply and install code pink buttons in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff have immediate access to code pink buttons in any locations where maternal and/or

neonatal Patients may reasonably be stationed and/or receiving treatment:

7.9.11.2.7.(d).1 Maternity Centre Patient rooms;
7.9.11.2.7.(d).2 Care Team Stations;
7.9.11.2.7.(d).3 Reception, registration, and triage areas;
7.9.11.2.7.(d).4 Fetal monitoring areas;
7.9.11.2.7.(d).5 Assessment areas;
7.9.11.2.7.(d).6 C-Section and procedures areas;
7.9.11.2.7.(d).7 Pediatrics and infant zones;
7.9.11.2.7.(d).8 Emergency (obstetrical areas);
7.9.11.2.7.(d).9 Medical Imaging rooms; and
7.9.11.2.7.(d).10 Exam/Treatment Room-Resuscitation.

7.9.11.2(7)(e) Trauma areas that require both code blue and code pink will supply a separate code station for code pink.

7.9.11.2(8) Code Blue/Pink Sequence

7.9.11.2(8)(a) Provide an integrated code blue and code pink system that achieves the following sequence of operation:

7.9.11.2.8.(a).1 Upon a code blue or code pink button activation a priority call signal will be annunciated at multiple nurse call consoles and switchboard console. A pop-up message will also be displayed on all switchboard workstations that will indicate the precise origin of the code blue call.

7.9.11.2.8.(a).2 A code blue signal will be automatically generated by the system. The code blue signal will comprise a coded message on the public address system, a text message that is sent to the code blue/pink teams and wireless Staff communication devices through the integration engine. Allow for a manual verification sequence and programming prior to initiating the code blue signal, for Staff to manually verify the code blue call.

7.9.11.2.8.(a).3 Dome/zone lights at all corridor intersections and elevator lobbies will direct and lead the code response team to the origin of the code blue/pink call. Project Co will ensure that these devices are visible along the entire length of the corridor and will install additional dome/zone lights at each doorway in the corridor, and as required to provide visibility

where line-of-sight may be obstructed by signage or other wall/ceiling mounted obstructions.

7.9.11.2.8.(a).4 Each code blue/pink team member will have the ability to recall any elevator from any elevator lobby by means of an elevator recall keyswitch and card swipe. The code blue team will assume control of the elevator by means of a code blue keyswitch located inside each elevator cab.

7.9.11.2.8.(a).5 Upon cancellation of the code blue/pink call at the originating station all systems will reset and resume normal operation.

7.9.11.2(9) Staff Duty Stations

7.9.11.2(9)(a) Provide adequate Staff duty stations for each nurse call system to ensure that tones are heard throughout each department.

7.9.11.2(9)(b) Project Co will supply and install Staff Duty Stations in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff will have ready access to Staff duty stations in any locations where Staff may reasonably be expected to be working alone and need the ability to see and/or hear all Nurse Call alerts:

7.9.11.2.9.(b).1 Clean supply storage rooms;

7.9.11.2.9.(b).2 Soiled Utility and Soiled Equipment Hold rooms;

7.9.11.2.9.(b).3 Medication rooms;

7.9.11.2.9.(b).4 Equipment store rooms supporting clinical components;

7.9.11.2.9.(b).5 Phlebotomy Rooms; and

7.9.11.2.9.(b).6 Satellite Scope Reprocessing, Clean Scopes store rooms, and Ultrasound Probe Cleaning.

7.9.11.2(9)(c) Provide the capability to mute each Staff duty station.

7.9.11.2(10) Typical Patient Rooms

7.9.11.2(10)(a) In each Patient Room with an ensuite washroom include the following:

7.9.11.2.10.(a).1 one Patient station for each headwall location;

7.9.11.2.10.(a).2 one pull/call cord station for each Patient chair location;

7.9.11.2.10.(a).3 one bath station with audio and pull cord capability in the ensuite;
7.9.11.2.10.(a).4 one bath station with pull cord in the bath/shower of the ensuite;
7.9.11.2.10.(a).5 one Staff workflow terminal; and
7.9.11.2.10.(a).6 one dome light outside the room.

7.9.11.2(10)(b) In each Patient Room-SRMC with an in-suite deep soaker tub include the following devices in addition to the devices required for a typical Patient Room:
7.9.11.2.10.(b).1 one (1) bath station with pull cord near the in-suite tub; and
7.9.11.2.10.(b).2 one (1) Staff assist/code station.

7.9.11.2(11) Mental Health Areas

7.9.11.2(11)(a) Nurse call devices located in Mental Health Areas other than zone/dome lights, call cords, pillow speakers, pull cords, Staff duty stations, and Staff consoles will have a suitable physical barrier, or enclosure that enables Staff to prohibit access to the device by the Patient.

7.9.11.2(11)(b) Devices in Mental Health Areas will not have cords permanently attached and will use Ligature Resistant cords where cords are required.

7.9.11.2(11)(c) These requirements apply to all rooms within Mental Health Areas, at a minimum, and in other locations as determined by the Owner in order that nurse call devices will be suitably protected in locations where patients who may be at risk of vandalism or self harm may reasonably be expected to be located.

7.9.11.2(12) Staff Workflow Stations

7.9.11.2(12)(a) Provide programmable Staff workflow stations with touchscreens and integrated audio at locations as determined in consultation with the Owner.

7.9.11.2(12)(b) Staff workflow stations will have a programmable touch screen functionality that will enable the Owner to program workflow applications.

7.9.11.2(12)(c) Locate Staff workflow stations separate from Patient stations close to the room entrance, not at the Patient bedside or at the side of the Patient exam table.

7.9.11.2(12)(d) Exact location of Staff workflow stations will be as directed by the Owner and determined in consultation with the Owner's clinical Staff and nurse call manufacturer.

7.9.11.2(12)(e) Project Co will supply and install Staff workflow stations in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff will have ready access to Staff workflow stations in any locations where Staff may reasonably be expected to initiate workflow processes through the nurse call system, voice communication and/or visual alert:

- 7.9.11.2.12.(e).1 Patient rooms (provide one Staff workflow station per Patient bed in each location);
- 7.9.11.2.12.(e).2 Exam rooms and bays;
- 7.9.11.2.12.(e).3 Treatment rooms and bays;
- 7.9.11.2.12.(e).4 Assessment rooms and bays;
- 7.9.11.2.12.(e).5 Procedure rooms and bays;
- 7.9.11.2.12.(e).6 Medical imaging rooms;
- 7.9.11.2.12.(e).7 Control-Imaging rooms;
- 7.9.11.2.12.(e).8 Operating Rooms and Interventional Suites;
- 7.9.11.2.12.(e).9 Clinical Skills Rooms;
- 7.9.11.2.12.(e).10 Staff lounges;
- 7.9.11.2.12.(e).11 Interview rooms;
- 7.9.11.2.12.(e).12 Exam/Treatment Room-Resuscitation;
- 7.9.11.2.12.(e).13 hemodialysis stations; and
- 7.9.11.2.12.(e).14 Multipurpose Rooms.

7.9.11.2(12)(f) Project Co will supply and install 4-button stations in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff, Patients or guests will have immediate access to 4-button stations in any locations where they may reasonably be expected to be gather in shared areas:

- 7.9.11.2.12.(f).1 Family rooms and lounges;
- 7.9.11.2.12.(f).2 Patient lounges and quiet rooms;
- 7.9.11.2.12.(f).3 Patient therapy, gym, rehabilitation, and ADL rooms; and
- 7.9.11.2.12.(f).4 Conference/Meeting Rooms used for therapy and rehabilitation meetings (both sides of dividable rooms).

7.9.11.2(12)(g) Provide an additional 4-button station with dome light at the hall calls for the clean and dirty elevators serving each sterile core and MDRD.

7.9.11.2(13) Infrastructure Requirements

7.9.11.2(13)(a) Provide a separate physical network, as per the manufacturer's requirements, and all servers and network equipment for the nurse call system and integrate this network with other Facility networks, as determined in consultation with the Owner. If there is a technical reason for the nurse call servers to be on site, the servers for this system will reside in the MERs. Project Co will coordinate installation of these servers with the Owner.

7.9.11.2(13)(b) Install nurse call terminal cabinets in TRs as reviewed by the Owner. All nurse call network horizontal runs will be terminated on separate and dedicated patch panels.

7.9.11.2(13)(c) Utilize standard Category 6A, or greater based on standard in place at the time of procurement, copper cabling and connectors for nurse call cabling as required by the manufacturer. Cabling to be supplied by approved cabling manufacturer as set out in the PHSA Communications Infrastructure Standard.

7.9.11.2.13.(c).1 Cable jacketing colour will be purple.

7.9.11.2.13.(c).2 All nurse call network horizontal runs to Communications Rooms will be terminated and labelled in accordance with Section 7.9 Communications (Division 27).

7.9.11.2(13)(d) The nurse call system will continue to operate in stand-alone mode if it loses connectivity to any other networks.

7.9.11.2(13)(e) The nurse call system will be supplied by power from the central IM/IT UPS system.

7.9.11.2(14) System Configuration

7.9.11.2(14)(a) Project Co will review with the Owner clinical Staff the technical capabilities of the nurse call system including hardware and software functionality and system workflow; including reporting tools;

7.9.11.2(14)(b) Project Co will train the Owner end-user Staff to use the system. The training schedule will be as determined in consultation with the Owner and overall end-user Staff training schedules.

7.9.11.2(14)(c) Project Co will confirm all operational workflows, call flows and device locations through user group meetings prior to installing or programming the system.

7.9.11.2(14)(d) Installation of the nurse call system will be to the satisfaction of the Owner including device installation, programming, configuration, interfacing, testing and Commissioning of the system.

7.9.11.2(15) Integration Requirements:

7.9.11.2(15)(a) The nurse call system will be integrated with other systems in a seamless manner to achieve the integrated functional requirements as determined in consultation with the Owner.

7.9.11.2(15)(b) The nurse call system will allow the Owner's EHR to report from the nurse call system and pull data from the nurse call system for the purposes of reporting and analytics for items such as workflow optimization. All data points within the nurse call system will be available for EHR access. No Patient data will be stored within the nurse call system database.

7.9.11.2(15)(c) Integrate the nurse call system with the IM/IT VoIP network and provide integration to the wireless Staff communications system. Provide sufficient audio channels to meet the Owner's interface requirements, as determined in consultation with the Owner.

7.9.11.2(15)(d) Project Co will integrate the nurse call system to the integration engine to annunciate on the Owner's wireless Staff communication devices (Staff communication device, wireless phone devices, PDA's, radios or phones) for near instant alarm response as a secondary alerting system. The nurse call system will operate seamlessly and allow two-way VoIP communication into all Patient locations. Project Co will provide all interfaces and programming.

7.9.11.2(15)(e) The nurse call system will integrate to the public address system to broadcast automated pre-recorded messages as determined by the Owner.

7.9.11.2(15)(f) The nurse call system will integrate to the wireless Staff duress and fixed duress system through the integration engine, such that when an alarm is initiated the location of the alarm will appear on the nursing console in each unit.

7.9.11.2(15)(g) The nurse call system will integrate to the RTLS system such that calls may be cancelled and dome lights illuminated based on tag presence in the room.

7.9.11.2(15)(h) Where smart beds are planned, the nurse call Patient station will fully Interface with the full range of smart bed call and audio functions.

7.9.11.2(15)(i) The nurse call system will provide an interface such that the audio from the guest infotainment system will be connected and audible through the smart bed speakers. This interface will also allow the Patient to control the guest infotainment system display from the controls available through the smart bed and nurse call devices within the room. The nurse call system will provide an interface such that the pillow speakers are capable of controlling Patient headwall lighting, and up/down control of the Patient room electric blinds.

7.9.11.2(15)(j) Interface the nurse call system with the integration engine for additional monitoring and vectoring of calls.

7.9.11.2(15)(k) Project Co will highlight integration issues and provide recommendations regarding system layout, configuration, programming, integration and functionality prior to designing and installing the system.

7.9.11.2(15)(l) Provide hard-wired connection to each Patient room smoke detections system to annunciate smoke alarms on the nurse call system console and associated dome lights. Program this integration such that it is able to be turned off on a departmental basis for annual fire alarm testing.

7.9.12 Distributed Antenna System

7.9.12.1 Basic Requirements

7.9.12.1(1) System Overview

7.9.12.1(1)(a) The Distributed Antenna System (DAS) is a network of antennas throughout the Facility that provides radio and cellular coverage within the buildings.

7.9.12.1(1)(b) The DAS will be an independent system that will support cellular, paging, ECOMM, and private two-way radio services for Facility security and FMO.

7.9.12.1(1)(c) The system will function effectively in all areas of the Facility, including underground parking.

7.9.12.1(2) Applicable Area

7.9.12.1(2)(a) Applies to the Facility.

7.9.12.1(3) System Responsibilities

7.9.12.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.12.1(3)(b) Refer to Section 3 of Schedule 2E [Equipment and Furniture] for the procurement and payment of Division 27 Cash Allowances.

7.9.12.1(3)(c) Owner will:

7.9.12.1.3.(c).1 Select the systems; and

7.9.12.1.3.(c).2 Provide design feedback to Project Co.

7.9.12.1(3)(d) Project Co will:

7.9.12.1.3.(d).1 Select, design, supply, install and commission all system infrastructure as determined in consultation with the Owner;

7.9.12.1.3.(d).2 Design the system equipment; and

7.9.12.1.3.(d).3 Supply, install, program, integrate, and commission all system equipment and software through the Distributed Antenna System cash allowance as determined in consultation with the Owner.

7.9.12.2 Performance Criteria

7.9.12.2(1) General

7.9.12.2(1)(a) The HE room will accommodate cellular service providers' base transceiver stations for LTE and HSPA services, as well as fibre connectivity to enable backhauling of cellular traffic to the cellular service providers' core networking equipment.

7.9.12.2(1)(b) The active DAS head-end unit will be located in the Antenna Headend Room (HE). The DAS head-end unit will interface to radio repeaters or powered remote antenna units to distribute the required frequencies and bands throughout the Facility. The HE will be sized to accommodate cellular carrier rack requirements and include appropriate power and connectivity pathways.

7.9.12.2(1)(c) Project Co will:

7.9.12.2.1.(c).1 provide all horizontal cabling required for the Facility's DAS system except where noted. All cabling installation will be labelled in accordance with the Owner's instructions and will conform to applicable standards, best practices and manufacturer specifications and instructions to ensure a high-quality installation;

7.9.12.2.1.(c).2 furnish the Owner with all Design documentation in the format requested by the Owner to complete a software based predictive Design of the DAS. This includes floor plans, reflected ceiling plans, elevation and section drawings, Furniture and equipment layouts and information on building materials and finishes.

7.9.12.2.1.(c).3 ensure that cellular, UHF, and pocket paging services function effectively in all areas of the Facility including stairwells, elevators, underground parking, service areas, and other shielded areas where these services are required through the inclusion of a distributed antenna system. Coverage should support all current technologies and all cellular service providers and public safety bands generally in use by the Owner or its Staff.

7.9.12.2(1)(d) Project Co will undertake the Design and Construction of:

7.9.12.2.1.(d).1 a complete horizontal fibre and powered copper structured cabling system to each DAS antenna location;

7.9.12.2.1.(d).2 provide the wall and or rack space required in the MER, HE Room and in each TR in the Facility for DAS passive components and/or active equipment;

7.9.12.2.1.(d).3 supply, install and label indoor/outdoor NEMA rated access point enclosures to protect DAS equipment from the environment, theft or vandalism in the parking levels and other areas inside or outside the Facility as specified by the Owner.

(d).3.1 enclosures will be UV stabilized for exposure to directly sunlight, virtually transparent to wireless signals, lockable and work with all variations of Owner provided DAS equipment; and

(d).3.2 Project Co, if requested, will provide samples of the enclosure to Owner for RF testing purposes and to check for interoperability with DAS equipment.

7.9.12.2(1)(e) Supply, install and label ceiling (hard cap and tile) enclosures to accommodate DAS equipment in areas of the Facility where the Owner identifies a high risk to Patient and Staff safety. These enclosures will hide wireless equipment from view and prevent unauthorized access to the access point and the connecting cabling. At a minimum, these will be required in all Mental Health Areas of the Facility.

7.9.12.2(1)(f) Project Co will provide all infrastructure required to support a singular distributed antennae system that will universally support the following cellular service providers: Telus, Bell, and Rogers.

7.9.12.2(1)(g) Project Co will work with the Owner and the cellular service providers to coordinate a transfer of the contract to the Owner upon Service Commencement.

7.9.13 Location Services (RTLS)

7.9.13.1 Basic Requirements

7.9.13.1(1) System Overview

7.9.13.1(1)(a) Location Services will be delivered through a RTLS that will be used to automatically identify and track the locations of tagged objects and people within the Facility.

7.9.13.1(1)(b) This system will consist of field antennas, structured cabling, software, and controller infrastructure.

7.9.13.1(2) Applicable Area

7.9.13.1(2)(a) Applies to the Facility.

7.9.13.1(3) System Responsibilities

7.9.13.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.13.1(3)(b) Owner will:

7.9.13.1.3.(b).1 Review and approve the system proposed by Project Co;

7.9.13.1.3.(b).2 Provide design feedback to Project Co.

7.9.13.1(3)(c) Project Co will:

7.9.13.1.3.(c).1 Select the system as reviewed by the Owner;

7.9.13.1.3.(c).2 Design, supply, install and commission all system infrastructure as determined in consultation with the Owner;

7.9.13.1.3.(c).3 Provide a minimum 1-year system warranty providing 100% replacement parts and 100% diagnostic labor coverage with a first-available on-site response time. All manufacturer's warranties will be transferable to the Owner at the completion of the project.

7.9.13.1.3.(c).4 Design, supply, install, integrate, and commission all system equipment and software; and

7.9.13.1.3.(c).5 Integrate the system including the following:

(c).5.1 Integration engine;

(c).5.2 Nurse call;

(c).5.3 FMO network;

(c).5.4 Owner's computerized maintenance management software;

(c).5.5 Owners inventory management control software;

(c).5.6 Owner's material management software

(c).5.7 Owner's EHR; and

(c).5.8 Owner's inventory management software.

7.9.13.2 Performance Criteria

7.9.13.2(1) General

7.9.13.2(1)(a) As determined in consultation with the Owner, Project Co will provide a complete Location

Services system for the Facility that includes the following applications and systems:

7.9.13.2.1.(a).1 Asset tag tracking;
7.9.13.2.1.(a).2 personnel tag tracking; and
7.9.13.2.1.(a).3 workflow analysis and reporting.

7.9.13.2(1)(b) The Location Services system will support multiple frequency modalities to utilize both active and passive tag technologies for the following frequencies, at a minimum, and others as reviewed by the Owner in order that it accurately locates Patients, Staff, and/or equipment without interference:

7.9.13.2.1.(b).1 Bluetooth low energy;
7.9.13.2.1.(b).2 ultrasonic;
7.9.13.2.1.(b).3 passive RFID (NFC and RAIN); and
7.9.13.2.1.(b).4 other emerging frequency modalities approved as determined in consultation with the Owner.

7.9.13.2(1)(c) The Staff Wireless Duress system will not be part of, or use the same infrastructure as, the Location Services (RTLS) unless Project Co can prove to the satisfaction of the Owner that:

7.9.13.2.1.(c).1 the failure of one component or application of the system will not negatively impact the rest of the systems on the RTLS;
7.9.13.2.1.(c).2 the RTLS is appropriate and fit for purpose for all applications of each system integrated to it;
7.9.13.2.1.(c).3 the tags are appropriate and fit for purpose for wireless Staff duress applications tagging.

7.9.13.2(1)(d) The RTLS will operate in a virtualized server environment and allow multiple workstations to access the system for supervision, control and reporting purposes.

7.9.13.2(1)(e) Monitoring and reporting interface will be customized through a web-browser interface for each of the following user groups at a minimum, and other groups as determined by the Owner:

7.9.13.2.1.(e).1 IM/IT;
7.9.13.2.1.(e).2 biomedical;
7.9.13.2.1.(e).3 logistics;
7.9.13.2.1.(e).4 FMO; and
7.9.13.2.1.(e).5 select clinical departments.

7.9.13.2(1)(f) The RTLS Asset tracking system will provide FMO reports including the following:

7.9.13.2.1.(f).1 Asset utilisation;
7.9.13.2.1.(f).2 shrink control;
7.9.13.2.1.(f).3 preventative maintenance;
7.9.13.2.1.(f).4 lost inventory; and
7.9.13.2.1.(f).5 custom reports.

7.9.13.2(1)(g) Provide the following quantities of RTLS tags in consultation with the Owner including the following:

7.9.13.2.1.(g).1 1,000 active tracking tags;
7.9.13.2.1.(g).2 1,500 active Staff tags; and
7.9.13.2.1.(g).3 enough passive asset tags, tagged and registered as set out in Schedule 2 [Design and Construction Protocols], for 57% of the new and existing Equipment according to the Equipment List, plus an additional 10% spare.

7.9.13.2(1)(h) The RTLS will provide 100% indoor coverage throughout the Facility.

7.9.13.2(1)(i) The Owner's 802.11 wireless network will be designed to maximize use for voice and data. The RTLS may use the Owner's wireless network for communications and location reporting purposes only, subject to the following conditions:

7.9.13.2.1.(i).1 Project Co will not be permitted to add to, modify, reconfigure or tune the Owner's wireless network to facilitate use by the RTLS;
7.9.13.2.1.(i).2 use of the wireless network by the RTLS system must not negatively impact the Owner's wireless network; and
7.9.13.2.1.(i).3 the RTLS will not use the Owner's wireless network as its sole communications method. The RTLS must remain operational if the wireless network is unavailable.

7.9.13.2(1)(j) Project Co will consult with the Owner to develop standard operating procedures for the system and program the system.

7.9.13.2(1)(k) Provide a PC based application that will provide a graphical presentation of tag locations by superimposing positional data on a Facility floor plan.

7.9.13.2(1)(l) Project Co will install infrastructure as required in consultation and direction from the system manufacturer. The system manufacturer will provide

design layouts for all beacon locations to both the Owner and Project Co.

7.9.13.2(1)(m) Compatible passive-RFID tags with no batteries are preferred for Asset tracking applications.

7.9.13.2(1)(n) Tags must have a minimum of 12 months of battery life in a typical usage scenario. Batteries to be standard format and swappable.

7.9.13.2(1)(o) The RTLS must provide the following functionality:

- 7.9.13.2.1.(o).1 Location tracking of actively tagged equipment, Patients, or Staff in all areas within the Facility to room level resolution;
- 7.9.13.2.1.(o).2 Tracking of passively tagged equipment and consumables within the Facility to grouped and individual room level resolution;
- 7.9.13.2.1.(o).3 The ability to break large rooms and corridors into smaller zones as determined by the Owner;
- 7.9.13.2.1.(o).4 The ability to use “virtual walls” to provide additional granularity to zones and areas of potential interference;
- 7.9.13.2.1.(o).5 The tracking system will update every 3 seconds or less;
- 7.9.13.2.1.(o).6 Tag location must be reported accurately within a defined detection perimeter and must only update a new location when the tag is moved through a defined threshold into an adjacent detection perimeter;
- 7.9.13.2.1.(o).7 Tag locations must not report false locations between vertical floors under any circumstances;
- 7.9.13.2.1.(o).8 Personnel tags must be non-Line of Sight and must work when covered with bed sheets and shirt sleeves;
- 7.9.13.2.1.(o).9 Reporting on infrastructure and tag health and availability;
- 7.9.13.2.1.(o).10 Reporting on tag movement and tag location relative to other tag locations;
- 7.9.13.2.1.(o).11 Alerting based on: location, proximity to location, duration in location, proximity to other tagged items, quantity of devices at a given location/area (surplus or deficit from a target amount), movement within the Facility, or temperature outside of bounds;

7.9.13.2.1.(o).12 Reporting on tag button press and alerting based on button press;

7.9.13.2.1.(o).13 Tags must be water-resistant and cleanable within the Owner's infection control standards. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs;

7.9.13.2.1.(o).14 Powered tags must have a visual alerting option (LED on tag); and

7.9.13.2.1.(o).15 Tags must have multiple attachment options, including integration with Patient wrist bands and Staff ID badge lanyards/

7.9.13.2(1)(p) Project Co will ensure each entrance and exit to the Facility has an RTLS beacon/exciter array to detect and alarm when tags near exit points to the Facility.

7.9.13.2(1)(q) Project Co will provide each department and unit with a manufacturer approved tag testing station for Staff to test the functionality and battery life of the tags;

7.9.13.2(1)(r) Tag testing station will be closed-loop such that activating tag buttons within the testing doesn't activate a system alarm but displays to the User that the button press has been received by the system.

7.9.13.2(2) Location Services Infrastructure:

7.9.13.2(2)(a) The Location Services infrastructure will be based on two primary applications:

7.9.13.2.2.(a).1 Individual Room Detection Perimeter; and

7.9.13.2.2.(a).2 Grouped Room Detection Perimeter.

7.9.13.2(2)(b) Individual Room Detection Perimeter:

7.9.13.2.2.(b).1 Intent is to confirm tag presence within a physical room wall perimeter or a virtual room perimeter based on functional areas as defined within the Functional Space Requirements;

7.9.13.2.2.(b).2 The typical applications are:

(b).2.1 to identify the location of actively tagged Patients, Staff, or equipment; and

(b).2.2 to identify the location of passively tagged consumables and equipment in all rooms where consumables and

equipment will commonly reside or be stored.

(b).2.2.1 a minimum of 770 rooms will require an individual room detection perimeter for the passive RTLS.

7.9.13.2.2.(b).3 Typical Room Infrastructure Allowance:

(b).3.1 For each room or functional area identified, install antenna(s)/beacon(s) at each door and/or perimeter threshold to establish the defined detection perimeter.

(b).3.2 Provide supporting electrical installation services for complete physical mounting of each antenna/beacon onto adjacent ceiling or wall in accordance with manufacturer installation recommendations.

(b).3.3 Project Co will draw and update all individual room detection perimeters onto a set of working Floor plans for regular coordination and final approval from the Owner's IM/IT representative.

7.9.13.2(2)(c) Grouped Room Detection Perimeter

7.9.13.2.2.(c).1 Intent is to confirm tag presence within a perimeter boundary containing multiple rooms and/or functional areas as defined within the Functional Space Requirements;

7.9.13.2.2.(c).2 A grouped room detection perimeter typically consists of single or double portal detection thresholds within circulation corridors and unit entrances;

7.9.13.2.2.(c).3 The typical applications are:

(c).3.1 to identify when actively tagged Patients, Staff, or equipment pass through doorways or portals into areas that cannot reasonably be delineated into smaller areas, such as mechanical floors or parking areas; and

(c).3.2 to break functional components into smaller groupings, such as 16-bed groups of IPUs, and allow tracking of passive tags as they move into and out of these spaces.

7.9.13.2.2.(c).4 Typical Single Portal Infrastructure Allowance:

(c).4.1 For each grouped room detection perimeter, install antenna(s)/ beacon(s) at each door and/or perimeter threshold to establish the defined detection perimeter.

(c).4.2 Provide supporting electrical installation services for complete physical mounting of each antenna/beacon onto adjacent ceiling or wall in accordance with manufacturer installation recommendations.

7.9.13.2.2.(c).5 Typical Double Portal Zone Threshold:

(c).5.1 For each grouped room detection perimeter, install antenna(s)/beacon(s) at each door and/or perimeter threshold to establish the defined detection perimeter.

(c).5.2 Provide supporting electrical installation services for complete physical mounting of each antenna/beacon onto adjacent ceiling or wall in accordance with manufacturer installation recommendations.

7.9.13.2.2.(c).6 Project Co will draw and update all grouped room detection perimeters onto a set of working Floor plans for regular coordination and final approval from the Owner's IM/IT representative.

7.9.13.2(3) Integration Requirements

7.9.13.2(3)(a) Integrate the RTLS to the following systems:

7.9.13.2.3.(a).1 Integration Engine

(a).1.1 The integration engine will allow the RTLS to send messages to 3rd party non-clinical systems using customizable messaging formats including:

(a).1.1.1 Email

(a).1.1.2 SMS

(a).1.1.3 JSON

(a).1.1.4 XML

7.9.13.2.3.(a).2 Owner's EHR

(a).2.1 The RTLS solution must integrate natively with the Owner's EHR solution

to be capable of supporting clinical workflow optimization.

(a).2.2 The EHR vendor will be required to certify the native compatibility of the RTLS integration.

(a).2.3 The Owner will be responsible for configuration of any EHR applications.

7.9.13.2.3.(a).3 Owner's inventory management software.

(a).3.1 Project Co will integrate the Location Services system to the inventory management system to determine and report on changing quantities of inventory within detection perimeters.

7.9.14 IM/IT End-use Equipment

7.9.14.1 Basic Requirements

7.9.14.1(1) System Overview

7.9.14.1(1)(a) The Owner's IM/IT equipment including the Owner's computing devices and other field equipment.

7.9.14.1(2) Applicable Area

7.9.14.1(2)(a) Applies to the Facility.

7.9.14.1(3) System Responsibilities

7.9.14.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.9.14.1(3)(b) Owner will:

7.9.14.1.3.(b).1 Select, design, supply and install all system equipment;

7.9.14.1.3.(b).2 Select, design, supply and install all system software; and

7.9.14.1.3.(b).3 Provide design feedback to Project Co.

7.9.14.1(3)(c) Project Co will:

7.9.14.1.3.(c).1 Select, design, supply, install and commission all system infrastructure as determined in consultation with the Owner.

7.9.14.1.3.(c).2 Supply and install all patch cords required to connect all IM/IT end-use devices requiring connectivity to the Facility data network as determined in consultation with the Owner.

7.9.14.1.3.(c).3 Commission all system infrastructure, equipment and software as determined in consultation with the Owner.

7.9.14.1.3.(c).4 Assist the Owner to define locations for the Owner-supplied end-use equipment and provide adequate space, infrastructure, power, and wired network data outlets for the Owner-supplied end-use equipment;

7.9.14.1.3.(c).5 Include the installation of the Owner-supplied end-use equipment as part of the Move in Schedule; and

7.9.14.1.3.(c).6 Provide jack number information to the Owner to facilitate placement of the Owner-supplied end-use equipment.

7.9.14.2 Performance Criteria

7.9.14.2(1) General

7.9.14.2(1)(a) Project Co will coordinate data and power locations to support all IM/IT equipment identified.

7.9.14.2(1)(b) Project Co will co-locate, at each TO location, electrical outlet(s) with an appropriate quantity and type of receptacles to support the end-use devices installed in the Facility.

7.10 Electronic Safety and Security (Division 28)

7.10.1 General

7.10.1.1 Project Co will:

7.10.1.1(1) Commission a reputable security company that specializes in threat and risk assessments and CPTED reports to provide a CPTED report for this Facility, and submit this document to the Owner upon request;

7.10.1.1(2) Minimize the visibility of security devices in Patient Care Areas to reinforce the therapeutic nature of treatment spaces. In interior and exterior public spaces such as lobbies, reception and waiting areas, rest areas, and access and egress points, security devices may be visible. Design the Facility and all outdoor areas with Users' safety and security in mind;

7.10.1.1(3) Ensure a safe environment for Facility Users through proper utilization of ESS systems; and

7.10.1.1(4) Work with IPS at all stages of the design process to develop suitable solutions for ESS systems.

7.10.1.1(5) Design all ESS systems infrastructure to comply with all applicable infrastructure requirements of the Communication systems set out in Section 7.9.

7.10.2 Fire Alarm System

7.10.2.1 Basic Requirements

7.10.2.1(1) Design and install the fire alarm system to meet the latest applicable versions of the standards set out in Section 2.4.6.

7.10.2.1(2) Provide a fire alarm system for the Facility, including coverage of all buildings, for fire detection and signalling of alarms, trouble, and supervisory conditions while maintaining secure conditions for all Facility Users.

7.10.2.1(3) Coordinate device types and locations to provide complete fire detection and audible/visible signal coverage and minimize access issues for regular testing and maintenance.

7.10.2.1(4) Ensure the fire alarm system is of a type that permits failed devices to be rapidly replaced and activated by FMO and does not require on-site presence of a manufacturer's representative, with verification able to be done by any third-party or employee with suitable credentials recognized by the City.

7.10.2.1(5) Provide a complete two-stage, zoned, supervised, microprocessor-based fire detection and alarm system that includes addressable, intelligent, automatic and manual initiating devices and audible/visible notification devices with voice evacuation capabilities. Provide alarm indication consisting of individual or combination audible/visible devices.

7.10.2.1(6) Design the fire alarm system by locating components in such a way that maintenance and testing can be performed with minimal risk to infection control or interruption of Patient care in Clinical Spaces, and to mitigate disruption to operations. Devices will be located such that they can be routinely accessed without the need for temporary infection control barriers or ventilation, man lifts or staging. When components are installed in an otherwise inaccessible location (such as high Enclosed Atrium ceilings), access will be provided by means of a fixed access system such as a moving gantry or overhead maintenance walkways (or catwalks), or by means of an aspirating-type system with active components in accessible locations.

7.10.2.1(7) Install a fire command centre at the main fire department response point for the Facility, including a Central Alarm and Control Facility (CACF) and an active graphic annunciator for Facility-wide alarm, trouble, and supervisory annunciation, voice communications and control of firefighting from a single location. Reserve adjacent space for one additional full-height enclosure bay to be installed in the future for annunciation of future Health Campus expansion areas.

7.10.2.1(8) Coordinate location of the fire command centre with the fire department and install additional remote annunciators as required by the fire department at designated entrances.

7.10.2.1(9) Provide stand-alone spark/flame detectors to mitigate drug use in public washrooms. Detectors to have a hard-wired power source and be completely separate from the fire alarm system. On activation, detectors to annunciate with local pre-programmed voice notifications and an alert signal at the nearest Security kiosk. Basis of Design to be as described in Appendix 3N [Safety and Risk Reduction Matrix].

7.10.2.2 Performance Criteria

7.10.2.2(1) Install all fire alarm wiring in conduit. Use approved fire-rated wiring methods where required by the VBBL.

7.10.2.2(2) Provide addressable smoke detectors of self-correcting type to maintain consistent sensitivity. The following areas will be provided with smoke detector coverage in addition to sprinklers for early detection:

7.10.2.2(2)(a) All areas required by code;

7.10.2.2(2)(b) All corridors except back-of-house corridors with access restricted to FMO use;

7.10.2.2(2)(c) Electrical Rooms; and

7.10.2.2(2)(d) Communications Rooms.

7.10.2.2(3) All smoke detectors in public or Patient areas will have bypass capabilities to allow them to be temporarily disabled during Indigenous smudging ceremonies. The bypass functions will be available at the fire alarm system computer workstations.

7.10.2.2(4) Any fire detectors serving elevator shafts will be of the air sampling or linear heat detection cable type with active components located outside the elevator shaft to allow detector testing and maintenance without entering the shafts.

7.10.2.2(5) Provide two-stage manual stations at all exits. In parking and areas accessible to Patients, manual stations will have flush-mount Tamper Resistant tough polycarbonate cover with horn. Horn to be powered by independent direct power connection (not battery).

7.10.2.2(6) Fire alarm devices will be Vandal Resistant and Tamper Resistant where noted in Appendix 3N [Safety and Risk Reduction Matrix],

7.10.2.2(7) Provide emergency telephone handsets in lockable enclosures adjacent to all exit stairs located within arm's reach of each stair access door.

7.10.2.2(8) Provide visible signal devices in all corridors, public spaces, Staff and Patient toilets and common use spaces, excluding toilets in Patient rooms.

7.10.2.2(9) Provide fire alarm EVAC speakers throughout the Facility. The EVAC speaker system will be used to broadcast all alarm conditions and emergency voice communication paging. The system will accommodate the use of pre-programmed messages transmitted to annunciate origin of the alarm. Message format will be as determined in consultation with the Owner prior to programming.

7.10.2.2(10) Use combination audible/visible signal devices where applicable.

7.10.2.2(11) Include control devices and connections to close fire and smoke doors on activation of local smoke detection or alarm condition.

7.10.2.2(12) Incorporate relays, monitor modules, and direct digital BMS communications into the fire alarm interface for the smoke control and smoke venting systems, including fans, dampers, sensors and associated control devices.

7.10.2.2(13) Provide class A addressable loops for all detection circuits. Provide isolation modules at each penetration of a fire separation or fire alarm zone, and wire to prevent wiring faults in any zone from affecting detection capabilities in adjacent zones.

7.10.2.2(14) Each connection between the fire alarm system and mechanical smoke control components will be located entirely within a single fire compartment and protected from fires in adjacent compartments. This includes connections from BMS controllers to any motor controls, dampers or sensors used for smoke control or smoke venting, as well as connections from these BMS controllers to the fire alarm system.

7.10.2.2(15) Provide functionality for the fire alarm system to automatically broadcast EVAC voice messages through the radio system to all maintenance radios. Provide all required middleware, converters and connections to the radio system. Confirm actual programming, priorities, and overrides with the Owner prior to implementation.

7.10.2.2(16) Provide a main annunciator at the fire command centre complete with:

7.10.2.2(16)(a) LCD alphanumeric display of all alarm, trouble, and supervisory conditions including zone and individual addressable device descriptions; and

7.10.2.2(16)(b) A main active graphic annunciator as approved by the local fire department, including scaled floor plans of each level of the Facility showing all zone boundaries, initiating device types, the CACF location and all designated firefighter entrances.

7.10.2.2(16)(c) Individual LEDs on the graphic annunciator for each zone, initiating device type, trouble and supervisory conditions on the system.

7.10.2.2(17) Provide an EVAC system to give the fire department the capability of providing evacuation instructions to all or selected areas of the Facility from the fire command centre. Include two-way voice communication capability from the fire command centre to the firefighters' emergency telephone handsets on each floor.

7.10.2.2(18) Provide LED type indicators for remote indication that a fire detector has been activated in a space with limited access by first responders, including detectors serving an elevator shaft (located at elevator lobby ceiling) or duct smoke detectors that are not readily visible (located on ceiling or at visible location nearest to duct smoke detector installation).

7.10.2.2(19) As determined in consultation with the Owner, provide remote annunciators at key locations throughout the Facility. At a minimum, these will include all secondary entrances to all buildings for firefighters' use. Remote annunciators will be complete with an alphanumeric LCD annunciator displaying details of all alarm, trouble, and supervisory conditions and will include a microphone for “all-call” EVAC paging and a remote master firefighters' emergency telephone handset.

7.10.2.2(20) Provide LCD annunciators at each Care Team Station where annunciation of Patient room smoke detectors is required. Confirm annunciator locations with Owner. To mitigate nuisance noise,

program the system to omit audible notification of events not requiring local care team Staff response occurring from system testing, upgrades, faults, etc.

7.10.2.2(21) Design remote fire alarm panels (or control units) to operate in a stand-alone mode and transmit data using a multiplex data line connecting the entire Facility via a full complement of communication cable. Provide the fire alarm cable network with a redundant backbone taking different physical paths to enhance reliability of communication. A trouble status indicator will annunciate if a partial break or fault occurs in the data link between any two control panels.

7.10.2.2(22) Ensure the fire alarm system has an appropriate electronic interlocking with the general paging system, so as to ensure automatic priority is given to operating the fire alarm during initial time periods as required by VBBL. Fire alarm system will not be used for general paging.

7.10.2.2(23) Coordinate with the Owner to establish a secure backup of the fire alarm system event log at regular intervals.

7.10.2.2(24) Provide two (2) fire alarm system computer workstations with high-resolution colour touch screen monitors capable of monitoring system performance and annunciation. Include hardware and software for complete interface suitable to annunciate all alarm, trouble and supervisory conditions on the system and enable examination of the status of individual devices, implement bypasses and ancillary functions, and set parameters as allowed by applicable codes. The computers will be located in the Shop-Electrical and Energy Centre Control Room. Each will be provided with an IM/IT UPS power outlet and a printer able to generate a hard copy of the system's event log.

7.10.2.2(25) Provide gel electrolyte type batteries with overcharge protection for all fire alarm control panels and transponders. Provide solid state battery charger(s) with capacity to recharge the entire battery system in accordance with ULC requirements. Ensure batteries will have sufficient capacity for emergency power backup of the entire system (except magnetic door holders), in accordance with the VBBL, plus 20% spare capacity for future renovations.

7.10.2.2(26) Locate duct smoke detectors such that they are easily maintainable and accessible. In CSA Z317.13 Population Risk Group 4 areas, provide access to any duct smoke detectors where they can be tested or replaced without having to enter the room or adjacent Restricted Corridor or sterile area.

7.10.2.3 Operational requirements:

7.10.2.3(1) Design the fire alarm system to incorporate the following operations to provide a safe environment for all Facility Users:

7.10.2.3(1)(a) Stage 1:

7.10.2.3.1.(a).1 Silent stage 1 alert throughout the Facility except where noted otherwise.

7.10.2.3.1.(a).2 Audible alert signal at security workstations, FMO offices, Care Team Stations and Fire Command Centre.

7.10.2.3.1.(a).3 Zone and device type alarm indication on fire alarm annunciators.

7.10.2.3.1.(a).4 The alarm can be cancelled by authorized personnel at any annunciator, control panel or transponder within five minutes if investigation reveals false alarm.

7.10.2.3.1.(a).5 Authorized third party (external) monitoring agency contracted by the Owner for monitoring of the fire alarm system is notified.

7.10.2.3(1)(b) Stage 2:

7.10.2.3.1.(b).1 A stage 2 alarm may be initiated by any of the following:

(b).1.1 If a stage 1 alert has not been acknowledged after 5 minutes.

(b).1.2 A key inserted in a key switch at a manual pull station.

(b).1.3 A key inserted in a key switch in a Staff workstation annunciator.

(b).1.4 Initiation by security or FMO.

7.10.2.3.1.(b).2 For stage 2 alarm, speakers will sound in the ISO 8201 emergency evacuation temporal pattern in all zones where initiating devices have been activated.

7.10.2.3.1.(b).3 Speakers will sound at 20 strokes per minute in all other zones.

7.10.2.3.1.(b).4 If the alarm zone is in a Patient wing, trigger an automatic ‘Fire Unlock’ of all Patient room doors in the Patient unit, and other locked doors as determined in consultation with the Owner. All doors for Contained Use Areas will remain locked.

7.10.2.3(2) Ensure smoke and heat detectors are individually field programmable, include multiple elements for earliest detection and are individually adjustable for ambient environmental conditions. Detectors in the Urban Health and Integrated Mental

Health and Substance Use Component will be security-type, of Tamper Resistant and Ligature Resistant construction.

7.10.2.3(3) Design the fire alarm system to monitor:

7.10.2.3(3)(a) Isolation valve positions of sprinkler system zones;

7.10.2.3(3)(b) All generators for run and trouble conditions;

7.10.2.3(3)(c) Any pre-action or dry agent fire suppression systems for alarm, trouble and supervisory conditions; and

7.10.2.3(3)(d) Fire pumps for the statuses of pump running, loss of phase, phase reversal and connected to alternate source.

7.10.2.3(4) Synchronize the fire alarm system clock with the security systems and the synchronized clock system.

7.10.2.3(5) Provide signals to all elevator controllers for elevator recall operation and elevator homing functions.

7.10.2.4 Integration:

7.10.2.4(1) Ensure the fire alarm system is monitored by the Owner's approved third-party monitoring agency.

7.10.2.4(2) Ensure the fire alarm system is fully integrated with ancillary systems and all integrations are fully functional prior to the Service Commencement Date. Perform integrated Life Safety System testing to comply with CAN/ULC-S1001, with a complete list of operational sequences provided to the Owner for review prior to system programming. Testing will include, but not be limited to, smoke control and smoke venting systems, and door holder and lock releasing functions.

7.10.3 Electronic Safety and Security Systems

7.10.3.1 Overview

7.10.3.1(1) Principles, Guidelines and Requirements

7.10.3.1(1)(a) Ensure a safe environment for Staff, Patients and visitors by proper utilization of ESS systems as described in this Agreement. ESS systems include all systems within Division 28, excluding fire alarm.

7.10.3.1(1)(b) Project Co will design, provide, and install a complete, integrated security system to meet the

Owner's security programs within a health care facility environment.

7.10.3.1(1)(c) Project Co will be responsible for providing all hardware, software, licensing, devices and all associated infrastructure required for full and complete security systems as specified. All workstations and monitors required for the ESS systems will be provided by the Owner. Project Co will assist the Owner in defining all technical requirements for the Owner to supply. All ESS application software will be installed on Owner provided virtualized servers except for the IP video surveillance systems' server hardware, which will be provided by Project Co.

7.10.3.1(1)(d) Project Co will ensure BC Solicitor General licensed security technicians are retained for the installation, implementation and programming of all ESS systems.

7.10.3.1(1)(e) Design all ESS systems to reside on dedicated security systems VLAN as part of the Owner's IM/IT data network connected via the structured cabling system and network devices to allow the Owner the opportunity to review events and monitor the status of security systems from off-Site locations. The system will be accessible through the Owner's IM/IT network, in accordance with Owner policies.

7.10.3.1.1.(e).1 Project Co will ensure that all ESS systems are available for status monitoring and control from any workstation within the Clinical Operations Centre.

7.10.3.1(1)(f) Project Co will utilize an Owner provided NTP time-sync server to ensure continuity of all ESS systems' archived data.

7.10.3.1(1)(g) Project Co will locate all security devices and provide monitoring and alarm annunciation requirements to the satisfaction of the Owner.

7.10.3.1(1)(h) Where software licensing is applicable, Project Co will supply a complete enterprise software package for Project Co supplied systems. Where available, provide perpetual software licenses for all systems provided by Project Co. Software as a service

packages with ongoing payments will not be purchased without written approval from the Owner.

7.10.3.1(1)(i) ESS systems will be scalable to allow for future additions and interconnections of many devices and subsystems from different manufacturers. Integrations will not be custom and will utilize commercial, off-the-shelf hardware or API/SDK. There will also be a minimum scalability value set for each system within the ESS. For example, the DVMS will be licensed for 10% more cameras and the ACS will be licensed for 20% more doors. Other values will be as determined in consultation with the Owner. The minimum scalability value for each system within the ESS will be 10%.

7.10.3.1(1)(j) The ESS systems 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. All integrations and interconnections will not experience failures resulting from software or firmware updates to any single system.

7.10.3.1(1)(k) Project Co will arrange meetings with the Owner to coordinate system design, interconnections and programming requirements of the ESS systems. Project Co will deploy ESS IP devices as determined in consultation with the Owner, including network configuration, to ensure that the network complies with Owner standards.

7.10.3.1(1)(l) All materials, including hardware and software provided will be fully compatible with the Owner's head-end systems and be the most current version or production model.

7.10.3.1(1)(m) Project Co will be responsible for providing all hardware, software, licensing, devices and all associated infrastructure required for full and complete security systems as specified. Workstations and wall-mounted displays required for all ESS systems will be provided by the Owner;

7.10.3.1.1.(m).1 Workstations provided for the Access control and IP Video Surveillance systems will meet

	the minimum requirements for enterprise solutions from the system manufacturers.
7.10.3.1.1.(m).2	Project Co will coordinate these requirements on behalf of the Owner.
7.10.3.1(1)(n)	ESS systems will maintain dependability and reliability under all operational environmental conditions and be capable of 24 hours-a-day, seven (7) days-a-week continuous operation.
7.10.3.1(1)(o)	Interconnect security systems to the fire alarm system and other systems as required by applicable codes and standards.
7.10.3.1(1)(p)	Project Co will provide detailed floorplans with doorways, room names, and other map features clearly visible for use as the background for the ESS mapping. ESS devices and alarms will be programmed onto these floorplans according to their physical location within the Facility.
7.10.3.1(1)(q)	Project Co will ensure the primary ESS User Interface will allow for integration-to and show real-time device status from Division 27 systems including nurse call, Staff communications and RTLS systems. The access control system or digital video management system will be the primary interfaces due to the embedded graphical mapping and therefore system integration must be made possible by software licensing between these systems. As noted elsewhere in the SOR, custom integrations and software development will not be accepted for this interoperability and the systems must be able to be added to the overall integration if required.
7.10.3.1(1)(r)	Project Co will consult with the Owner to determine integration and views between multiple security systems and customizations for Owner user groups.
7.10.3.1(1)(s)	Security systems infrastructure will comply with the manufacturer’s technical specifications and configuration requirements.
7.10.3.1(1)(t)	Project Co will supply all baluns, converters, and PoE extenders required to provide functioning system components in elevators.

7.10.3.1(1)(u) Project Co will provide a minimum 1-year system warranty providing 100% replacement parts and 100% diagnostic labour coverage with a first-available on-site response time for all Division 28 systems. All manufacturer's warranties will be transferred to the Owner upon completion of the Project.

7.10.3.1(1)(v) Project Co will ensure that all networked electronic security systems will utilize manufacturer hardening for best-practice cyber security and meet the Owner's requirements for network security. Project Co will develop a security plan as determined in consultation with the Owner and submit it as part of the security documents.

7.10.3.1(1)(w) All ESS systems will meet all Owner privacy standards pertaining to storage and operation of devices. Provide all necessary documentation and completed privacy impact assessment required to meet Owner privacy/confidentiality standards.

7.10.3.1(1)(x) Project Co will consult with the Owner to develop standard operating procedures and customized training plans for each system and program the systems as determined in consultation with the Owner.

7.10.3.1(1)(y) Train Owner Staff (minimum 8 hours per user group, per system) on the use and operation of security systems and the location of all security devices. Schedule training in consultation with the Owner.

7.10.3.1(1)(z) All manufacturers' warranties as they relates to the ESS systems will be transferred to the Owner at the completion of the Project.

7.10.3.1(1)(aa) All cabling and communications infrastructure is required to meet Owner standards; refer to the PHSA Communications Infrastructure Standards and Specifications and Division 27 for details.

7.10.4 Access Control

7.10.4.1 Basic Requirements

7.10.4.1(1) System Overview

7.10.4.1(1)(a) An access control system (ACS) will be installed throughout the Facility for the purpose of allowing access to secure or restricted spaces by authorized users as well as allowing authorized remote control of door-lock status.

7.10.4.1(1)(b) All components of the access control system will be compatible with and integrated to the existing Owner Lenel OnGuard system. All global operations, user and group definitions, reporting parameters and system accessibility will be aligned with software and hardware currently operational. Implementation of new doors, door groups, inputs/outputs, integrations and HR database will be coordinated in consultation with the Owner to ensure a seamless integration and transition with minimal unplanned impact on any user-groups.

7.10.4.1(2) Applicable Area

7.10.4.1(2)(a) Applies to the Facility.

7.10.4.1(2)(b) Project Co will provide access control system devices in the following locations, at a minimum, and other locations as determined by the Owner where it is reasonably necessary to restrict and audit access, to modify access control in real-time, and/or to support integration with electronic safety and security systems:

- 7.10.4.1.2.(b).1 offices containing cash or valuables;
- 7.10.4.1.2.(b).2 elevator cabs and elevator hall calls;
- 7.10.4.1.2.(b).3 rooms with multiple workstations;
- 7.10.4.1.2.(b).4 Communications Rooms;
- 7.10.4.1.2.(b).5 mechanical and electrical space entries;
- 7.10.4.1.2.(b).6 department entry and exit points;
- 7.10.4.1.2.(b).7 exterior entry points;
- 7.10.4.1.2.(b).8 underground parking gates;
- 7.10.4.1.2.(b).9 containment level 2+ entries;
- 7.10.4.1.2.(b).10 rooms and other areas restricted to Staff only;
- 7.10.4.1.2.(b).11 Patient Rooms, Secure Rooms, Exam/Treatment Rooms, Consult/Interview Rooms, and Procedure Rooms in Mental Health Areas;
- 7.10.4.1.2.(b).12 Exam/Treatment Rooms-Ophthalmology, ENT, EYE and ECG;
- 7.10.4.1.2.(b).13 Store-General for the Gift Shop;
- 7.10.4.1.2.(b).14 Cryogenic Freezer Room;
- 7.10.4.1.2.(b).15 Ambulance Garage

7.10.4.1.2.(b).16 entrances into restricted areas of Surgical and Interventional Services;
7.10.4.1.2.(b).17 Housekeeping Closets;
7.10.4.1.2.(b).18 Outbreak Control Zones;
7.10.4.1.2.(b).19 Medication Rooms;
7.10.4.1.2.(b).20 Soiled Utility rooms;
7.10.4.1.2.(b).21 Store-Clean Supplies;
7.10.4.1.2.(b).22 narcotics storage rooms and cabinets;
7.10.4.1.2.(b).23 security vestibules and anterooms;
7.10.4.1.2.(b).24 rooms requiring additional protection for assets and Staff;
7.10.4.1.2.(b).25 Secure Outdoor Spaces and rooftop access;
7.10.4.1.2.(b).26 critical operational infrastructure;
7.10.4.1.2.(b).27 Audiometry Booths;
7.10.4.1.2.(b).28 underground parking and building stairwells, sally-ports;
7.10.4.1.2.(b).29 shared Patient washrooms in Mental Health Areas;
7.10.4.1.2.(b).30 rooms where mail will be received or stored;
7.10.4.1.2.(b).31 areas identified in Appendix 3M [Door Requirements Matrix];
7.10.4.1.2.(b).32 areas identified in Appendix 3P [Security Operation Matrix];
7.10.4.1.2.(b).33 areas identified in Appendix 3A [Clinical Specifications and Functional Space Requirements]; and
7.10.4.1.2.(b).34 high-risk areas as designated by the Owner.

7.10.4.1(3) System Responsibilities

7.10.4.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.10.4.1(3)(b) Owner will:
7.10.4.1.3.(b).1 Select the system: Lenel Onguard; and
7.10.4.1.3.(b).2 Provide design feedback to Project Co.

7.10.4.1(3)(c) Project Co will:
7.10.4.1.3.(c).1 Design, supply and install all system infrastructure as determined in consultation with the Owner.
7.10.4.1.3.(c).2 Design, supply and install all system equipment;
7.10.4.1.3.(c).3 Design, supply and install all system software.
7.10.4.1.3.(c).4 Commission all system infrastructure, equipment and software;
7.10.4.1.3.(c).5 Integrate the system to the following systems:
(c).5.1 Fire alarm (as required by code);

(c).5.2 Intercommunications;
(c).5.3 IP video surveillance;
(c).5.4 AGV;
(c).5.5 Patient wandering; and
(c).5.6 Integration engine.

7.10.4.2 Performance Criteria

7.10.4.2(1) General

7.10.4.2(1)(a) The ACS will be interconnected to the electrified locks to lock and unlock doors via time schedule and card readers utilizing proximity field effect technology. Requirements for doors will be determined through user group meetings. The ACS will grant or restrict access to employees on a door-by-door basis via a programmable classification system and will operate over the Owner's network.

7.10.4.2(1)(b) Project Co will coordinate all aspects of the ACS that affect door hardware with the Architectural Openings Consultant and identify any conflicts or code issues to the Owner.

7.10.4.2(1)(c) Project Co will coordinate all aspects of the AGV system that require integration to the access control system to provide a functioning AGV system. Integrate the ACS to the AGV system such that the AGV system can unlock and open doors along designated AGV routes.

7.10.4.2(1)(d) The ACS will have the capability for Staff to remotely control groups of perimeter doors to restrict entry to units/Components or other areas identified by the Owner in the event of an emergency or global command. Determine and program final access control system configuration as determined in consultation with the Owner. Project Co will provide lockdown functionality in the following Components, at a minimum, and other locations as determined by the Owner:

7.10.4.2.1.(d).1 Emergency Department;
7.10.4.2.1.(d).2 Decontamination areas;
7.10.4.2.1.(d).3 Outbreak Control Zones;
7.10.4.2.1.(d).4 Maternity Centre;
7.10.4.2.1.(d).5 Specialty Pharmacy; and
7.10.4.2.1.(d).6 Mental Health Areas.

7.10.4.2(1)(e) In the event of network disruption or loss of connectivity to the server, the ACS will function in non-degraded mode of operation at the field panel or controller level. All electrified locks will be hard wired to the field control panels. The field controllers will be located in Communications Rooms (Refer to Section 7.9 Division 27) and will be connected to the access control server via TCP/IP using the structured cabling.

7.10.4.2(1)(f) Access controlled doors will have a local sounder (independent of the card reader) to annunciate door held open and door forced open alarms. The tone will be adjustable in volume and will have a programmable option allowing the tone to be turned on/off via the ACS graphical user interface (GUI) by authorized system administrators. The configuration of each door alarm will be as determined in consultation with the Owner. By default, door held open and door forced open alarms will be programmed in the off position.

7.10.4.2(1)(g) The ACS will be complete with graphical mapping and will be implemented to match the Owner's existing system with a format developed as determined in consultation with the Owner. The maps will include interactive alarm points for all access doors.

7.10.4.2(1)(h) The ACS will use hard-wired proximity type readers and will be capable of reusing all existing cards presently distributed across the Owner's facilities. The ACS will be compatible with the Owner's existing systems to allow existing Owner cards to work on the system and allow new cards for the Facility to work on systems in the rest of the Owner's regions:

7.10.4.2.1.(h).1 Existing cards are HID Corporate 1000, 35 bit, with embedded Gemalto .net V2 chip for single sign on to client PCs; and

7.10.4.2.1.(h).2 Project Co will provide three thousand (3000) blank proximity cards for Owner Staff. Confirm card type with the Owner prior to purchase.

7.10.4.2(1)(i) Provide card readers, locking hardware (refer to Division 8), 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. Wiring to card readers will allow for OSDP, and the system will adhere to the OSDP standard.

7.10.4.2(1)(j) All access-controlled doors will be provided with keyed hardware, on both sides of the door if required, to override all access controls and allow passage through the door in either direction. Physical keys will be used only for bypass in the event of local system failure. Coordinate key and key hierarchy with the Owner.

7.10.4.2(1)(k) For all access-controlled door locations, provide a DPDT-type door contact.

7.10.4.2(1)(l) Power supplies will be on a dedicated UPS vital circuit and centralized within the Communications Rooms. Refer to Section 7.9 Division 27. All access control and door hardware components will be powered via individual self-resetting positive temperature coefficient device outputs from the power supplies.

7.10.4.2(1)(m) Individual power supplies will not serve more than eight doors, more than one department, or multiple floors in the Facility. Power supplies will individually control the power output based on the fire alarm relay input.

7.10.4.2(1)(n) The use of system integration points, such as SIP boards or Division 8 hardware integration boards, within the access control system is not permitted.

7.10.4.2(1)(o) Provide secure, simplified local door controls, accessible only to Staff for manual control of local department doors, or doors within the department, at Care Team Stations and other areas as required.

7.10.4.2.1.(o).1 Door controls to provide momentary lock/unlock, permanent lock/unlock, and other functions as required by Staff in order to meet functional requirements.

7.10.4.2.1.(o).2 Door controls to provide LED status indicators to indicate the state of the door.

7.10.4.2(1)(p) Access control card readers will provide LED status indicators to indicate device status. Project Co will confirm the LED status colours with the Owner prior

to programming. All readers will be proximity field effect readers.

7.10.4.2(1)(q) Refer to Section 7.10.4.1(2) for preliminary card reader locations and types. Additional card reader locations will be as determined in consultation with the Owner.

7.10.4.2(1)(r) Project Co will provide card readers at all required access/egress locations to/from all controlled areas identified in Section 7.10.4.1(2) and as determined in consultation with the Owner. Functional programming requiring dual authentication will be done at the direction of the Owner for specific doors. Combination card readers will facilitate access by the following methods:

7.10.4.2.1.(r).1 pin code only;
7.10.4.2.1.(r).2 card read only; and
7.10.4.2.1.(r).3 pin code and card read.

7.10.4.2(1)(s) Where combination card readers are required (PIN code and proximity field effect), the PIN code feature will be fully integrated into the card reader with full functionality in the access system and software. Parallel, separately installed pin devices are not acceptable.

7.10.4.2(1)(t) Project Co will be responsible for the initial programming of access control proximity cards.

7.10.4.2(1)(u) The access control system will be interconnected to the elevator controls for floor-by-floor access control via card readers in all elevators and elevator lobbies. Card readers in cabs and elevator lobbies will be flush mounted to the car operating panel or hall stations respectively.

7.10.4.2(1)(v) Project Co will supply clear, permanent signage indicating entry procedures and secure access areas. Wording and signage locations will be developed in consultation with the Owner.

7.10.4.2(1)(w) Intercommunication devices (intercoms) with integrated momentary remote door release are required at designated restricted access entry/exit points. Refer to Section 7.10.8 Intercommunications Systems for functional requirements and ensure that unlock is initiated from the ACS and not from the

intercom master direct to door lock. Determine, through the consultation process, the placement of all intercom locations within the Facility.

7.10.4.2.1.(w).1 The intercommunications device will provide an input to the ACS to notify it of door unlock.

7.10.4.2(2) Restricted Egress Doors

7.10.4.2(2)(a) Project Co will provide restricted egress operation and alarms at emergency exit doors as determined in consultation with the Owner and with Project Co's code consultant. Alarms will annunciate locally at the door and closest Care Team Station, and via the integrated ACS.

7.10.4.2(2)(b) ACS functionality in impeded egress zones will be determined by Project Co as determined in consultation with the Owner and with the code consultant.

7.10.4.2(2)(c) Restricted egress doors will not allow egress without valid access control card-swipe. Project Co will coordinate all code exemptions required to achieve this with the code consultant and the relevant Governmental Authority.

7.10.4.2(3) Delayed Egress Doors

7.10.4.2(3)(a) Project Co will coordinate architectural designs, code exiting strategies and door hardware to eliminate the use of delayed egress doors in close consultation with its architect, security, code consultants and the Owner.

7.10.4.2(3)(b) Where all other viable design options for alternates to delayed-egress doors have been ruled out, notify the Owner in writing for approval. If reviewed by the Owner, the following clauses will apply:

7.10.4.2.3.(b).1 Delay time will be programmed as determined in consultation with the Owner and with the Project Co's code consultant.

7.10.4.2.3.(b).2 All delayed-egress alarms will be silenced using a key-switch integral to the panic hardware. The key cylinder will be keyed to match the Facility master key.

7.10.4.2.3.(b).3 Project Co will ensure that the delayed egress crash bar has an auxiliary output for additional alarm monitoring.

7.10.4.2(4) Programming

7.10.4.2(4)(a) Project Co will be responsible for programming all systems including the initial programming of Staff proximity cards (including existing cards). Programming will to include the programming of access levels and the assignment of access levels to individual Staff.

7.10.4.2(5) Project Co will retain the VAR of the Owner's choice to program all devices, data bases, and schedules as well as coordinate software integration with the Owner's existing Lenel OnGuard system. Coordinate meetings as required. The associated cost is the responsibility of Project Co.

7.10.4.2(6) All programming by the VAR will be completed before Commissioning of the Facility. The VAR will also be responsible for the programming of any proximity cards required during the course of construction up until Commissioning acceptance.

7.10.4.2(7) All security alarms will be logged for a minimum period of two (2) years. Logging system will be capable of external archiving/backup on external storage.

7.10.4.2(8) Security recording will provide, as a minimum, the following information for each alarm:

7.10.4.2.8.(a).1 date;
7.10.4.2.8.(a).2 time;
7.10.4.2.8.(a).3 device identification;
7.10.4.2.8.(a).4 descriptive code;
7.10.4.2.8.(a).5 user/cardholder ID (when applicable); and
7.10.4.2.8.(a).6 acknowledgement and action taken (when applicable).

7.10.4.2(9) Integration Requirements

7.10.4.2(9)(a) The access control system will Interface with the IP video surveillance system such that when an alarm is initiated at an access-controlled door, all local IP video surveillance cameras associated with the door are displayed at the local security and site workstations.

7.10.4.2(9)(b) The access control system will integrate with the Intercommunications system to allow remote access to specified areas.

7.10.4.2(9)(c) Interconnect the access control system to the fire alarm system to release doors in the event of a fire as required by applicable laws and or standards.

7.10.4.2(9)(d) The access control system will integrate with the Patient wandering system to prevent unauthorized egress.

7.10.4.2(9)(e) Integrate the access control system to the AGV system such that the AGV system can unlock and open doors along designated AGV routes. Coordinate all required hard-wired and logical interfaces with the AGV vendor and the Owner.

7.10.4.2(9)(f) The access control system will integrate with the integration engine such that events from the ACS can be sent to other systems accessible by the integration engine.

7.10.4.2(9)(g) Provide interconnection of the ACS with other security systems as required.

7.10.5 Wireless Staff Duress System

7.10.5.1 Basic Requirements

7.10.5.1(1) System Overview

7.10.5.1(1)(a) A wireless Staff duress system will be installed in the Facility for the purpose of alerting and reporting Staff duress events initiated wirelessly.

7.10.5.1(1)(b) The system will consist of tags/badges, sirens, strobes and all associated hardware and infrastructure.

7.10.5.1(1)(c) The wireless Staff duress system will supplement the installation of the fixed duress system for reliable and dependable operation under all operational and environmental conditions. The wireless system will not be affected by or interfere with any equipment in use in the Facility.

7.10.5.1(1)(d) The wireless Staff duress system design is to be developed as determined in consultation with the Owner.

7.10.5.1(2) Applicable Area

7.10.5.1(2)(a) Applies to the Facility.

7.10.5.1(2)(b) Project Co will provide wireless staff duress system coverage in the following locations, at a minimum, and in other locations as determined by the Owner in order that staff will be able to wirelessly initiate emergency assistance calls in any locations where their safety may reasonably be expected to be at risk:

- 7.10.5.1.2.(b).1 Mental Health Areas;
- 7.10.5.1.2.(b).2 Emergency Department;
- 7.10.5.1.2.(b).3 Specialty Pharmacy;
- 7.10.5.1.2.(b).4 Anesthetic Care Unit;
- 7.10.5.1.2.(b).5 connecting corridors between the areas identified above; and
- 7.10.5.1.2.(b).6 high-risk areas as designated by the Owner.

7.10.5.1(3) System Responsibilities

7.10.5.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.10.5.1(3)(b) Owner will:

- 7.10.5.1.3.(b).1 Provide design feedback to Project Co.

7.10.5.1(3)(c) Project Co will:

- 7.10.5.1.3.(c).1 Select the system as determined in consultation with the Owner;
- 7.10.5.1.3.(c).2 Design, supply and install all system infrastructure;
- 7.10.5.1.3.(c).3 Design, supply and install all system equipment;
- 7.10.5.1.3.(c).4 Design, supply and install all system software;
- 7.10.5.1.3.(c).5 Commission all system infrastructure, equipment and software; and
- 7.10.5.1.3.(c).6 Integrate the system with the following systems:
  - (c).6.1 Fixed duress;
  - (c).6.2 Integration engine;
  - (c).6.3 IP video surveillance;
  - (c).6.4 Intrusion detection system;
  - (c).6.5 Nurse call; and
  - (c).6.6 Wireless Staff communications

7.10.5.2 Performance Criteria

7.10.5.2(1) General

7.10.5.2(1)(a) The wireless Staff duress system will provide reliable and dedicated coverage and allow multiple

workstations to access the system for supervision, control and reporting purposes.

7.10.5.2(1)(b) The wireless Staff duress systems will be fully integrated onto a graphical mapping software platform for reporting, alarm response and annunciation purposes. Graphical user interface and reporting requirements will be programmed as determined in consultation with the Owner.

7.10.5.2(1)(c) Access to the wireless Staff duress software will be restricted to specific user groups as determined by the Owner. Project Co to provide programming to support the Owner's network security requirements and user group authentication.

7.10.5.2(1)(d) The wireless Staff duress system will not be part of or use the same infrastructure as the RTLS unless Project Co can prove to the satisfaction of the Owner that:

- 7.10.5.2.1.(d).1 the failure of one component or application of the system will not negatively impact the rest of the systems on the RTLS;
- 7.10.5.2.1.(d).2 the RTLS is appropriate and fit for purpose for all applications of each system integrated with it; and
- 7.10.5.2.1.(d).3 the tags are appropriate and fit for purpose.

7.10.5.2(1)(e) Provide a complete structured cabling infrastructure that will allow the installation of the complete wireless Staff duress network, including access points, exciters, and/or ultrasonic receivers if applicable.

7.10.5.2(1)(f) Upon activation of any wireless Staff duress tag, the exact unit ID, and room/zone location are to be annunciated to the graphical mapping software and Staff workstation locations. The system will continue tracking the location of the tag in real-time until the alarm is cancelled.

7.10.5.2(1)(g) The wireless Staff duress system will provide the following functionalities:

- 7.10.5.2.1.(g).1 Tracking of Staff locations in all areas where the system is installed to floor and room level;
- 7.10.5.2.1.(g).2 The ability to segment larger rooms, open areas, and corridors into smaller zones as determined by the Owner;

7.10.5.2.1.(g).3 Tags that are non-Line of Sight and will work when covered with bed sheets and shirt sleeves;

7.10.5.2.1.(g).4 Identification of Staff duress location within the Facility by floor and room;

7.10.5.2.1.(g).5 Reporting on tag and wireless Staff duress infrastructure health and availability;

7.10.5.2.1.(g).6 Reporting on tag button press and alerting based on button press;

7.10.5.2.1.(g).7 Tags that are water-resistant and cleanable within the Owner's infection control standards. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs;

7.10.5.2.1.(g).8 Tags that support configuration in "always on" mode;

7.10.5.2.1.(g).9 Tags that have a visual alerting option (LED or light on tag); and

7.10.5.2.1.(g).10 Tags that have multiple attachment options, including integration with Staff ID badge lanyards.

7.10.5.2(1)(h) The Owner's IM/IT data network will be designed to maximize use for voice and data. Project Co may use this network for transmitting data of the wireless Staff duress system, subject to the following conditions:

7.10.5.2.1.(h).1 Project Co will not be permitted to add to, modify, reconfigure or tune the wireless network to facilitate use by the wireless Staff duress system;

7.10.5.2.1.(h).2 use of the wireless network by the wireless Staff duress system will not negatively impact the performance of the Owner's wireless network; and

7.10.5.2.1.(h).3 the system will not use the Owner's wireless network as its sole communications method. The wireless Staff duress system will remain operational with redundant gateways if the Owner's wireless network is unavailable.

7.10.5.2(1)(i) The hard-wired and wireless Staff duress systems will be fully integrated onto a graphical mapping software platform for reporting, alarm response and annunciation purposes.

7.10.5.2(1)(j) All data points within the system will be capable of being archived for the purposes of reporting.

7.10.5.2(1)(k) Provide 500 Staff tags for use with the wireless Staff duress system. Tags will have minimum one-year battery life, LED indicator and be provided with attachment accessories. Tags will have the ability to be tested and will provide warning signal to monitoring software indicating advance warning of low battery.

7.10.5.2(1)(l) Each unit utilizing the system will be provided with a manufacturer-approved tag test device that audibly and visually indicates on a pass / fail basis the functionality and battery life of the tag. The testing device will be a closed loop device / station that allows for full functional testing without activating alarm system and will provide audit function as required.

7.10.5.2(1)(m) The entire wireless Staff duress system will be supervised for the following:

- 7.10.5.2.1.(m).1 power loss;
- 7.10.5.2.1.(m).2 system trouble;
- 7.10.5.2.1.(m).3 communication loss; and
- 7.10.5.2.1.(m).4 wiring and device (including short, ground fault, open circuit).

7.10.5.2(2) Integration Requirements

7.10.5.2(2)(a) Fixed duress

- 7.10.5.2.2.(a).1 The fixed duress system will be integrated to the wireless Staff duress system, such all points including, name of device, type, and exact location of the devices, is displayed on a common graphical map at security workstation(s).
- 7.10.5.2.2.(a).2 The wireless Staff duress system will provide direct integration of all fixed duress systems points within a unified software platform.

7.10.5.2(2)(b) IP video surveillance

- 7.10.5.2.2.(b).1 The wireless Staff duress system will integrate with the IP video surveillance system to provide video popups of cameras located closest to the location of the duress alarm.

7.10.5.2(2)(c) Intrusion detection

7.10.5.2.2.(c).1 The wireless Staff duress system will integrate with the intrusion detection system to report the alarm location to the remote Owner ULC-listed central call centre using a duress system specific monitoring/control panel. Coordinate directly with the Owner's service provider as required to configure and confirm this integration.

7.10.5.2.2.(c).2 Alarm location to include the building, floor level, and room/zone where the alarm originated.

7.10.5.2(2)(d) Integration engine

7.10.5.2.2.(d).1 The wireless Staff duress system will provide seamless connectivity to the integration engine, which will allow the Owner the capability to integrate system events to Division 27 systems including nurse call and Staff wireless communication devices.

7.10.6 Fixed Duress System

7.10.6.1 Basic Requirements

7.10.6.1(1) System Overview

7.10.6.1(1)(a) The fixed duress system consists of concealed buttons, public duress buttons, emergency stations, sirens, strobes, and their associated hardware and infrastructure.

7.10.6.1(2) Applicable Area

7.10.6.1(2)(a) Applies to the Facility.

7.10.6.1(2)(b) Project Co will provide fixed duress system equipment in the following locations, at a minimum, and in other locations as determined in consultation with the Owner in order that Staff will have ready access to initiate emergency assistance calls in any locations where their safety may reasonably be expected to be at risk:

7.10.6.1.2.(b).1 Mental Health Areas;
7.10.6.1.2.(b).2 Each department's Care Team Station(s);
7.10.6.1.2.(b).3 Reception desks;
7.10.6.1.2.(b).4 Wicket/cashier;
7.10.6.1.2.(b).5 Pharmacy;
7.10.6.1.2.(b).6 Medication rooms;
7.10.6.1.2.(b).7 Isolated work areas (night use);

7.10.6.1.2.(b).8 Staff locker rooms and showers areas;
7.10.6.1.2.(b).9 Stairwells at each floor level;
7.10.6.1.2.(b).10 Interview/consultation/therapy rooms;
7.10.6.1.2.(b).11 Gyms and rehabilitation areas;
7.10.6.1.2.(b).12 Outpatient Care Areas;
7.10.6.1.2.(b).13 Office with public access;
7.10.6.1.2.(b).14 Triage areas;
7.10.6.1.2.(b).15 Bike cages/storage areas;
7.10.6.1.2.(b).16 Conference/Meeting Rooms used for therapy and rehabilitation functions (both sides of dividable rooms);
7.10.6.1.2.(b).17 Inter-Professional Team Rooms;
7.10.6.1.2.(b).18 Areas identified in Appendix 3A [Clinical Specifications and Functional Space Requirements];
7.10.6.1.2.(b).19 Gift shops; and
7.10.6.1.2.(b).20 High-risk areas as determined in consultation with the Owner.

7.10.6.1(3) System Responsibilities

7.10.6.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.10.6.1(3)(b) Owner will:
7.10.6.1.3.(b).1 Provide design feedback to Project Co.

7.10.6.1(3)(c) Project Co will:
7.10.6.1.3.(c).1 Select the system as determined in consultation with the Owner;
7.10.6.1.3.(c).2 Design, supply and install all system infrastructure;
7.10.6.1.3.(c).3 Design, supply and install all system equipment;
7.10.6.1.3.(c).4 Design, supply and install all system software;
7.10.6.1.3.(c).5 Commission all system infrastructure, equipment and software; and
7.10.6.1.3.(c).6 Integrate the system with the following systems:
(c).6.1 Wireless Staff duress;
(c).6.2 Intrusion detection;
(c).6.3 IP video surveillance; and
(c).6.4 Integration engine.

7.10.6.2 Performance Criteria

7.10.6.2(1) General

7.10.6.2(1)(a) Fixed duress system buttons will be strategically located, suitably sized, clearly identified, and suitable for the application. Buttons will latch when pressed and require physical attendance by Security or authorized personnel to reset and verify the integrity of the device.

7.10.6.2(1)(b) Provide fixed duress system buttons for Staff to initiate emergency assistance calls in areas of the Facility as determined in consultation with the Owner.

7.10.6.2(1)(c) Provide fixed duress system buttons in two form factors:

7.10.6.2.1.(c).1 Button Type 1: Fixed duress stations for Staff safety will be a latching single button device requiring a deliberate insertion of a finger, to activate the alarm, installed such that they can be easily reached and operated inconspicuously.

7.10.6.2.1.(c).2 Button Type 2: Fixed duress stations in areas intended for Staff and public safety use will be wall mounted and located in areas easily seen to the user. These fixed duress stations will have a mushroom-style push button that will illuminate when pushed and activated and reset to illuminated and ready for next use when twisted.

7.10.6.2(1)(d) Duress stations upon activation will annunciate locally by means of a siren/strobe unit(s), as well as reporting the alarm to the system network for alarm annunciation and reporting. The only areas that are silent alarms are Pharmacy

7.10.6.2(1)(e) Affixed wireless buttons are not acceptable; fixed buttons are to be hard wired.

7.10.6.2(1)(f) All fixed duress buttons and stations that are publicly visible will be clearly marked with signage indicating their use. Wording and signage type will be as determined in consultation with the Owner.

7.10.6.2(1)(g) Upon activation of a fixed duress button or emergency station, a signal will identify the exact location of the event while providing the name and location of the device that initiated the alarm on graphical mapping software located at the Security

Dispatch Centre (if applicable), specified care stations and Facility protection services offices. A local audible and visual alarm will be annunciated so that it may be seen and heard by Staff throughout certain areas as determined in consultation with the Owner.

7.10.6.2(1)(h) The entire fixed duress system will be supervised for the following:

- 7.10.6.2.1.(h).1 power loss;
- 7.10.6.2.1.(h).2 system trouble;
- 7.10.6.2.1.(h).3 communication loss; and
- 7.10.6.2.1.(h).4 wiring and device (including short, ground fault, open circuit).

7.10.6.2(2) Public Emergency Stations

7.10.6.2(2)(a) Provide public emergency stations that are highly visible, illuminated, and accessible. Emergency stations upon activation will annunciate locally by means of a siren/strobe unit(s), as well as reporting the alarm to the system network for alarm annunciation and reporting.

7.10.6.2(2)(b) Emergency stations will be wall or floor mounted, rated for exterior use, and come equipped with built in strobe and phone / intercom capabilities.

7.10.6.2(2)(c) Provide all areas of parking including the underground parking with emergency stations such that no location is more than 30 m distant from an emergency station. Ensure each emergency station is clearly visible from at least one surveillance camera.

7.10.6.2(2)(d) Project Co will provide public emergency stations in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff and public will have ready access to initiate emergency assistance calls in any locations where their safety may reasonably be expected to be at risk:

- 7.10.6.2.2.(d).1 Staff and public parking areas;
- 7.10.6.2.2.(d).2 stairwell entrances on underground parking levels;
- 7.10.6.2.2.(d).3 bike cages/storage areas;
- 7.10.6.2.2.(d).4 dedicated Staff entrances;
- 7.10.6.2.2.(d).5 exterior walkways and courtyards;

7.10.6.2.2.(d).6 exterior of Staff entrances; and

7.10.6.2.2.(d).7 secure outdoor spaces.

7.10.6.2(3) Integration Requirements

7.10.6.2(3)(a) Wireless Staff duress

7.10.6.2.3.(a).1 The fixed duress system will be integrated to the wireless Staff duress system, such that all points including the name, type, and exact location of each device is displayed on a common graphical map at security workstation(s).

7.10.6.2.3.(a).2 The wireless Staff duress system will provide direct integration of all fixed duress system points within a unified software platform.

7.10.6.2(3)(b) IP video surveillance

7.10.6.2.3.(b).1 The fixed duress system will integrate with the IP video surveillance system to provide video popups of cameras located closest to the location of the duress alarm.

7.10.6.2(3)(c) Intrusion detection

7.10.6.2.3.(c).1 The fixed duress system will integrate with the intrusion detection system to report the alarm location to the remote Owner ULC-listed central call centre using a duress system specific monitoring/control panel. Coordinate directly with the Owner's service provider as required to configure and confirm this integration.

7.10.6.2.3.(c).2 Alarm location will include the building, floor level, and room/zone in which the alarm originated.

7.10.6.2(3)(d) Integration engine

7.10.6.2.3.(d).1 The fixed duress system will provide seamless connectivity to the integration engine, which will enable Project Co to integrate duress system events with other Facility systems, including nurse call and Staff wireless communication devices.

7.10.6.2.3.(d).2 Provide integration with the lighting control system such that activating a fixed duress button in a public space will cause all lights in nearby lighting zones to be brought to full illumination.

7.10.7 Intrusion Detection System

7.10.7.1 Basic Requirements

7.10.7.1(1) System Overview

7.10.7.1(1)(a) The intrusion detection system consists of alarm controllers, local keypads, motion sensors, door contacts, strobes, sirens and other alarm initiating devices as needed for a reliable and fully operational system.

7.10.7.1(1)(b) Intrusion detection systems will be installed in all areas where the protection of physical Assets is deemed critical by the Owner.

7.10.7.1(1)(c) The intrusion detection system and all associated alarm panels must be remotely programmable and will be programmed to the satisfaction of the Owner.

7.10.7.1(2) Applicable Area

7.10.7.1(2)(a) Applies to the Facility.

7.10.7.1(2)(b) Project Co will provide intrusion detection system coverage in the following locations, at a minimum, and in other locations as determined by the Owner in order that areas with valuable physical assets will be protected and/or in order to achieve compliance with regulatory requirements:

- 7.10.7.1.2.(b).1 Departmental office suites (e.g. administration; mental health outpatient services);
- 7.10.7.1.2.(b).2 Nuclear medicine and/or areas where nuclear material is utilized or stored;
- 7.10.7.1.2.(b).3 Pharmacy spaces;
- 7.10.7.1.2.(b).4 Cashier;
- 7.10.7.1.2.(b).5 Multimedia rooms, types 2 through 6;
- 7.10.7.1.2.(b).6 Critical infrastructure areas;
- 7.10.7.1.2.(b).7 Health records storage;
- 7.10.7.1.2.(b).8 Stores (shipping/receiving);
- 7.10.7.1.2.(b).9 Ground level departments;
- 7.10.7.1.2.(b).10 Communications Rooms;
- 7.10.7.1.2.(b).11 Perimeter windows and openings that may compromise integral security of the Facility;
- 7.10.7.1.2.(b).12 Areas identified within Appendix 3A [Clinical Specifications and Functional Space Requirements]; and
- 7.10.7.1.2.(b).13 High-risk areas as designated by the Owner.

7.10.7.1(3) System Responsibilities

7.10.7.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.10.7.1(3)(b) Owner will:

7.10.7.1.3.(b).1 Provide design feedback to Project Co.

7.10.7.1(3)(c) Project Co will:

7.10.7.1.3.(c).1 Select the system as determined in consultation with the Owner;

7.10.7.1.3.(c).2 Design, supply and install all system infrastructure;

7.10.7.1.3.(c).3 Design, supply and install all system equipment and software;

7.10.7.1.3.(c).4 Commission all system infrastructure, equipment and software; and

7.10.7.1.3.(c).5 Integrate the system with the following systems:

(c).5.1 Wireless Staff duress;

(c).5.2 Fixed duress;

(c).5.3 IP video surveillance; and

(c).5.4 Integration engine.

7.10.7.2 Performance Criteria

7.10.7.2(1) General

7.10.7.2(1)(a) The intrusion detection system will utilize industry proven devices for intrusion alarm detection and reporting capable of 24 hours-a-day, seven (7) days-a-week continuous operation, with a minimum of eight (8) hours' battery backup operation in the event of power outages.

7.10.7.2(1)(b) The intrusion detection system will have GSM communications.

7.10.7.2(1)(c) Project Co will complete all system programming in accordance with the monitoring company requirements.

7.10.7.2(1)(d) The system will be compatible with the Owner's existing administrative software.

7.10.7.2(1)(e) The entire intrusion detection system will be supervised for the following:

7.10.7.2.1.(e).1 power loss;

7.10.7.2.1.(e).2 system trouble;

7.10.7.2.1.(e).3 communication loss; and

7.10.7.2.1.(e).4 wiring and device (including short, ground fault, open circuit).

7.10.7.2(1)(f) Control of the system for each area will be provided by keypad(s) located inside the department or area being protected.

7.10.7.2(2) Angel's Cradle Notification System

7.10.7.2(2)(a) As part of the intrusion detection system, Project Co will provide a notification system for the Angel's Cradle-Baby Drop-off.

7.10.7.2(2)(b) The system will provide a blinking light and speaker with customizable ringtone at the Emergency Department Care Team Station for notification purposes.

7.10.7.2(2)(c) The notification will occur 30 to 60 seconds after the Angel's Cradle-Baby Drop-off is opened. Project Co will confirm the delay time with the Owner for programming.

7.10.7.2(2)(d) The Angel's Cradle notification system will be supervised by the intrusion detection system for the following:

7.10.7.2.2.(d).1 power loss;

7.10.7.2.2.(d).2 system trouble;

7.10.7.2.2.(d).3 communication loss; and

7.10.7.2.2.(d).4 wiring and device (including short, ground fault, open circuit).

7.10.7.2(2)(e) Project Co will provide a reset button near the Staff access point inside the Facility for the Angel's Cradle-Baby Drop-off.

7.10.7.2(3) Overdose Notification System

7.10.7.2(3)(a) As part of the intrusion detection system, Project Co will provide an overdose system consisting of door lock/strike contacts, motion sensors, audio/visual alerting devices, and integration with nurse call through the integration engine.

7.10.7.2(3)(b) The system will achieve the following functionalities:

7.10.7.2.3.(b).1 When the door to the washroom or stall is closed and motion is detected, the system will activate.

7.10.7.2.3.(b).2 Once activated, the system will continuously monitor motion within the washroom/stall;

7.10.7.2.3.(b).3 If motion is not detected for a predetermined length of time (1 to 3 minutes), the system will alarm and initiate a priority call from the nurse call audio device within the washroom/stall. A strobe light outside the washroom will also activate upon alarm.

7.10.7.2.3.(b).4 Ten (10) seconds before the system alarms, a local audible and visual alert consisting of a buzzer and light will activate within the washroom or stall.

7.10.7.2.3.(b).5 If motion is detected, the timer will reset and begin the countdown process again, and this sequence will repeat until the system deactivates.

7.10.7.2.3.(b).6 The system will deactivate when the door opens.

7.10.7.2(3)(c) The time required to initiate the call will be customizable and will be programmed as determined in consultation with the Owner.

7.10.7.2(3)(d) Provide a local key switch outside the room door to disable/enable the overdose notification system within the room.

7.10.7.2(3)(e) The installation of the overdose notification system will be Tamper Resistant and Ligature Resistant.

7.10.7.2(3)(f) The system will be installed in the following locations:

7.10.7.2.3.(f).1 Emergency Department public washrooms;

7.10.7.2.3.(f).2 Main Entrance public washrooms;

7.10.7.2.3.(f).3 Public washrooms in Mental Health Areas; and

7.10.7.2.3.(f).4 Patient washrooms in Urban Health and Integrated Mental Health and Substance Use, including the Stabilization Unit and the Eating Disorders Day Hospital Program.

7.10.7.2(4) Integration Requirements

7.10.7.2(4)(a) Wireless Staff duress

7.10.7.2.4.(a).1 The Wireless Staff duress system will integrate with the intrusion detection system to report the alarm location to the remote Owner ULC-listed central call centre using a duress system specific monitoring/control panel. Coordinate

directly with the Owner's service provider as required to configure and confirm this integration.

7.10.7.2.4.(a).2 Intrusion alarms will be displayed on a common graphical map with other ESS system alarms at security workstation(s).

7.10.7.2.4.(a).3 Alarm location will include the building, floor level, and room/zone where the alarm originated.

7.10.7.2(4)(b) Fixed Duress

7.10.7.2.4.(b).1 The fixed duress system will integrate with the intrusion detection system to report the alarm location to the remote Owner ULC listed central call centre using a duress system specific monitoring/control panel. Coordinate directly with the Owner's service provider as required to configure and confirm this integration.

7.10.7.2.4.(b).2 Alarm location will include the building, floor level, and room/zone where the alarm originated.

7.10.7.2(4)(c) IP video surveillance

7.10.7.2.4.(c).1 The intrusion detection system will integrate with the IP video surveillance system to provide video popups of cameras located closest to the location of the intrusion alarm.

7.10.7.2(4)(d) Integration engine

7.10.7.2.4.(d).1 The intrusion detection system will integrate with the integration engine such that a nurse call event can be triggered from a local nurse call device when the overdose system alarms.

7.10.8 Intercommunications System

7.10.8.1 Basic Requirements

7.10.8.1(1) System Overview

7.10.8.1(1)(a) A combination of video, and audio-only, intercom stations strategically located throughout the Facility and interfaced to the access control system to provide remote access through specific portals.

7.10.8.1(2) Applicable Area

7.10.8.1(2)(a) Applies to the Facility.

7.10.8.1(2)(b) Determine the location and quantity of devices required for each area in consultation with the Owner.

7.10.8.1(2)(c) Project Co will provide intercom master stations in the following locations, at a minimum, and in other locations as determined by the Owner in order that staff will have ready access to intercom master stations where they may reasonably be expected to verify access to secure spaces:

- 7.10.8.1.2.(c).1 Security stations and kiosks;
- 7.10.8.1.2.(c).2 FMO;
- 7.10.8.1.2.(c).3 Care Team Stations of all clinical departments;
- 7.10.8.1.2.(c).4 Anteroom-Secure for Secure Rooms;
- 7.10.8.1.2.(c).5 Triage (Emergency Department);
- 7.10.8.1.2.(c).6 Office suite entrances;
- 7.10.8.1.2.(c).7 Clinical Operations Centre;
- 7.10.8.1.2.(c).8 Control-Imaging rooms (Surgical and Interventional Services);
- 7.10.8.1.2.(c).9 Energy Centre;
- 7.10.8.1.2.(c).10 Reception and Control desks;
- 7.10.8.1.2.(c).11 MDR:
  - (c).11.1 Decontamination Area;
  - (c).11.2 Sterile Storage and Distribution area; and
  - (c).11.3 Shared offices.
- 7.10.8.1.2.(c).12 areas identified within Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.10.8.1(2)(d) Project Co will provide video door intercom stations in the following locations, at a minimum, and in other locations as determined by the Owner in order that individuals will have ready access to video door intercom stations where they may reasonably be expected to request access to secure spaces:

- 7.10.8.1.2.(d).1 Areas identified in Appendix 3P [Security Operation Matrix];
- 7.10.8.1.2.(d).2 public entries to departments and units;
- 7.10.8.1.2.(d).3 all entries to the Facility;
- 7.10.8.1.2.(d).4 Interior zone doors of the Maternity Centre;
- 7.10.8.1.2.(d).5 Cadaver Preparation/Viewing Room;
- 7.10.8.1.2.(d).6 EMG and EEG exam rooms; and
- 7.10.8.1.2.(d).7 areas identified in Appendix 3A [Clinical Specifications and Functional Space Requirements].

7.10.8.1(3) System Responsibilities

7.10.8.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.10.8.1(3)(b) Owner will:

7.10.8.1.3.(b).1 Provide design feedback to Project Co.

7.10.8.1(3)(c) Project Co will:

7.10.8.1.3.(c).1 Select the system as determined in consultation with the Owner;

7.10.8.1.3.(c).2 Select, design, supply, install and commission all system infrastructure as determined in consultation with the Owner;

7.10.8.1.3.(c).3 Design, supply and install all system equipment as determined in consultation with the Owner;

7.10.8.1.3.(c).4 Design, supply and install all system software as determined in consultation with the Owner;

7.10.8.1.3.(c).5 Commission all system infrastructure, equipment and software as determined in consultation with the Owner; and

7.10.8.1.3.(c).6 Integrate the system with the following systems:

(c).6.1 IM/IT VoIP;

(c).6.2 IP video surveillance;

(c).6.3 Access control; and

(c).6.4 Integration engine.

7.10.8.2 Performance Criteria

7.10.8.2(1) General

7.10.8.2(1)(a) Project Co will undertake the Design and Construction of a fully digital IP audio-video intercom system.

7.10.8.2(1)(b) The intercom system will be IP based and manufactured by recognized industry leaders in the intercom business.

7.10.8.2(1)(c) Project Co will supply, install, label, configure, program, integrate, test and commission all components of the intercom system including:

7.10.8.2.1.(c).1 all stations, expansion modules, mounting hardware, loudspeakers, microphones, wiring, servers, plug-in cards, software, licenses and other components required to provide a turn-

key solution that meets or exceeds the Owner's requirements; and

7.10.8.2.1.(c).2 all server hardware, software and licensing required for the intercom control system and to complete the integration scope of work as defined in this section.

7.10.8.2(1)(d) Project Co will provide operations, programming and maintenance training for the overall intercom system including the control system. Operating, programming and maintenance manuals and user guides will be provided at the time of training;

7.10.8.2(1)(e) The intercom system supplied and installed by Project Co will:

7.10.8.2.1.(e).1 meet the functional requirements described in:

(e).1.1 Appendix 3A [Clinical Specifications and Functional Space Requirements]; and

(e).1.2 the most recent Province of British Columbia Provincial Quality, Health and Safety Standards and Guidelines for Secure Rooms;

7.10.8.2.1.(e).2 provide full duplex hands-free voice communication, allowing simultaneous talking and listening with echo cancellation;

7.10.8.2.1.(e).3 process and transmit audio signals with 16 kHz message bandwidth to provide wideband voice level performance in the 50–15,000 Hz range;

7.10.8.2.1.(e).4 support broadcast and multicast audio transmission;

7.10.8.2.1.(e).5 have intelligent volume control where intercom stations and loudspeakers will be enabled to monitor background noise levels and automatically adjust their sound level accordingly;

7.10.8.2.1.(e).6 support the audio recording of 100 simultaneous calls;

7.10.8.2.1.(e).7 provide one-way and bi-directional video transmission;

7.10.8.2.1.(e).8 be microprocessor controlled and incorporate modular components;

7.10.8.2.1.(e).9 provide all interfaces and associated licensing for integration and or connection with other systems;

7.10.8.2.1.(e).10	store and distribute pre-recorded music and audio messages to be played constantly, on a schedule, or upon activation via event trigger or operator. Replay of pre-recorded content will be configurable to multiple groups or zones within the Facility;
7.10.8.2.1.(e).11	allow direct dialing functions for each station individually as required by the Owner;
7.10.8.2.1.(e).12	restrict features and dialing sequences for any station individually as required by the Owner;
7.10.8.2.1.(e).13	support ambient noise analytics that constantly monitor the volume level of the background sound within the listening range of an intercom station and automatically open a call connection if the sound volume level exceeds a defined threshold;
7.10.8.2.1.(e).14	provide full autonomous supervision of all intercom systems components including servers, loudspeakers, microphones, stations and communications lines;
7.10.8.2.1.(e).15	receive configurable alarms where upon the receipt of any alarms, the intercom system will send alarm status messages to designated workstation(s) and initiate system events such as email notification; and
7.10.8.2.1.(e).16	provide for logging and reporting of all system events which can be accessed and compiled into custom reports by means of configurable data filters.

7.10.8.2(1)(f)	Door stations located at locked perimeter doors will link to the master intercom station at the Control-Security office. Master intercom station at the Control-Security office will be capable of remotely unlocking perimeter entrance doors.
7.10.8.2(1)(g)	The numbers of locations will be as determined in consultation with the Owner, based on the Facility Threat and Risk Assessment Report.
7.10.8.2(1)(h)	Project Co will supply and install hardware and mounting kits as required to place master stations either on the desktop or wall (flush or surface).
7.10.8.2(1)(i)	Intercom systems for Secure Rooms will be provided in accordance with the Provincial Quality, Health and Safety Standards and Guidelines for

Secure Rooms in Designated Mental Health Facilities under the BC Mental Health Act.

7.10.8.2(2) Location Criteria

7.10.8.2(2)(a) Appendix 3P [Security Operation Matrix] contains additional details regarding door locations that require video door intercoms. Project Co will design the system to meet these criteria in addition to the requirements contained in this Agreement.

7.10.8.2(2)(b) Local video intercommunication systems are required at locked entrance doors that delivery personnel or the public will need access through and at the doors to the hearse Sally-Port. Provide door stations with integral two-way audio and one-way video capabilities.

7.10.8.2(2)(c) Project Co will supply and install intercom door stations with integral two-way audio and one-way video capabilities at all exterior points of entry into the Facility and Energy Centre.

7.10.8.2(2)(d) Project Co will supply and install intercom stations with integral two-way audio in all imaging rooms and their associated control rooms to provide direct communications between the imaging room and attached control room.

7.10.8.2(2)(e) Project Co will supply and install intercom stations with integral two-way audio in all Airborne Isolation Rooms and Decontamination Rooms and their associated Anterooms to provide direct communications between the anteroom and attached room. If a room that can be operated in airborne isolation mode does not have an attached Anteroom, such as a hybrid room or an Operating Room having airborne isolation functionality, provide an intercom station in the hallway for communication into the room.

7.10.8.2(2)(f) Project Co will supply and install intercom stations with integral two-way audio in the Hot Lab and Pharmacy Clean Rooms to provide communications between the rooms and their associated anterooms, as well as communications to a designated area outside the room.

7.10.8.2(2)(g) Project Co will supply and install membrane protected stations that are detergent and disinfectant resistant where there is a heightened requirement for infection control or in environments where washing and disinfection occurs. Refer to PICNet British Columbia Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Healthcare Settings and Programs.

7.10.8.2(2)(h) Provide a Vandal Resistant, colour video intercommunication system at all entrance locations to the Facility.

7.10.8.2(2)(i) Provide a video intercom door-station at the entrance to each clinical department in the Facility and Energy Centre. Each clinical department will have master stations at each collaboration station and care hub. Calls from the door-station will be broadcast to each master station within the department simultaneously and may be answered from any of these locations. Any master station will be capable of releasing the department entrance door.

7.10.8.2(3) Secure Rooms

7.10.8.2(3)(a) Provide master or sub-master stations in Secure Room anterooms. Anteroom door stations will have integral two-way audio capabilities and be equipped with two call buttons; one call button to the Secure Room door station and the second call button to the master intercom station at the Care Team Station.

7.10.8.2(3)(b) Within the Secure Room, door stations will be audio only and will have no buttons (voice-activated hands-free operation).

7.10.8.2(3)(c) Secure Room door stations will link to the door station on the Anteroom and to the master intercom station in the Care Team Station. Speakers at the Care Team Station will have volume control to reduce volume but not turn off completely.

7.10.8.2(4) Intercommunications Equipment and Software

7.10.8.2(4)(a) The door stations for the department doors and the entrances to the Facility will have the following minimum requirements:

7.10.8.2.4.(a).1 digital pan/tilt and zoom with a minimum 170-degree wide-angle lens;
7.10.8.2.4.(a).2 video quality – HDTV 1080P and H.264 or H.265;
7.10.8.2.4.(a).3 support DSP features, hands-free open duplex audio capability, and switched duplex;
7.10.8.2.4.(a).4 16 kHz voice speech quality;
7.10.8.2.4.(a).5 push-to-talk/call buttons;
7.10.8.2.4.(a).6 protection classification IP65 Vandal Resistant and mechanical impact resistance up to IK09, Tamper Resistant and Ligature Resistant where accessible by Patients; and
7.10.8.2.4.(a).7 each video door intercom station will be able to provide a signal to the access control system for door release.

7.10.8.2(4)(b) The door stations in the Secure Rooms will have the following minimum requirements:
7.10.8.2.4.(b).1 open duplex with hands-free communication with high volume audio capability;
7.10.8.2.4.(b).2 16 kHz voice speech quality;
7.10.8.2.4.(b).3 protection classification IP65 Vandal Resistant and mechanical impact resistance up to IK09, Tamper Resistant and Ligature Resistant; and
7.10.8.2.4.(b).4 no call button.

7.10.8.2(4)(c) The door stations in each of the anterooms attached to a Secure Room will have the following minimum requirements:
7.10.8.2.4.(c).1 Digital pan/tilt and zoom with a minimum 170-degree wide-angle lens.
7.10.8.2.4.(c).2 video quality – HDTV 1080P and H.264 or H.265;
7.10.8.2.4.(c).3 support DSP features, hands-free open duplex audio capability, and switched duplex;
7.10.8.2.4.(c).4 16 kHz voice speech quality;
7.10.8.2.4.(c).5 push-to-talk/call buttons; and
7.10.8.2.4.(c).6 protection classification IP65 Vandal Resistant and mechanical impact resistance up to IK09, Tamper Resistant and Ligature Resistant where accessible by Patients.

7.10.8.2(4)(d) Master intercom stations will have the following minimum requirements:
7.10.8.2.4.(d).1 desk and wall mount capability;
7.10.8.2.4.(d).2 7” colour display;

7.10.8.2.4.(d).3 support display of IP video streams from other intercom stations;
7.10.8.2.4.(d).4 IP65 protection classification;
7.10.8.2.4.(d).5 support DSP features, hands-free open duplex audio capability, and switched duplex;
7.10.8.2.4.(d).6 16 kHz voice speech quality; and
7.10.8.2.4.(d).7 support remote unlocking of doors;

7.10.8.2(5) Intercom Control System

7.10.8.2(5)(a) The intercom control system will be a virtual software platform whereby all control desk functions of the intercom system server are displayed on one or several monitors;

7.10.8.2(5)(b) The intercom control system will function in a server client architecture whereby the Owner's workstations and mobile devices communicate with the intercom control system software that is provided and configured by Project Co;

7.10.8.2(5)(c) Software for the Intercom Control system will be installed on Owner provided servers in a redundant configuration;

7.10.8.2(5)(d) Project Co will:
7.10.8.2.5.(d).1 supply and install all base, client (including web client), data point, recording, mobile and other licenses on both the primary and back-up intercom control system servers sufficient to meet the Owner's initial operational requirements; and
7.10.8.2.5.(d).2 supply and configure all software for both the primary and back-up intercom control system servers to fully function.

7.10.8.2(5)(e) Display and visualization
7.10.8.2.5.(e).1 The intercom system will support display on multiple monitors with options for saving individual layout profiles and free positioning of plan overviews, status windows, and actions;
7.10.8.2.5.(e).2 Status windows will be configurable to provide operators with an instant, at-a-glance overview of the entire intercom system, presenting all relevant details of events on-screen as they happen;
7.10.8.2.5.(e).3 Interactive icons (on-screen symbols) will represent calls and error or alarm messages,

changing colour depending on the required level of operator attention; and

7.10.8.2.5.(e).4 The intercom control system will be capable of loading floor plans, maps, and other graphics depicting the topology in which intercom system elements are installed.

7.10.8.2(5)(f) Video viewing

7.10.8.2.5.(f).1 The intercom control system will allow for the integration of live IP video streams into its displays when receiving call requests and during calls; and

7.10.8.2.5.(f).2 The intercom control system will allow for video scanning and sequencing.

7.10.8.2(5)(g) Audio recording

7.10.8.2.5.(g).1 The intercom control system will be able to record audio streams from servers and/or directly from supported IP devices; and

7.10.8.2.5.(g).2 Audio recordings will be able to be stored on the Owner's network storage devices.

7.10.8.2(5)(h) Scheduling

7.10.8.2.5.(h).1 The intercom control system will allow the Owner's operators to define functions and procedures of the intercom system on a flexible time schedule.

7.10.8.2(6) The intercom control system will be initially programmed and configured by Project Co with input from the Owner to provide complete visualization, management and control of the intercom system in the Facility. This includes:

7.10.8.2(6)(a) setup of clients and web clients;

7.10.8.2(6)(b) setup of user privileges;

7.10.8.2(6)(c) configuration of status windows;

7.10.8.2(6)(d) loading and organization of floor, building and campus plans in the software necessary to visualize the system and display all controllable devices;

7.10.8.2(6)(e) configuration of icon graphics for controllable devices and their positioning on the plans as well as enabling other standard elements of visualization required by the Owner;

7.10.8.2(6)(f) scheduling the functions and procedures of the intercom system, including specific call flows for different work shifts;

7.10.8.2(6)(g) creation of reports; and

7.10.8.2(6)(h) integration setup of video viewing and audio recording capabilities where desired by the Owner.

7.10.8.2(7) Energy Centre

7.10.8.2(7)(a) If the Energy Centre is a separate building, integrate the intercom system in the Facility with the intercom system in the Energy Centre to create one seamless intercommunications network that covers both buildings. This integration will enable:

7.10.8.2.7.(a).1 bi-directional audio and video communication between any master station located in the Facility and door stations in the Energy Centre (and vice versa) where required by the Owner; and

7.10.8.2.7.(a).2 any master station in the Facility to release doors in the Energy Centre (and vice versa) plus all associated integration with the IP video surveillance systems in both buildings (as previously described) where required by the Owner.

7.10.8.2(8) Integration Requirements

7.10.8.2(8)(a) Project Co will physically and logically integrate the intercom system in the Facility with:

7.10.8.2(8)(b) IP video surveillance

7.10.8.2.8.(b).1 the IP video surveillance system in the Facility and the Energy Centre such that when a door station is activated, the nearest IP video surveillance camera will focus on the location of the request and display the image on the workstations co-located with the master station receiving the call. Computer workstation monitors will not be used to display intercom video.

7.10.8.2(8)(c) Access control

7.10.8.2.8.(c).1 the access control system in the Facility and Energy Centre to release the doors via master stations as required by the Owner;

7.10.8.2(8)(d) IM/IT VoIP system

7.10.8.2.8.(d).1 the IM/IT VoIP system, such that the intercom network will function in a SIP environment and will be able to integrate to the Owner's PBX using SIP trunk lines for remote audio and dial-tone unlocking capabilities; and

7.10.8.2(8)(e) Integration engine

7.10.8.2.8.(e).1 Provide seamless connectivity to the integration engine, which will allow the Owner the capability to integrate system events to Division 27 systems including nurse call and Staff wireless communication devices for remote audio and dial-tone unlocking capabilities.

7.10.9 IP Video Surveillance System

7.10.9.1 Basic Requirements

7.10.9.1(1) System Overview

7.10.9.1(1)(a) The IP video surveillance system will consist of high definition, IP video surveillance cameras, storage devices, network video recorders, digital video management system, and all associated hardware and software.

7.10.9.1(1)(b) The system will be able to record clear images of individuals to allow distinction of facial features, clothing and other identifiable details. The system will provide recorded images of sufficient quality to be used as court-admissible evidence in Canada.

7.10.9.1(2) Applicable Area

7.10.9.1(2)(a) Applies to the Facility.

7.10.9.1(2)(b) Project Co will provide IP Video Surveillance System devices in the following locations, at a minimum, and in other locations as determined by the Owner where Staff, Patient and/or public safety may reasonably be at risk other than areas where there is a reasonably expectation of personal privacy:

7.10.9.1.2.(b).1 main entrances and exits to the Facility and Energy Centre;

7.10.9.1.2.(b).2 vehicle drop off and pickup locations;

7.10.9.1.2.(b).3	security vestibules, entrance and exit doors and corridors to all departments;
7.10.9.1.2.(b).4	public lobbies, lounges in Patient areas and waiting and gathering areas;
7.10.9.1.2.(b).5	corridors within clinical units;
7.10.9.1.2.(b).6	Pharmacy and Specialty Pharmacy;
7.10.9.1.2.(b).7	Dispensary Area, medication rooms, narcotic storage locations;
7.10.9.1.2.(b).8	loading docks;
7.10.9.1.2.(b).9	entrances to locker rooms;
7.10.9.1.2.(b).10	elevators;
7.10.9.1.2.(b).11	elevator lobbies (public and service);
7.10.9.1.2.(b).12	parking entrances and exits, including stairwells;
7.10.9.1.2.(b).13	traffic routes in parking areas;
7.10.9.1.2.(b).14	Fixed duress button locations;
7.10.9.1.2.(b).15	Entrance Vestibule-VPD/BCEHS;
7.10.9.1.2.(b).16	stretcher bays;
7.10.9.1.2.(b).17	parking pay stations;
7.10.9.1.2.(b).18	bicycle lockers/storage;
7.10.9.1.2.(b).19	publicly accessible panic duress stations;
7.10.9.1.2.(b).20	Communications Rooms and/or areas identified as key building infrastructure;
7.10.9.1.2.(b).21	perimeter walkways and walkways connecting to other buildings on the Campus;
7.10.9.1.2.(b).22	in exit stairwells at grade or exit door;
7.10.9.1.2.(b).23	Secure Outdoor Spaces on all Facility levels;
7.10.9.1.2.(b).24	outdoor amenity areas;
7.10.9.1.2.(b).25	areas where cash is exchanged;
7.10.9.1.2.(b).26	accessible roof areas;
7.10.9.1.2.(b).27	the Future Heliport roof area;
7.10.9.1.2.(b).28	Ambulance Garage;
7.10.9.1.2.(b).29	locations of all Intercom door stations;
7.10.9.1.2.(b).30	the Energy Centre and locations of major mechanical equipment as determined in consultation with the Owner. Refer to Sections 7.2 and 5.4 for additional details;
7.10.9.1.2.(b).31	areas identified within Appendix 3A [Clinical Specifications and Functional Space Requirements] and Appendix 3P [Security Operation Matrix]; and
7.10.9.1.2.(b).32	high-risk areas as designated by the Owner.

7.10.9.1(3) System Responsibilities

7.10.9.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.10.9.1(3)(b) Owner will:

7.10.9.1.3.(b).1 Select the system: Avigilon.

7.10.9.1.3.(b).2 Provide design feedback to Project Co.

7.10.9.1(3)(c) Project Co will:

7.10.9.1.3.(c).1 Design, supply and install all system infrastructure;

7.10.9.1.3.(c).2 Design, supply and install all system equipment, including servers and storage devices as per the vendor's specifications for the system;

7.10.9.1.3.(c).3 Design, supply and install all system software;

7.10.9.1.3.(c).4 Commission all system infrastructure, equipment and software; and

7.10.9.1.3.(c).5 Integrate the system with the following systems:

(c).5.1 Access control

(c).5.2 Wireless Staff duress;

(c).5.3 Fixed duress;

(c).5.4 Integration Engine;

(c).5.5 Intercommunications;

(c).5.6 Intrusion detection; and

(c).5.7 Patient wandering.

7.10.9.2 Performance Criteria

7.10.9.2(1) General

7.10.9.2(1)(a) Provide new IP video surveillance field devices, pathways, wiring, control panels, network equipment and all supporting infrastructure to support a fully functional IP video surveillance system. Cabling for the system will adhere to the requirements in Section 7.9.3 IM/IT Structured Cabling.

7.10.9.2(1)(b) Each camera will be selected and configured with the appropriate lens to meet or exceed the resolution scene requirements of observation, identification, or recognition. Each camera will have scene purpose stated. All cameras will be no less than 3MP image quality and utilize H.264 or better image compression technology.

7.10.9.2(1)(c) Integrate all Owner IP video surveillance cameras onto a single open architecture type platform.

7.10.9.2(1)(d) Project Co will ensure that the IP video surveillance network equipment follows industry best practices

	for cyber security hardening and consult with the Owner to ensure it meets the Owner's network security requirements.
7.10.9.2(1)(e)	Provide video storage capacity for minimum of thirty (30) days at minimum 18 frames per second, recorded at each camera's intended resolution for all installed cameras, including clinical cameras. The IP video surveillance system will have the option of recording each camera at various resolution levels and FPS depending on use and location, as well as by schedule or event. Provide file servers and optical storage devices and connect each to the IM/IT data network. The system will have activity detection and incorporate smart search capabilities. Playback speed will be supported at five (5) times the normal rate.
7.10.9.2(1)(f)	Project Co will provide and install a new standalone Avigilon DVMS for the Facility. The DVMS will be connected to the Owner's enterprise IP Video Surveillance server, and support the full range of functionality and integrations required by this Agreement. The DVMS will maintain this functionality locally in the Facility if the network connection to the regional server is lost.
7.10.9.2(1)(g)	In the event of network disruption or loss of connectivity to the Owner's enterprise server, the IP video surveillance system will continue to function in non-degraded mode of operation.
7.10.9.2(1)(h)	The DVMS will be a network-based client application allowing for authorized users to remotely view, control and manage all aspects of the IP video surveillance system across the network. The system will have network and web access for remote monitoring, using predefined user authentication.
7.10.9.2(1)(i)	Project Co will provide remote monitoring software and licensing for all Owner supplied workstations requiring remote monitoring of the IP Video Surveillance system, including the Clinical Observation Camera component of the system.
7.10.9.2(1)(j)	The DVMS will reside on the Owner's IM/IT Network on a separate VLAN and be part of the Owner's structured cabling plan.

7.10.9.2(1)(k) All cameras will have FOV digital masking ability through software to allow sensitive areas within a scene to be hidden as required.

7.10.9.2(1)(l) Camera mounting will be appropriate for the environment and unobtrusive, with hidden cabling.

7.10.9.2(1)(m) Position cameras to minimize the possibility of reflection including glare created by bright light sources, both natural and artificial.

7.10.9.2(1)(n) The use of PTZ or fisheye lens cameras will not be permitted unless reviewed by the Owner.

7.10.9.2(1)(o) Project Co will provide and install permanent, Owner approved signage posted at all public entrances to the Facility. The signage will notify the public that the area is under IP video surveillance. Consult the Owner for appropriate wording for all signage.

7.10.9.2(1)(p) Once the system is installed and operational, Project Co will provide screenshots of each camera for review by the Owner to ensure the correct field of view is captured. Project Co will adjust any camera that the Owner identifies as not meeting the intent of the design.

7.10.9.2(1)(q) The IP video surveillance system will provide recorded images of sufficient quality to be used as court-admissible evidence in Canada. Designated objects within each camera's field of view require specific pixel densities in the following areas:

7.10.9.2.1.(q).1 Identification: 250 horizontal pixels/m for individuals at main entry and exit points to the Facility, department entry and exit points, emergency drop-off zones, elevator lobbies, drug storage and medication rooms, high risk areas and at each public emergency station location;

7.10.9.2.1.(q).2 Recognition: 250 horizontal pixels/m for individuals in public lobbies, waiting and gathering areas, areas where cash is exchanged, entrances to locker change rooms, equipment/server rooms and hallways/corridors;

7.10.9.2.1.(q).3 Observation: 125 horizontal pixels/m for exterior walkways, court yards and parking lots; and

7.10.9.2.1.(q).4 LPR: Licence plate recognition will be required for vehicles entering and exiting:

(q).4.1 Emergency drop-off zones;

(q).4.2 Entrances and exits to underground parking;

(q).4.3 Main entrance drop-off zone(s); and

(q).4.4 All after-hours entrance drop-off zone(s).

7.10.9.2(1)(r) Appendix 3P [Security Operation Matrix] provides additional details regarding the minimum required surveillance coverage of specific spaces and door types. Project Co will ensure that the design of the IP video surveillance system meets these requirements in addition to all other requirements contained in this Agreement.

7.10.9.2(1)(s) Provide IP video surveillance throughout the Facility, underground parking and exterior areas for the purpose of viewing and recording video to enhance the level of security and assist the Owner's Staff in providing a safe environment for Patients, Staff, visitors and the general public while protecting the physical Assets of the Facility.

7.10.9.2(1)(t) Project Co will post signage at entrances to the Facility and Energy Centre. The signage in accordance with Owner standards will notify the public that this area is under video surveillance. IP video surveillance processes will be governed by the Public Surveillance System Privacy Guidelines.

7.10.9.2(1)(u) Indoor cameras will be:

7.10.9.2.1.(u).1 fixed type;

7.10.9.2.1.(u).2 capable of a full analytic package including Avigilon Appearance Search;

7.10.9.2.1.(u).3 colour;

7.10.9.2.1.(u).4 high resolution;

7.10.9.2.1.(u).5 capable of HDR and auto white-balancing;

7.10.9.2.1.(u).6 high sensitivity (day/night);

7.10.9.2.1.(u).7 smoke dome type;

7.10.9.2.1.(u).8 equipped with an auto iris and zoom capability; and

7.10.9.2.1.(u).9 Vandal Resistant.

7.10.9.2(1)(v) Outdoor cameras will be:

- 7.10.9.2.1.(v).1 fixed type;
- 7.10.9.2.1.(v).2 capable of a full analytic package including Avigilon Appearance Search;
- 7.10.9.2.1.(v).3 colour;
- 7.10.9.2.1.(v).4 high resolution;
- 7.10.9.2.1.(v).5 capable of HDR and auto white-balancing;
- 7.10.9.2.1.(v).6 high sensitivity (day/night);
- 7.10.9.2.1.(v).7 equipped with an auto iris and zoom capability; and
- 7.10.9.2.1.(v).8 Tamper Resistant and Vandal Resistant.

7.10.9.2(1)(w) Outdoor cameras will be complete with weatherproof housing and internal heater/defroster/blower/wiper as required for suitable operation under varying environmental conditions.

7.10.9.2(1)(x) Cameras will not be set up in private areas such as Patient rooms, treatment rooms or Clinical Spaces (unless specifically identified for use by clinical department Staff), locker rooms or washrooms. Cameras will not be placed or reviewed for the purpose of observing the work performance of employees.

7.10.9.2(1)(y) Provide a video surveillance system complying with the Provincial guidelines and standards for the monitoring of Secure Rooms in Mental Health Areas.

7.10.9.2(1)(z) Provide IP video surveillance equipment to monitor and record the identity of all persons entering and exiting the Facility's entrances and corridors/links and utilizing elevators in strictly controlled high-risk departments and associated areas, as determined in consultation with the Owner.

7.10.9.2(1)(aa) The IP video surveillance system will not provide camera coverage of the Angel's Cradle-Baby Drop-off. Camera coverage of the walkways and areas surrounding the Angel's Cradle-Baby Drop-off will be as determined in consultation with the Owner.

7.10.9.2(2) Clinical Observation Camera Systems

7.10.9.2(2)(a) The clinical observation camera system consists of cameras that are used in clinical settings for remote

monitoring or educational purposes in designated areas of the Facility.

7.10.9.2(2)(b) Coordinate location of video surveillance monitors in Clinical Spaces with clinical programs and the Millwork design to ensure ergonomic viewing and usage in conjunction with other systems as determined in consultation with the Owner.

7.10.9.2(2)(c) The clinical observation camera system will be a subset of the IP video surveillance system and will utilize the same camera manufacturer and headend equipment.

7.10.9.2(2)(d) Project Co will provide a clinical observation camera system to allow clinical and other Staff to monitor Patient and other activity.

7.10.9.2(2)(e) Cameras solely intended for clinical observation purposes will be viewable by clinical Staff and set to not record on the Digital Video Management system (DVMS). Clinical cameras will have settings to support video recording if required by the Owner.

7.10.9.2(2)(f) Corner-mount correctional style, Ligature Resistant cameras will be installed in areas such as Secure Rooms and other specialized environments where Patient safety is a concern. Refer to Appendix 3A [Clinical Specifications and Functional Space Requirements] and consult with the Owner's security programs for exact locations.

7.10.9.2(2)(g) Provide a minimum of one viewing client, and license at each location identified as the designated viewing location for the areas requiring clinical observation cameras in the locations identified in this section, for Staff to monitor all cameras associated within the Clinical Space and other locations requiring clinical observation cameras.

7.10.9.2(2)(h) Clinical observation cameras will be:

- 7.10.9.2.2.(h).1 fixed type;
- 7.10.9.2.2.(h).2 colour;
- 7.10.9.2.2.(h).3 high resolution capable of a full analytic package including Avigilon Appearance Search;
- 7.10.9.2.2.(h).4 capable of HDR and auto white-balancing;
- 7.10.9.2.2.(h).5 high sensitivity (day/night);

7.10.9.2.2.(h).6 capable of providing high quality images under low light conditions;

7.10.9.2.2.(h).7 equipped with an auto iris and zoom capability; and

7.10.9.2.2.(h).8 Tamper Resistant and Vandal Resistant.

7.10.9.2(2)(i) All cameras will be no less than 3MP image quality and utilize H.264 or better image compression technology.

7.10.9.2(2)(j) Clinical observation cameras in Secure Rooms will have a minimum 24 inch display installed outside the room displaying the video feed from inside the room. Project Co will coordinate the design of these screens with the Owner and install all required infrastructure.

7.10.9.2(2)(k) Project Co will provide clinical observation video coverage in the following locations, at a minimum, and in other locations as determined by the Owner in order that staff may remotely monitor patients who require continuous supervision and/or in order to capture and record video for educational purposes:

7.10.9.2.2.(k).1 Secure Rooms, including anterooms;

7.10.9.2.2.(k).2 Patient Room-NICU;

7.10.9.2.2.(k).3 Patient Room-NICU-Airborne Isolation-Hybrid;

7.10.9.2.2.(k).4 Decontamination Room;

7.10.9.2.2.(k).5 ECG exam rooms;

7.10.9.2.2.(k).6 EMG exam rooms;

7.10.9.2.2.(k).7 Evoked Potentials exam room;

7.10.9.2.2.(k).8 Consult/Interview rooms;

7.10.9.2.2.(k).9 Exam/Treatment Room-Resuscitation;

7.10.9.2.2.(k).10 Procedure and Operating Rooms;

7.10.9.2.2.(k).11 Interventional Suites;

7.10.9.2.2.(k).12 Waiting rooms in the Medical Imaging component; and

7.10.9.2.2.(k).13 Areas Identified within Appendix 3O [Electrical IM/IT Matrix].

7.10.9.2(3) Integration Requirements

7.10.9.2(3)(a) If supported by the DVMS manufacturer, when a system integrated with the IP video surveillance system triggers an alarm, all cameras associated with the alarm will increase their recorded framerate to a minimum of 30 FPS, with pre and post record.

7.10.9.2(3)(b) Access control

7.10.9.2.3.(b).1 The access control system will interface with the IP video surveillance system through manufacturer-supported API's such that when an alarm is initiated at an access-controlled door, selected surveillance cameras associated with the door are displayed at the local and site security workstations.

7.10.9.2(3)(c) Wireless Staff duress

7.10.9.2.3.(c).1 The wireless Staff duress system will integrate with the IP video surveillance system to provide video popups of cameras located closest to the location of the alarm.

7.10.9.2(3)(d) Fixed duress

7.10.9.2.3.(d).1 The fixed duress system will integrate with the IP video surveillance system to provide video popups of cameras located closest to the location of the alarm.

7.10.9.2(3)(e) Intrusion detection

7.10.9.2.3.(e).1 The intrusion detection system will integrate with the IP video surveillance system to provide video popups of cameras located closest to the location of the alarm.

7.10.9.2(3)(f) Patient wandering

7.10.9.2.3.(f).1 The intrusion detection system will integrate with the IP video surveillance system to provide video popups of cameras located closest to the location of the alarm.

7.10.9.2(3)(g) Project Co will program each alert/alarm location of integrated systems to corresponding cameras near the location of the alert, as determined in consultation with the Owner.

7.10.10 Patient Wandering System

7.10.10.1 Basic Requirements

7.10.10.1(1) System Overview

7.10.10.1(1)(a) The Patient wandering system is a tag-based security system that prevents tagged Patients from leaving pre-defined areas.

7.10.10.1(1)(b) The Patient wandering system design will be developed as determined in consultation with the Owner.

7.10.10.1(2) Applicable Area

7.10.10.1(2)(a) Applies to the Facility.

7.10.10.1(2)(b) Project Co will provide Patient Wandering System devices in the following locations, at a minimum, and in other locations as determined by the Owner in order that Staff will readily receive notifications in any locations where Patients may reasonably be expected to be contained and are considered by Staff to be a risk for elopement due to cognitive impairment or similar conditions.

7.10.10.1.2.(b).1 Each of the following Components:

(b).1.1 Emergency Department Clinical Decision Unit;

(b).1.2 Critical Care Complex including Unit 01 and 02;

(b).1.3 All 16-Bed pods within the IPU 64-Bed Units;

(b).1.4 Maternity Care Centre; and

(b).1.5 Centre for Healthy Aging.

7.10.10.1(3) System Responsibilities

7.10.10.1(3)(a) Refer to Appendix 3E [Systems Responsibility Matrix] for Owner and Project Co scope summaries.

7.10.10.1(3)(b) Owner will:

7.10.10.1.3.(b).1 Provide design feedback to Project Co.

7.10.10.1(3)(c) Project Co will:

7.10.10.1.3.(c).1 Select the system as determined in consultation with the Owner;

7.10.10.1.3.(c).2 Design, supply and install all system infrastructure as determined in consultation with the Owner;

7.10.10.1.3.(c).3 Design, supply and install all system equipment;

7.10.10.1.3.(c).4 Design, supply and install all system software;

7.10.10.1.3.(c).5 Commission all system infrastructure, equipment and software; and

7.10.10.1.3.(c).6 Integrate the system with the following systems:

(c).6.1 Access control;

(c).6.2 IP video surveillance; and
(c).6.3 Integration engine.

7.10.10.2 Performance Criteria

7.10.10.2(1) General

7.10.10.2(1)(a) The Patient wandering system will not be part of or use the same infrastructure as the RTLS unless Project Co can prove to the satisfaction of the Owner that:

7.10.10.2.1.(a).1 the failure of one component or application of the system will not negatively impact the rest of the systems on the RTLS;

7.10.10.2.1.(a).2 the RTLS is appropriate and fit for purpose for all applications of each system integrated to it; and

7.10.10.2.1.(a).3 the tags are appropriate and fit for purpose for Patients.

7.10.10.2(1)(b) Patients will be provided with tags, ID bands, badges, or bracelets. The tracking system will be capable of continuous monitoring within departments as identified in this section.

7.10.10.2(1)(c) System will be water resistant and Tamper Resistant and will annunciate an alarm if any component of the system is tampered with.

7.10.10.2(1)(d) Each department and unit utilizing the Patient wandering system will be provided with a wireless Patient tracking tag test device that audibly and visually indicates on a pass/fail basis the functionality and battery life of the Patient tracking tag. The testing device will be a closed loop device/station that allows for full functional testing without activating the Facility Patient tracking alarm system and will support audit function as required.

7.10.10.2(1)(e) The system will annunciate or alarm at or in the Care Team Station in the vicinity of the event and areas as determined in consultation with the Owner, if a Patient leaves the area to which they are assigned.

7.10.10.2(1)(f) The system will be designed such that if doors/devices on the system lose network connectivity, they will continue to function in stand-alone mode, complete with local manual override.

7.10.10.2(1)(g) The system will support the enabling and disabling of tags. Users will be able to quickly deactivate and reactivate tags.

7.10.10.2(1)(h) Project Co will install the system, including all integrations, in one of the mock-up spaces and demonstrate that the system works reliably for the duration of the mock-up.

7.10.10.2(2) Performance Requirements

7.10.10.2(2)(a) At each designated perimeter door, provide a Patient wandering exciter array on each side of the door that will be interfaced with the access control system such that the restricted egress of a door can be initiated automatically upon local detection of Patient wandering tags.

7.10.10.2(2)(b) At each door equipped with a Patient wandering exciter array, a local strobe/sounder will activate when the associated door Patient wandering system alarms.

7.10.10.2(2)(c) The system will alarm and send alerts when Patient tags approach, or pass through, a designated threshold as determined in consultation with the Owner.

7.10.10.2.2.(c).1 When a Patient tag enters the field near a department perimeter door, the door will lock and a visual indicator on each side of door will activate.

7.10.10.2.2.(c).2 If the Patient tag passes through the door, the system will alarm and send alerts to Staff.

7.10.10.2.2.(c).3 Proximity alert/alarm distance to the exit point will be adjustable to minimum of 2 m.

7.10.10.2(2)(d) Provide a local keypad at each Patient wandering exciter door for reset and override by authorized Staff members. Local override can also be accomplished by detection of a Staff/companion tag at the same exciter door location.

7.10.10.2(2)(e) Provide a PC-based application that will provide a graphical presentation of Patient locations by superimposing positional data on a Facility floor plan and providing Patient tag-based information.

7.10.10.2(2)(f) Provide dedicated workstations at each inpatient unit Care Team Station that can assign tags and annunciate alarm locations.

7.10.10.2(2)(g) The Patient wandering system will interface with the IP video surveillance system such that when a tagged Patient exits through a department perimeter door, all local cameras associated with the door are displayed at the Care Team Station associated with the alarm, and a local audible/visual alarm is activated at the point of exit. The event will also be transmitted to the wireless Staff communications system.

7.10.10.2(2)(h) Upon the initiation of an alert, the system will identify the location of the event and the particular Patient and display the location on graphical mapping on the local clinical department workstations;

7.10.10.2(2)(i) All tags will report on battery status in real-time and be rechargeable.

7.10.10.2(2)(j) Patient tags will be non-Line of Sight and will work when covered with bed sheets and shirt sleeves.

7.10.10.2(2)(k) Provide tags and battery types that will last 1 year minimum based on average usage scenarios.

7.10.10.2(2)(l) Provide 500 Patient wandering tags and 500 Staff/companion tags.

7.10.10.2(2)(m) Project Co will consult with the Owner to develop standard operating procedures for the system and program the system as determined in consultation with the Owner.

7.10.10.2(3) Integration Requirements

7.10.10.2(3)(a) Integrate to the access control and IP video surveillance systems such that upon the initiation of an alert:

7.10.10.2.3.(a).1 The access control system will lock the door where the alert is initiated.

7.10.10.2.3.(a).2 The system will identify the location of the event and the particular Patient on the local clinical department workstation(s) graphical mapping software.

7.10.10.2.3.(a).3	All IP video surveillance cameras associated with the alert will be displayed at the local Care Team Station workstations.
7.10.10.2(3)(b)	The Patient wandering system will provide seamless connectivity to the integration engine which will allow the Owner the capability to integrate system events to Division 27 systems including nurse call and Staff wireless communication devices.

PART 8. SITE AND INFRASTRUCTURE SUBGROUP SPECIFICATIONS

8.1 Earthworks (Division 31)

8.1.1 Site Slopes and Retaining Walls

8.1.1.1 Basic Requirements

8.1.1.1(1) Site grading is to provide positive grading throughout. No surface ponding is permitted on-site.

8.1.1.1(2) Site grading is to avoid over-steepened slopes that cause erosion, cause pedestrian instability and will not hold growing medium and plants.

8.1.1.1(3) All slopes and site grading will conform to accessibility requirements. Ensure accessibility to Persons with Disabilities at grade changes through sloped walkways and ramps and avoid the use of stairs.

8.1.1.1(4) Retaining walls will be constructed of Architectural Concrete.

8.1.1.2 Performance Requirements

8.1.1.2(1) Design of on-site grading, roadway, walkway, and retaining wall to be in accordance with the latest MMCD, the VBBL, CD-1 (-) Bylaw and the City of Vancouver Engineering Design Manual.

8.1.1.2(2) Steep slopes are to be no steeper than 4:1 and finished with growing medium and plant material. Rip Rap is prohibited on slopes.

8.1.1.2(3) Slopes steeper than 4:1 are to be retained using structural, architecturally-finished retaining walls (e.g. cast-in place concrete walls).

8.1.1.2(4) Retaining walls greater than 1.5 m in height will be 'green' retaining walls, such as terraced planters, planted with vegetation to cover the face of the retaining walls.

8.2 Landscape

8.2.1 Basic Requirements

8.2.1.1 All landscape plans will adhere to the specifications set out in Section 4.5 Urban Design and Site Development, including the Site design concept, gateway elements, green roof development, public art, accessibility and exterior safety and security.

8.2.1.2 All landscape plans will coordinate with and adhere to the specifications outlined in Section 4.5 Urban Design and Site Development for the specific use areas, including the Plaza, Wellness Walkway and streetscape, Healing Corridor, Healthcare Boulevard, Spiritual Garden, Traditional Medicine Garden and Courtyard, Mental Health Inpatient Unit Exterior Courtyard and Therapy Roof Garden.

8.2.1.3 Provide outdoor spaces in the design of the Facility in accordance with Appendix 3A [Clinical Specifications and Functional Space Requirements] and all applicable provisions of this Schedule.

8.2.1.4 All landscaping and site design will comply with all applicable City standards and bylaws, including Bylaw CD-1.

8.2.1.5 Provide landscape site plans prepared by a BCSLA registered landscape architect.

8.2.1.6 Installation of the landscape will be supervised and approved by Project Co's BCSLA registered landscape architect.

8.2.1.7 Work and materials will meet requirements of the latest edition of the B.C. Landscape Standard.

8.2.2 Landscape Elements - All Areas

8.2.2.1 Provide landscape design that contributes to a liveable, healthy and responsive community, reflects our place on the unceded traditional territories of the Musqueam, Squamish and Tsleil-Waututh First Nations and is mindful of and responsive to the safety and security needs of the vulnerable and marginalized populations served by the Facility and its Staff.

8.2.2.2 Provide and coordinate the design of fixed exterior Furniture, including benches provided at regular intervals for ease of use, particularly for people with differing levels of mobility, physical and mental wellness. Select products on the basis of safety, comfort, design and materials that relate to the Facility architecture and landscape design, durability and required maintenance. Provide installation details for Furniture on all specified surfaces.

8.2.2.3 Design landscape features and provide Furniture that does not encourage the use of skateboards, the setting up of tents or other forms of shelter, public urination and defecation, and mitigates the risk of assault, self-harm, suicide, and intravenous drug use.

8.2.2.4 Locate trees, shrubs, lighting and seating elements to support, and not conflict with, Wayfinding on the Site and to provide comfortable waiting areas at the Facility entrances.

8.2.2.5 Maximize the extent of landscape areas on the Site and minimize the extent of impervious surfaces to increase the natural absorption rate of storm water to meet

City bylaw requirements for site soft landscape percentage, including trees, shrubs, groundcovers and grass.

8.2.3 Performance Criteria

8.2.3.1 Provide outdoor activity spaces in the design of the Facility, including:

8.2.3.1(1) Spaces that will be fully accessible to the public with strong connections to the site and the neighbourhood;

8.2.3.1(2) Spaces that provide respite to pedestrians; and

8.2.3.1(3) Spaces that provide a convenient and comfortable environment for Staff breaks and eating outdoors.

8.2.3.2 Provide accessible entrances to the outdoor spaces from the public areas of the Facility.

8.2.3.3 Provide outdoor amenity areas, with covered portions for protection from the elements, that provide for respite and repose dedicated to the following purposes:

8.2.3.3(1) Patient and family use.

8.2.3.4 The outdoor amenity areas will meet the following requirements:

8.2.3.4(1) Provide all landscaping for the outdoor amenity areas. Include all site furnishings and locations for artwork, supplied by others, to complete the space;

8.2.3.4(2) Provide elements such as sculptures, labyrinths, healing gardens, raised garden plots and a variety of seating spaces to create distinct zones of use within the courtyards and perimeter areas;

8.2.3.4(3) Design to stimulate the senses of sight, sound, smell and touch;

8.2.3.4(4) Provide natural lighting and sounds;

8.2.3.4(5) Design with an emphasis on natural features such as plants, stone, and wood; and

8.2.3.4(6) Water features are not acceptable.

8.2.3.5 Concrete paving will be coloured, contain special aggregates and/or architectural finishes to enhance its appearance and be used in combination with built-in Furniture or landscape features to break up wide expanses. Use concrete paving in varying patterns and textures to provide visual interest. To reduce visual glare, avoid large areas of light-coloured paving.

8.2.3.6 Provide at least one (1) hose bib for all outdoor gardens and Secure Outdoor Spaces. Tamper Resistant hose bib is required for the Mental Health Inpatient Unit Exterior Courtyard.

8.2.3.7 Design outdoor amenity areas to minimize ambiguity by:

8.2.3.7(1) providing well-defined and inviting entrances;

8.2.3.7(2) providing a Design that is easy to interpret by the intended occupants; and

8.2.3.7(3) Ensuring that patterns, colours and forms that are used in the design to be compatible with the intended occupants.

8.2.3.8 Provide Site Furniture to meet the following requirements:

8.2.3.8(1) Unify the exterior ground plane treatment through the use of common paving materials, tree grates, lighting and other landscape furniture items. Clearly show the installation and construction details for the integration of these various elements;

8.2.3.8(2) Provide and coordinate design for site Furniture, including benches provided at regular intervals for ease of use, particularly for people with differing levels of mobility and physical and mental wellness;

8.2.3.8(3) Seating in public areas will

8.2.3.8(3)(a) be designed for a variety of visitors to the Site;

8.2.3.8(3)(b) be designed to allow a wheelchair to sit alongside fixed seating or, where tables are provided, to allow a wheelchair to pull up to each table;

8.2.3.8(3)(c) have 25% of seating provided with backrests;

8.2.3.8(3)(d) have a middle armrest on benches in public areas to prevent people sleeping on bench; and

8.2.3.8(3)(e) shed rain water or be under shelter, either built or natural;

8.2.3.8(4) Seating areas with benches will be located within the landscape areas, no more than 12 m apart from each other. Select products on the basis of safety, comfort, design and materials that relate to the Facility architecture and landscape design, durability and required maintenance;

8.2.3.8(5) Provide exterior waste receptacles at all gathering spaces and entrances to the Facility that are wildlife-proof and accessible to Persons with Disabilities;

8.2.3.8(6) Select products for their suitability and durability in the climatic conditions found at the Facility;

8.2.3.8(7) Select products with Vandal Resistant and anti-theft design features;

8.2.3.8(8) Utilize a variety of scales, locations and orientations of seating areas and site furnishings to cater to varied outdoor activities and varied experiences of the Staff and visitors; and

8.2.3.8(9) Encourage temporary use while preventing sleeping and the setting up of tents or shelters.

8.2.4 Plant Material - All Areas

8.2.4.1 Include plants indigenous to this local area and include plants that were traditionally used by the local Host Nations. Refer to the recommendations from the Indigenous wisdom group for plant materials.

8.2.4.2 Use large calliper deciduous trees that provide seasonal interest in association with ground cover plants and low shrub plantings. Use a variety of plant material to reflect seasonal change.

8.2.4.3 Limit the number of tree species where appropriate to help unify the Site character, create recognizable spaces, contribute to Health Campus orientation and create a strong sense of place.

8.2.4.4 Avoid using fruit-producing trees that attract rodents. Avoid fruit-producing trees in hard surface and patio areas.

8.2.4.5 Use indigenous flora where appropriate to minimize maintenance and reduce water requirements. All plant selections will be suitable for the site plant hardiness zone and specific to the micro-climate conditions of the Site.

8.2.4.6 Group plants of similar habits and environmental requirements together to minimize the use of water, chemicals and fossil fuel use for routine maintenance and to promote a healthy local ecosystem using sustainable measures.

8.2.4.7 Shrubbery within 2 m of walkways will not exceed 500 mm in height.

8.2.4.8 Provide landscaped surfaces to entire site, exclusive of hard-surfaced circulation and paved areas. Grassed areas are to be sodded.

8.2.4.9 The selection of outdoor plantings in all outdoor spaces will be low maintenance.

8.2.4.10 The selection and placement of outdoor plantings and furnishings in all Secure Outdoor Spaces will be safe for Patients and not allow opportunities for hiding or seclusion. Plants that are sharp, poisonous, climbable or otherwise dangerous, or that can potentially cause allergic reactions are not permitted.

8.2.4.11 Provide street trees and plantings to create functioning sustainable and ecological systems. Linear tree planting will be made in connected below-grade soil trenches or in clustered groupings of trees with a generous soil mass to allow for interconnected root systems that will promote tree health and contribute to the urban forest. Coordinate the planting of street trees and branch heights with the requirements and design layout of bicycle lanes.

8.2.4.12 Street tree planting specifications and soil volume requirements will be in accordance with City standards and specifications.

8.2.4.13 Proposed plantings will not have high-maintenance root systems or produce messy leaves that clog drains or make areas hard to clean.

8.2.4.14 Plant selection will be favourable to bee pollination where appropriate.

8.2.5 Secure Outdoor Spaces

8.2.5.1 Basic Requirements

8.2.5.1(1) In addition to general outdoor spaces, provide distinct, separate Secure Outdoor Spaces to accommodate programmed and un-programmed activities in the Facility in accordance with this Schedule and Appendix 3A [Clinical Specifications and Functional Space Requirements].

8.2.5.2 Performance Criteria

8.2.5.2(1) Project Co will design the Secure Outdoor Spaces as follows:

8.2.5.2(1)(a) Provide a sense of control, security, and safety by:

8.2.5.2.1.(a).1 ensuring the Secure Outdoor spaces are observable from indoor areas, as described in Appendix 3A [Clinical Specifications and Functional Space Requirements];

8.2.5.2.1.(a).2 providing a variety of seating areas from which to choose, including covered areas protected from the elements and areas exposed to the weather;

8.2.5.2.1.(a).3 providing fixed Furniture as indicated in Appendix 3A [Clinical Specifications and Functional Space Requirements];

8.2.5.2.1.(a).4 ensuring the seating material will be a comfortable material that does not get excessively hot or cold, such as wood, and

facilitates the shedding of water. Avoid the use of concrete, aluminum and steel seats;

8.2.5.2.1.(a).5 providing seating surfaces that have rounded corners with no sharp edges; and

8.2.5.2.1.(a).6 providing seating with back rests.

8.2.5.2(1)(b) Provide for social support by:

8.2.5.2.1.(b).1 providing areas with seating to encourage conversation;

8.2.5.2.1.(b).2 providing areas of solitude;

8.2.5.2.1.(b).3 providing areas for reading, resting, meditation, contemplation and reflection; and

8.2.5.2.1.(b).4 providing areas for Patients to have scheduled visits outdoors under supervision from Staff.

8.2.5.2(1)(c) Provide for physical movement and exercise in all Secure Outdoor Spaces, with the exception of the Critical Care Roof Garden, by:

8.2.5.2.1.(c).1 including pathway loops where space permits;

8.2.5.2.1.(c).2 providing areas or spaces for horticultural therapy programs, which may include raised garden planters, storage for gardening supplies, access to water, etc.;

8.2.5.2.1.(c).3 accommodating behavioural difficulties or challenges;

8.2.5.2.1.(c).4 ensuring paved areas will be a minimum width of 1.5 m and have a slip-resistant surface that accommodates Patients with intravenous equipment, gurneys, and wheelchairs or walkers;

8.2.5.2.1.(c).5 providing synthetic turf and/or resilient safety surfacing for exercise areas. Surface specifications will meet or exceed every category of the CSA Z614 industry safety standards for the proposed activities;

8.2.5.2.1.(c).6 utilizing pavement edging to prevent those using wheelchairs from rolling into planting beds;

8.2.5.2.1.(c).7 ensuring pavement expansion joints will be no more than 3 mm in width to prevent the wheels of equipment getting caught and stuck;

8.2.5.2.1.(c).8 providing a minimum of one handrail between the entrance to any Secure Outdoor Space and a seat for Patients experiencing difficulties with strength or balance;

8.2.5.2.1.(c).9 ensuring Secure Outdoor Spaces will be fully accessible with low entry lips to facilitate wheelchair access; and

8.2.5.2.1.(c).10 designing the Secure Outdoor Space so that it provides a wheelchair accessible raised planter for one Patient to support horticultural therapy.

8.2.5.2(1)(d) Provide access to positive distractions, including by:

8.2.5.2.1.(d).1 incorporating visibility and visual interest both into and out of the Secure Outdoor Spaces;

8.2.5.2.1.(d).2 providing adequate signage within the Facility to alert occupants of the Secure Outdoor Spaces;

8.2.5.2.1.(d).3 providing visual relief and interest in vertical and horizontal dimensions, such as plant material with seasonal interest, elements with bright colours, and views to the greater surrounding landscape;

8.2.5.2.1.(d).4 providing a home-like environment at the scale of the Patient; and

8.2.5.2.1.(d).5 providing landscape accent lighting to provide nighttime interest and enhanced views from interior spaces.

8.2.5.2(1)(e) Design to minimize intrusive stimuli, as follows:

8.2.5.2.1.(e).1 Enclose the space with security screens and provide shelter from the wind;

8.2.5.2.1.(e).2 Provide separation or screening from adjacent Patient rooms;

8.2.5.2.1.(e).3 Within each designated Secure Outdoor Space, provide gathering or seating areas that are sheltered from the sun and rain as well as areas that are exposed to them from above;

8.2.5.2.1.(e).4 Provide surfaces that reduce glare, such as tinted concrete; and

8.2.5.2.1.(e).5 Do not use bright lights.

8.2.6 Green Roofs

8.2.6.1 Basic Requirements

8.2.6.1(1) Roof areas not designed for human occupancy will be designed as extensive green roofs where required to provide energy performance benefits, fauna habitat and aesthetically pleasing vistas as viewed from surrounding indoor spaces.

8.2.6.1(2) Extensive green roofs, where required on unoccupied green roofs except areas identified as Secure Outdoor Space, will utilize a proprietary pre-grown tray system such as LiveRoof Maxx 8 system or an acceptable alternative as reviewed by the Owner.

8.2.6.1(3) Intensive green roofs, which will comprise all occupied areas identified as Secure Outdoor Space, will be a build-up system such as the Roof Garden system by ZinCo, or an acceptable alternative as reviewed by the Owner, and will accommodate a variety of plant types from lawns and perennials to shrubs and small trees.

8.2.6.2 Performance Criteria

8.2.6.2(1) Green roof assemblies will, as a minimum, consist of a root repellent membrane, a drainage system, a filtering layer, minimum 200 mm growing medium and plants, and will be installed on a waterproof membrane. Erosion control soil bags are not an acceptable green roof system design.

8.2.6.2(2) Landscape plans will demonstrate details for construction, access requirements for maintenance, water availability, irrigation methods, and the extent of maintenance required. If used, all extensive green roof areas will have low maintenance requirements and be appropriate for the micro-climate of each roof area.

8.2.6.2(3) Confirm and provide maintenance access to all green roof areas.

8.2.6.2(4) Parapet height and/or Overflow Scupper Locations

8.2.6.2(4)(a) Parapets heights and overflow scuppers will be specified in the Design, as required, to limit retained rain water loads to within structural limits in the event of obstructed internal drains.

8.2.6.2(5) Waterproofing Protection

8.2.6.2(5)(a) The Design and Construction will include installation of a root barrier in all vegetated roofing systems.

8.2.6.2(6) Drainage

8.2.6.2(6)(a) The design hydraulic load will be evaluated assuming that the green roof system is fully saturated prior to the maximum fifteen-minute rainfall.

8.2.6.2(6)(b) Positive slope to drain will be provided at the level of the waterproofing membrane.

8.2.6.2(6)(c) The system will permit effective drainage beneath the growth media.

8.2.6.2(6)(d) Vegetation-free zones will be provided around all drains.

8.2.6.2(7) Water Retention

8.2.6.2(7)(a) Water retention mats or equivalent materials will be employed as required to promote vegetation growth.

8.2.6.2(7)(b) The drainage layer will be appropriate for storm water retention and will be selected to comply with ASTM E2398-05 Standard Test Method for Water Capture and Media Retention of Geo-Composite Drain Layers for Green Roof Systems.

8.2.6.2(8) Plant Selection

8.2.6.2(8)(a) Plantings will be low maintenance, such as sedum species, and adaptive to the specific micro-climate of each roof area.

8.2.6.2(8)(b) Vegetation on a green roof will not include noxious weeds as defined in the latest revision of the British Columbia Noxious Weed Control Act.

8.2.6.2(8)(c) The plant selection and design on extensive green roofs will be such that plants will cover 100% of the vegetated roof area at the time of installation.

8.2.6.2(9) Irrigation

8.2.6.2(9)(a) Adequate measures will be provided to permit the irrigation necessary to initiate and sustain the vegetation during the service life of the green roof.

8.2.6.2(9)(b) Green roofs will have a high-efficiency irrigation system that includes the following features: pressure regulating sprinklers, check valve in sprinklers at low areas, matched precipitation rate nozzles, separate zones based on micro climate, and wind resistant spray nozzles.

8.2.6.2(9)(c) Proprietary drip or capillary irrigation is acceptable where manufacturer-designed build-up green roof systems are employed.

8.2.6.2(10) Fire Safety

8.2.6.2(10)(a) Where roof penetrations, intersecting walls, parapets, upturns or mechanical equipment are clad with combustible materials, the Design will include a vegetation-free border zone abutting such feature and the vegetation-free border will be equal to the vegetation height at maturity but in no case less than 0.5 m.

8.2.6.2(11) Wind Protection

8.2.6.2(11)(a) All green roof landscape materials and site furnishings need to be designed and secured to prevent any disturbance or movement due to the impacts of wind, including the impacts of flights to potential roof-top helipad.

8.2.7 Irrigation

8.2.7.1 All soft landscape areas will be irrigated by a permanent, automatic and high efficiency irrigation system meeting the following requirements:

8.2.7.1(1) The irrigation system will comply with the Irrigation Industry Association of B.C's Standards for Landscape Irrigation Systems;

8.2.7.1(2) The irrigation design will be supervised and approved by a BCSLA registered landscape architect;

8.2.7.1(3) The irrigation system design will be prepared by a Certified Irrigation Designer and Certified Landscape Irrigation Auditor (CLIA); and

8.2.7.1(4) The irrigation system will be installed by an IIABC Certified Irrigation Contractor – Commercial (CIC).

8.2.7.2 Incorporate efficient, low water-use irrigation design where practical and appropriate, utilizing harvested water if possible.

8.2.7.3 Raised planters and pots, which will be located only in the Secure Outdoor Spaces, will have a drip system, as follows:

8.2.7.3(1) Drip line will have pressure compensating emitters; and

8.2.7.3(2) Each drip zone will have an inline filter, inline pressure-regulating valve and air-relief valve.

8.2.7.4 Grass areas will have a high-efficiency spray irrigation system that includes the following features: pressure-regulating sprinklers, check valve in sprinklers at low

areas, matched precipitation rate nozzles, separate zones based on microclimate, wind resistant nozzles.

8.2.7.5 All valves, controllers or other irrigation equipment located in Secure Outdoor Spaces will be housed in a lockable enclosure.

8.2.7.6 The controller for the irrigation systems will be an electronic, programmable, multi-zone controller with a rain sensor or weather station meeting the EPA's WaterSense Criteria.

8.2.8 Maintenance

8.2.8.1 Delineate the extents of the different levels of landscape maintenance requirements for establishment and continued sustainability of this Project.

8.2.8.2 Provide a landscape design with low maintenance requirements where practical and appropriate. Landscape maintenance requirements will vary for the high-use courtyards and roof gardens of the Facility and the perimeter streetscapes.

8.2.8.3 Prepare a maintenance plan and one-year schedule outlining the levels of maintenance required to establish the proposed landscapes. Refer to Section 2.5 for Submittal requirements.

8.2.8.4 Maintenance period performed by Project Co will be one year after acceptance of construction completion certificate.

8.2.8.5 Warranty period for all landscape material will be one year after Service Commencement.

8.2.9 Sustainability

8.2.9.1 Concept plan submission will include an outline of the sustainability elements in the exterior spaces.

8.2.9.2 Project Co will provide documentation at the concept design stage demonstrating alignment of the urban design and landscape design of the Project with sustainable design and LEED requirements.

8.2.9.3 Provide sustainable street tree planting using current best management practices. Provide continuous tree trench planting details where possible in street boulevards and in hard surface courtyard conditions.

8.2.9.4 Maximize the amount of landscape areas on the Site and minimize the amount of impervious surfaces to increase the natural absorption rate of storm water. Coordinate with storm water management criteria.

8.2.9.5 A combination of pervious paving, green roof, absorbent landscaping and infiltration reservoirs are potential best management practices to meet the requirements of the Rainwater Management Plan. Coordinate the design of the landscape elements with these requirements.

8.2.9.6 Site lighting will conform to LEED® light spillage requirements, complete with sharp cut-off (will be dark sky compliant) to meet LEED certification.

8.2.9.6(1) Refer to the Citywide IRMP, the Rezoning Policy for Sustainable Large Developments, and the City's Engineering Design Manual for detailed rainwater management requirements.