Owner's Project Requirements

Compiled Version 1

May 2, 2024

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ARCHITECTURAL SECTION

1. INTRODUCTION

This ***Owner's Project Requirements (OPR) for Vancouver Coastal Health Facilities*** (the "OPR") sets out Vancouver Coastal Health's comprehensive requirements for architects, engineers, contractors, Facility administrators, or operators involved in designing, building or renovating Vancouver Coastal Health Acute and Long-Term Care Facilities (collectively, the Facilities"). OPR is VCH's design requirements, and Architects, Engineers, Constructors, and any entity engaged in design or construction of VCH Care Facilities must comply with it. The OPR aligns with provincial policy and legislation, including Capital Health Services Manual chapters 11, 12 and 14 (February 22, 2021).

The OPR provides minimum baseline requirements and guidelines for the planning, design, and construction of Facilities. The OPR Requirements are based on components and systems which have proven to be reliable and efficient, to meet Vancouver Coastal Health requirements for the Facilities, including user experience and to offer acceptable life cycle costs.

The OPR was developed to complement existing standards and codes by providing a set of conceptual requirements for the Facilities and referencing specific standards and codes as appropriate.

1.1 Definition and Interpretation

.1 In the OPR the following definitions are incorporated:

a) "Airborne Isolation Room" means a room designed, constructed and ventilated to limit the spread of airborne microorganisms from an infected occupant, having negative pressure ventilation to the surrounding areas 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;
b) "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;
c) "BC Building Code" or "BCBC" means the most recent version of the British Columbia Building Code;
d) "CSA" means Canadian Standards Association or CSA Group, a standards development organization accredited by the Standards Council of Canada, which 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;
e) "FMO" means Facilities Maintenance and Operations or Plant Services staff at the Facility; and
f) "Persons with Disabilities" has the meaning set out in the BCBC.

1.2 Acronym List

.1 The OPR incorporates the following acronyms:

a) AHU – Air Handling Unit
b) AIR – Airborne Isolation Room
c) ANSI – American National Standards Institute
d) ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers
e) ASME – American Society of Mechanical Engineers
f) ASPE – American Society of Plumbing Engineers
g) ASTM – American Society for Testing and Materials
h) BCBC – BC Building Code
i) BCICA – British Columbia Insulation Contractors Association
j) BMS – Building Management System
k) CSA – Canadian Standards Association
l) DALI – Digital Addressable Lighting Interface
m) FHA – Fraser Health Authority
n) FMO – Facilities Maintenance and Operations
o) HEPA – High Efficiency Particulate Air
p) HVAC – Heating, Ventilating and Air-Conditioning
q) NEMA – National Electrical Manufacturers Association
r) NFPA – National Fire Protection Association
s) NSF – NSF International (formerly National Sanitation Foundation)
t) RO – Reverse Osmosis
u) RHFAC - Rick Hansen Foundation Accessibility Certification
v) SMACNA – Sheet Metal and Air Conditioning National Contractors Association
w) TSBC - Technical Safety BC
x) VAV – Variable Air Volume
y) VCH – Vancouver Coastal Health Authority
z) VFD – Variable Frequency Drive

2. DESIGN PRINCIPLES

2.1 Guiding Principles

.1 Facilities will be planned and designed to serve their patients, families, staff, and visitors in accordance with the following core principles:

a) Operations — creating an operating environment that promotes the efficient and effective delivery of health care services to help ensure positive patient outcomes. Safety and security — creating a care environment that is safe and secure for all occupants (patients and their families, staff, and visitors);

b) Infection prevention and control — creating an environment that prevents health care acquired infections and the control of infectious diseases for the Facilities' patients and their families, staff, and visitors;

c) Sustainability — creating environmental sustainability and low carbon resilience throughout the construction process, finished Facilities, and sustainable operations of the Facilities;

d) Climate resilient – anticipating disruptions to the Facilities from unpredictable, frequent, and severe climate events; and

e) Technology - smart technology will be included as appropriate, to enable automation and predict outcomes by gathering and analyzing time/actionable data driven intelligence to inform decision-making.

2.2 Design and Construction Philosophy

.1 Evidence-Based Design – Facilities will be designed based on credible research, information derived from comparable North American projects, and information about its proposed operations.

.2 Maintenance – Facilities will be designed to provide clear access to all equipment maintenance requirements and routines and minimize the need for Vancouver Coastal Health to undertake work that causes disruption to the Facilities' patients, staff and visitors or to its operations.

.3 Quality Assurance - All systems will conform to Vancouver Coastal Health's non-proprietary requirements, and all components will have a demonstrated record of reliable performance, for a minimum of five years, in applications like those of the Facility.

.4 Infection Prevention and Control - Facilities will be designed and constructed to minimize the potential for acquisition and transmission of infections in the health care setting, conforming to an infection control risk assessment (ICRA). An ICRA will be conducted as part of the planning process for any new construction, addition, or renovation.

.5 Sustainability – Facilities will take advantage of alternative sources of energy and opportunities for waste heat recovery.

.6 Climate Resilient – Facilities will implement climate science and best practices in peer jurisdictions including North America, Europe, and Australia for reducing risks related to climate-related events.

Facilities will consider all applicable regulations and policies such as CleanBC Roadmap to 2030 and Climate Change Accountability Act. Review all Ministry of Health policies such as the Health Capital Policy Manual Chapters 11 and 12, "Environmental Sustainability and LEED Gold Certification" and "Carbon Neutral and Climate Resilient Health Care Facilities" with the Owner.

.7 Emerging Technologies – Facilities will be dispensed at the forefront of technology, innovation and sustainability. Proposals for new technologies that address energy efficiency and environmental performance will be provided. All technologies proposed for implementation will have an established track record. Final approval is required from the Vancouver Coastal Health Facilities Management.

.8 Inclusivity - Facilities will feature an inclusive design that is welcoming, accessible and intuitive for a multicultural population of patients, families and staff; The design of the Facility will include partnership with local Indigenous peoples and the Nations on whose territories the Facility is located to create culturally appropriate physical environments that visibly include Indigenous artwork, signage and territorial acknowledgement throughout the Facility.

.9 Health and Wellness – Facilities will be designed to promote the health and wellness of patients, visitors and staff 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. The design will incorporate positive enhancements into the built environment, such as art and opportunities to participate in traditional Indigenous healing practices and will expressly facilitate the physical activities of staff and patients to increase their safety, efficiency and general well-being.

.10 Artwork – The design of all Facilities will integrate architecture, interior design and artwork to support wayfinding throughout the Facility.

2.3 Site Design

.1 Locate entrances and access points to minimize slopes and promote accessibility.

.2 The site design should respond to new and existing public transit routes and promote access for those using public transportation systems.

.3 Support community access through highly visible entry points into the Facility complete with canopies or porte cochere for protection from the elements.

.4 Minimize the impact the Facility has on adjacent neighbors 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 community context.

.5 Consider the micro-climatic effects arising from the location and configuration of parking, walkways and buildings on the site, including effects of Facility entrance orientation on patient, staff and visitor comfort and safety.

.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.

.7 Create high-quality, vibrant, pedestrian-friendly environments by providing pedestrian sidewalks and bicycle pathways that connect to existing sidewalks, pathways and transit, wherever possible. The Facility signage should help connect the exterior and interior pathways.

.8 Design for the functional separation of uninterrupted routes for emergency vehicles, visitors, staff and service vehicles, and to minimize public and service vehicle traffic interference with ambulance vehicle access to the site.

.9 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.

.10 Use signage to clearly distinguish between pedestrian and cycle-specific routes and lanes.

.11 Design vehicular service entrances so that they are integrated into the Facility design with minimal visual impact.

.12 Provide safe pedestrian crossings that are designated using pavement markings and signage. In areas where a high volume of pedestrian crossings is expected such as at the main entrance, provide for changes in surface material (such as from asphalt to enhanced concrete paving).

.13 Provide safe access for the mobility impaired (including people with strollers) by providing paths of travel which are wide enough to allow for two people walking side by side and someone passing (and for wheelchairs or scooters).

.14 Provide safe pedestrian refuge spaces behind all sidewalk wheelchair ramps.

.15 Circulation through surface parking areas for pedestrians should include contrasting, durable concrete sidewalk paving treatments where pathways extend through vehicle circulation areas.

.16 Consider traffic calming measures including curb bulges and raised crosswalks to minimize roadway pavement width at pedestrian crosswalks.

2.4 Accessibility

.1 The primary pedestrian systems, public open spaces, primary walkways and all public entrances to the Facility will be accessible for Persons with Disabilities.

.2 The pedestrian path of travel between vehicle layby stalls, short-term parking stalls and the Facility entrances will not contain ramps or steps, wherever possible.

.3 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 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 should generally not be considered for outdoor surfaces.

.5 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, as required.

.6 Provide walkways and ramp surfaces that are slip resistant.

.7 Ramps will have sufficient width to allow two wheelchairs to pass.

.8 Pedestrian walkways and ramps will be separated from roadways, vehicles and service areas with a minimum 100 mm high barrier in a colour suitable to distinguish it from paths and grass.

.9 Construct exterior stairways with a maximum of 10 risers per flight followed by a landing.

.10 Rest areas and seating opportunities should be provided at a reasonable spacing.

.11 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.

.12 Provide pedestrian walkways alongside underground parking vehicle ramps complete with raised curb and guardrail to protect people from vehicles.

.13 Locate parking stalls for Persons with Disabilities directly adjacent to each entrance and parking shuttle passenger elevator lobbies.

.14 Provide traffic calming measures including curb bulges and raised crosswalks to minimize roadway pavement width at pedestrian crosswalks.

.15 Engage a Rick Hansen Foundation Accessibility Certification Professional to review the Facility design and conduct a rating for potential RHFAC registry and certification.

2.5 Maintenance Access and Serviceability

.1 Provide adequate space around equipment for serviceability, balancing, commissioning, safety, removal, and to accommodate component removal such as tube bundles, filter media, or large motors.

.2 Provide a means, such as a davit arm system, to remove equipment exceeding 50 pounds in areas that may require periodic equipment replacement for maintenance, or for future equipment installations (this should consider requirements for door opening sizes such as double doors, elevator size and maximum weights, corridor dimensions, obstructions, etc.).

.3 Secure roof working areas with a minimum of 1,067 mm (3'-6") high insulated or thermally broken parapets or guardrails. Fall restraint and fall arrest systems may be used only as a last resort if the design cannot accommodate parapets or guardrails and only with Vancouver Coastal Health's written consent.

.4 Configure components that require maintenance, service, and inspection in a place that is accessible from a standing position on the floor or using a platform ladder no higher than two meters with its railings. When use of such ladder is not acceptable or practical, provide access by means of a fixed access system such as overhead maintenance walkways (or catwalks) 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 and Vancouver Coastal Health will not accept ladder access to maintenance walkways.

.5 Provide maintenance walkways for access to the following Facilities' systems and components, including but not limited to steam headers, all steam and hot water boiler safety valves, and other spaces as determined by Vancouver Coastal Health.

.6 Where unavoidable, all equipment located on the roof will be approved by Vancouver Coastal Health. Roof top items will be serviceable and located to provide a work area that is a minimum of two meters away from any unprotected roof edge, so they can be accessed without requiring fall protection equipment. Provide a davit and walkable platform around roof mounted equipment including but not limited to cooling towers and lab exhaust fans so that ladders will not be required for equipment maintenance. For cooling towers, provide three levels of walkable platform so that cooling towers can be fully accessed and serviced.

.7 Facilities are to be designed to produce an environment that facilitates patient access to receiving care and caregiver capacity to provide appropriate and effective care.

.8 Facilities are to be designed so that people of all abilities are able, without modification to their normal conduct, access services, work, and staff in accomplishing their work.

.9 Provide pressurization systems for all stairwells to avoid crossovers required by the BCBC.

.10 All loading docks to incorporate a ramp leading to the apron with a maximum slope of 2.5% and minimum 1500mm wide between bollards (to accommodate large pallets). Provide a set of double doors directly into the Facility to avoid the need to move large items around corners or the apron area.

2.6 Infection Prevention and Control

.1 All Facilities will be designed to prevent health care acquired infections and control infectious disease as per CSA Z8000 Canadian Healthcare Facilities and CSA_Z317.13. Infection Control during Construction, Renovation or Maintenance of Healthcare Facilities.

.2 Where airborne isolation rooms and AIR anterooms are provided, they will be designed 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.

.3 The Facility will be designed to mitigate and prevent, where possible, the spread of infection including via contaminated surfaces and airborne pathogens, consistent with all infection control standards.

.4 Select materials that meet CSA Z8000 requirements, using simple detailing with quality workmanship and finishes and providing ease of accessibility to withstand repeated routine cleaning with hospital-grade disinfectants, 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 Storage and handling of construction materials will meet the requirements of CSA Z317.13.

.6 All the materials used in the Facility will be endorsed by the Infection Control Practitioner.

.7 The Facility will be designed to segregate sterile, clean, and soiled items, including segregation of circulation traffic patterns of clean and soiled materials being transported within the Facility.

.8 The Facility will be designed to mitigate the spread of airborne infections during an outbreak by creating Outbreak Control Zones.

.9 The design process for all Facilities must include input from an interdisciplinary design team from the earliest stages, including infection prevention and control professional participation.

.10 Refer to Appendix A: CCDC Master Specification – Division 01 01 11 00 Summary of Work and Section 01 56 00 Temporary Barriers and Enclosures for additional requirements.

2.7 Flexibility

.1 The planning and design process for new construction, additions, and renovations of Facilities must include consideration of potential changes in the Facility's functional requirements over time.

.2 Facilities that have programs that may be expected to change must be designed with flexibility to facilitate future internal conversion to accommodate such change.

.3 Facilities 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, implementing program, service and equipment changes in the future with minimized impact to utility infrastructure and to the Facilities.

.4 To support future expansion of components the Facility will contemplate plan for future growth of clinical components by providing floor zoning that allows for expansion of programs or services and will provide a loose-fit design to optimize functionality within a given floor area.

.5 The Facility will 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 authority technology or technological progression.

2.8 Total life cycle cost

.1 Per CSA Z8000, sub-section 4.6.3 Total life cycle cost: "The expected lifespan of the HCF (Facility) will be determined at the early stages of planning and a total life cycle cost analysis will be performed during planning and design.

.2 Capital cost versus its long term operations and maintenance costs will be reviewed with Vancouver Coastal Health for decisions about the total cost of design.

.3 Life cycle cost analysis will include the costs of inaction related to embodied carbon (e.g., accelerated degradation of materials and replacement) compared with the costs of investing in climate resilience (e.g., external shading, raised foundation).

.4 Methodology of Life Cycle Costing is to follow ASTM E917-17e1 Standard Practice for Measuring Life-Cycle Costs of Buildings and Building Systems

2.9 Durability and Design Service Life

.1 The design of the facility is to follow the guidelines and advice of CSA standards S478 Guideline on Durability in Buildings, and Z782 Guideline for Design for Disassembly and Adaptability in Buildings

.2 The required service life of the facility is to be reviewed with Vancouver Coastal Health. Tentatively the service life of the Facility is to be 50 years, with the main structure and foundation waterproofing having a service life of 100 years allowing for future refurbishment to extend the service life of the facility. All other components are to be replaceable having reasonable appropriate service life.

2.10 Commissioning

.1 All Facilities will be commissioned in accordance with CSA standards: Z320 Building commissioning, CSA Z8001 Commissioning of Health Care Facilities and Appendix A: CCDC Master Specification – Division 01 Section 01 91 13.

.2 All Facilities installation commissioning activities will be completed and coordinated with operational commissioning prior to turnover to Vancouver Coastal Health.

.3 Facilities functional performance testing will include testing the integration of all associated equipment and systems concurrently. Integration testing will be carried out under actual conditions, not simulated conditions, and under all modes of operation. Refer to the Appendix A: CCDC Master Specification – Division 01 Section 01 91 26 Integrated System Testing for additional requirements.

2.11 Warranty

.1 Upon completion of the work, the Contractor will issue a written warranty to Vancouver Coastal Health for all work. The duration of the warranty for materials and workmanship from the date of Substantial Completion will vary based on the form of contract and be determined in consultation with the Owner.

.2 The general warranty is in no way to supplant extended warranties. The Contractor is to review with manufacturers, installers and applicators all extended warranties offered and extended warranties asked for by VCH. The contractor is to compile a summary list of extended warranties with options and extra costs where applicable for review with VCH for selection. The Contractor is to secure selected warranties from warrantors, and provide written warranties issued to the benefit of VCH upon Substantial Completion. The obligations under extended warranties are solely the responsibility of the warrantors.

.3 For additional warranty requirements refer to Appendix A: CCDC Master Specification – Division 01

2.12 Post-Disaster Requirements

.1 In undertaking the Design of acute care hospitals (Class A facilities), specify Function Protection, the highest level of post-disaster preparedness where practical and by the definition set out by the Health Authority's disaster planning requirements. The goal of Function Protection is to protect life and investment, and to ensure that the facility continues to operate post-disaster.

.2 Design the facility's structure, structural components, non-structural components, anchorages, and equipment to satisfy the post disaster requirements as outlined in the Building Codes and applicable standards.

.3 Design essential services to post disaster standards. Locate these services in utilities enclosures that meet post disaster standards.

.4 Design the facility and services so that essential clinical requirements are met for a minimum period of 72 hour following a disaster or as prescribed by the Heath Authority's requirements.

.5 Design the Facility so that it includes space that is capable of being used as an Emergency Operations Centre ("EOC") during an emergency, where applicable

2.13 Elevators

.1 Follow VCH Elevator Technical Guidelines and Requirements - Refer to Appendix L.

END OF ARCHITECTURAL SECTION

MECHANICAL SECTION

3. INTRODUCTION

This Owner's Project Requirements (OPR) for Vancouver Coastal Health Facilities (the "OPR") sets out Vancouver Coastal Health's comprehensive requirements for architects, engineers, contractors, sub-contractors, Facility administrators, or operators involved in designing, building or renovating VCH Facilities. OPR is VCHA's design requirements, and Architects, Engineers, Constructors, and any entity engaged in design or construction of VCHA Care Facilities must comply with it. The OPR aligns with provincial policy and legislation, including Capital Health Services Manual chapters 11, 12 and 14 (February 22, 2021).

The OPR provides minimum baseline requirements and guidelines for the planning, design, and construction of Facilities.

The OPR was developed to complement existing standards and codes by providing a set of conceptual requirements for the Facilities and referencing specific standards and codes as appropriate.

Related Vancouver Coastal Health guidelines and documents include:

The OPR is a "living document" and may be updated to address ongoing changes in facilities' design and technology.

4. DESIGN PRINCIPLES

4.1 Guiding Principles

.1 Facilities shall be planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements and to serve their patients, families, staff, and visitors in accordance with the following core principles:

a) Operations — creating an operating environment that promotes the efficient and effective delivery of health care services to help ensure positive patient outcomes;
b) Safety and security — creating a care environment that is safe and secure for all occupants (patients and their families, staff, and visitors);
c) Infection prevention and control — creating a environment that prevents health care acquired infections and the control of infectious diseases for the Facilities' patients and their families, staff, and visitors;
d) Sustainability — creating environmental sustainability and low carbon resilience throughout the construction process, finished Facilities, and sustainable operations of the Facilities. Use of "Clean Energy Management Software Platform" to enable the low-carbon planning, implementation, monitoring and reporting to meet VCH's environmental sustainability goals related to the reduction of Energy and Carbon footprint (see https://bcgreencare.ca/energy-carbon/ for details).
e) Follow the Low Carbon, Resilience, and Environmental Sustainability Guidelines for Health Care New Construction (LCRES Guidelines) for new construction and major renovations of acute, long-term care and other healthcare facilities.
f) Climate resilient – anticipating disruptions to the Facilities from unpredictable, frequent, and severe climate events.

4.2 Access

.1 Provide adequate space around equipment for serviceability, balancing, commissioning, safety, removal, and to accommodate component removal such as tube bundles, filter media, or large motors.

.2 Provide clear access to all equipment maintenance requirements and routines and minimize the need for the Owner to undertake work that causes disruption to occupants and the Owner's operations.

.3 Equipment to be placed out of patient care areas when possible such as HVAC filter access serving clinical spaces, exam, and procedure rooms to avoid additional labour cost to the facility in doing quarterly maintenance and filter replacement.

.4 Provide a means, such as a davit arm system, to remove equipment exceeding 50 pounds in areas that may require periodic equipment replacement for maintenance, or for future equipment installations (this should take into account requirements for door opening sizes such as double doors, elevator size and maximum weights, corridor dimensions, obstructions, etc.).

.5 Secure roof working areas with a minimum of 1,067 mm (3'-6") high insulated or thermally broken parapets or guardrails. Fall restraint and fall arrest systems may be used only as a last resort if the design cannot accommodate parapets or guardrails and only with Vancouver Coastal Health's written consent.

.6 Configure components that require maintenance, service, and inspection in a place that is accessible from a standing position on the floor or using a platform ladder no higher than two meters with its railings. When use of such ladder is not acceptable or practical, provide access by means of a fixed access system such as overhead maintenance walkways (or catwalks) 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 and Vancouver Coastal Health will not accept ladder access to maintenance walkways.

.7 Provide maintenance walkways for access to the following Facilities' systems and components, including but not limited to steam headers, all steam and hot water boiler safety valves, and other spaces as determined by Vancouver Coastal Health.

.8 Where unavoidable, all equipment located on the roof will be approved by Vancouver Coastal Health. Roof top items shall be serviceable and located to provide a work area that is a minimum of two meters away from any unprotected roof edge, so they can be accessed without requiring fall protection equipment. Provide a davit and walkable platform around roof mounted equipment including but not limited to cooling towers and lab exhaust fans so that ladders will not be required for equipment maintenance. For cooling towers, provide three levels of walkable platform so that cooling towers can be fully accessed and serviced.

.9 Facilities are to be designed to produce an environment that facilitates patient access to receiving care and caregiver capacity to provide appropriate and effective care.

.10 Facilities are to be designed so that people of all abilities are able, without modification to their normal conduct, access services, work, , and staff in accomplishing their work.

.11 Provide pressurization systems for all stairwells to avoid crossovers required by the BCBC.

.12 All loading docks to incorporate a ramp leading to the apron with a maximum slope of 2.5% and minimum 1500mm wide between bollards (to accommodate large pallets). Provide a set of double doors directly into the Facility to avoid the need to move large items around corners or the apron area.

.13 Mechanical and plumbing equipment (and piping) shall be designed such that it is not located within a confined space. Where this is absolutely necessary, the design of the confined space is to be coordinated with Worksafe requirements and also the Project Manager and the VCH FMO team during early design phase.

.14 Backflow preventors must be installed in an easily accessible location with minimum Plumbing Code clearances for testing equipment.

4.3 Infection Prevention and Control

.1 All Facilities shall be designed to prevent health care acquired infections and control infectious disease as per CSA Z317.13.

.2 The design process for Facilities must include the participation of representatives of Vancouver Coastal Health stakeholders having an interest in infection prevention and control issues and practices.

4.4 Flexibility

.1 The planning and design process for new construction, additions, and renovations of Facilities must include consideration of potential changes in the Facility's functional requirements over time.

.2 Facilities that have programs that may be expected to change must be designed with flexibility to facilitate future internal conversion to accommodate such change.

.3 Flexibility is to include for future climate needs as outlined in LCRES Guidelines. Typical strategy is at a minimum to allow additional capacity in duct and pipe distribution systems.

4.5 Commissioning

.1 All Facilities shall be commissioned in accordance with CSA Z8001, CSA Z320.

.2 All Facilities commissioning activities shall be completed prior to turnover to Vancouver Coastal Health.

.3 Facilities functional performance testing shall include testing the integration of all associated equipment and systems concurrently. Integration testing shall be carried out under actual conditions, not simulated conditions, and under all modes of operation.

.4 An Owner's Representative or an independent Commissioning Authority (CxA) retained by the Owner (VCH) oversees the commissioning process.

.5 Commissioning Plan to be submitted by CxA for further review by the Owner's (VCH) Representative.

.6 Incorporate Commissioning Specifications and Commissioning Plan in the IFT & IFC documents.

.7 All Open Items listed in the deficiencies or Commissioning issues log must be rectified or closed prior to scheduled "Mechanical System Demonstration and Training to Owner (VCH)".

.8 Deferred performance verification and testing of equipment or systems must be carried out within a year to meet the required seasonal weather conditions.

.9 The CxA completes substantial performance follow-up and verification of systems operation during a minimum of two separate site visits, scheduled for approximately 5 and 10 months after the date of substantial completion.

.10 The CxA submits reports following the Commissioning Plan as the Commissioning process progresses to ensure timely resolution of any issues.

4.6 Warranty

.1 All work on Facilities must include a written warranty to Vancouver Coastal Health stating that all work provided to Vancouver Coastal Health will be free from defective workmanship and materials for a period of two (2) years from the date of substantial completion of the work, as determined by Vancouver Coastal Health.

.2 Construction deficiencies discovered after substantial completion will remain the contractor's responsibility to correct and will not be treated as a warranty item.

.3 Purchase warranty before equipment ship date.

.4 Include the option to have a "Delayed Equipment Start-up Warranty".

4.7 Operation & Maintenance Manuals

.1 Operation and Maintenance Manuals shall be provided to meet the minimum required information such as:

a) List of Mechanical Drawings
b) Description of Systems
c) Controls As-Built Drawings
d) Maintenance and Lubrication Schedule List of Equipment Suppliers and Subcontractors
e) Valve tag schedule
f) Pipe colour schedule
g) Equipment filter schedule
h) Balancing report
i) Commissioning report
j) Equipment startup reports
k) Manufacturer's equipment data / shop drawings

5. GENERAL REQUIREMENTS

5.1 Intent

.1 All mechanical systems shall be selected and designed taking into consideration their functionality, reliability, efficiency, flexibility, safety, maintainability, ability to be cleaned, potential for vandalism, and expandability/reserve capacity for future modifications where required. Provide tie-in valves and connection points for future expansion.

.2 All mechanical systems shall be selected and designed taking into consideration VCH's commitment targets related to energy and carbon footprint reduction (see section 3.2 References).

5.2 References

.1 The Design Consultant shall undertake the design in accordance with the governing Codes and Standards (latest edition unless noted otherwise) and all applicable bylaws, policies and guidelines. Where conflicts or omissions exist between various Codes and Standards, the design report shall

indicate which measure was taken including the reasoning to support that decision. The design consultant shall undertake the design in accordance with VCH's Energy and Carbon reduction targets (see https://bcgreencare.ca/energy-carbon/ for details) and LCRES Guidelines (see https://bcgreencare.ca/resource/guidelines/).

5.3 Design

.1 Mechanical systems and equipment shall be designed to reduce the risk of injury to operators of the equipment and systems, and with the following features:

a) Safe and unrestricted access is required for all boilers, pressure vessels, ancillaries & piping.

b) Ability to maintain and repair systems and equipment with no impact to patient care (e.g. provide valve isolation box outside patient room(s))

c) HVAC performance for specific areas in accordance with CAN/CSA-Z317.2;

d) Infection prevention and control in accordance with CSA Z8000.18

e) Measures to prevent the propagation of legionella in plumbing systems, in accordance with CSA Z317.1

f) Specific water quality measures as per the manufacturer's instructions for use for dedicated equipment, e.g., medical device reprocessing equipment (see CAN/CSA-Z314) and water for dialysis (see CAN/CSA-ISO 26722), and

g) Fountains inside AND outside of the building are to be avoided and are not allowed due to legionella risk.

.2 Energy Management and Sustainability in compliance with CSA Z317.2:19.

.3 Monitoring as per CSA Z317.2:19 - The design and installation of HVAC systems shall include measurement, monitoring, and alarm provisions for air handling system parameters during normal and emergency conditions.

.4 Metering of mechanical systems (water systems supply, HVAC systems and equipment etc), shall be provided as outlined in the Metering Matrix – Refer to Metering Matrix in Appendix K.

.5 Direct Digital Controls as per CSA Z317.2:19.

.6 N+1 redundancy of mechanical equipment is required for the following or as approved by the Facility Management:

a) Cooling plant: chillers, cooling towers, pumps

b) Heating plant: boilers, heat recovery chillers, pumps, heat exchangers

c) Steam plant

d) Air handling for Type I areas (i.e. 100% airflow). 70% airflow for Type II and III areas.

e) Exhaust air system for critical areas: fans, HEPA

f) Each separate fan and the associated auxiliaries must have separate electrical disconnecting means to allow each fan to be serviced while the system stays operational.

.7 General requirements for pressure piping are as follows:

a) Piping design and installation code:

i. ASME B31.9 (Building Services Piping)
ii. ASME B31.1 (Power Piping)
iii. ASME B31.3 (Process Piping)

b) All aspects of the ASME pressure piping shall be designed and registered with Technical Safety BC (TSBC).

.8 No water-based system including heating, cooling, fire suppression and plumbing system will be installed in an unheated space. Where such an installation cannot be avoided, Vancouver Coastal Health approval is required and measures will be used for freeze protection. Measures include heat tracing with BMS monitoring and using glycol heating or cooling medium as applicable. Heat tracing shall be on delayed vital power, or on vital power in locations without delayed vital sources nearby.

.9 In Any Case where the non-potable water connections are made to mechanical systems through Potable Water Supply, the system will provide TWO parallel Backflow Preventers for purposes of online maintenance.

.10 Provide automatic change-over of systems containing redundant components where feasible to extend lifespan of equipment.

.11 Facilities shall be designed to provide heating and cooling capacities based on the outdoor ambient temperatures in the Vancouver Building By-Law or BC Building Code plus climate projections for years 2050 and 2080. All mechanical systems should be designed to 2050 climate projections and sized for optimal flexibility to 2080 climate projections. For the purposes of designing for the peak cooling and heating conditions, as well as allowance for future provision, the adjusted global warming Change Factor is to follow Table C-2 of Design Value Explorer and an RCP8.5 value as developed by the Pacific Climate Impact Consortium (PCIC – https://services.pacificclimate.org/design-value-explorer). For example, the factors follow this methodology for the City of Vancouver for 2050 and 2080 design temperatures.

a) 2050 Cooling – minimum of 35 C DB and 25 C WB
b) 2050 Heating – January, 1% value
c) 2080 Cooling – minimum of 38 C DB and 28 C WB
d) 2080 Heating – January, 1% value
e) Note that Energy Models should use 2050 values developed by PCIC as well (also using RCP8.5 figures).
f) Design and modelling values developed by PCIC shall be used unless approved otherwise by VCH.

.12 Consider low energy (and low carbon) alternate options for humidification such as adiabatic, ultrasonic, evaporative, or high pressure fog type humidification. Alternate technologies are to be reviewed with the Project Manager and VCH FMO group.

5.4 Commissioning

.1 Commissioning for mechanical systems shall be in compliance with the CSA Z317.2, CSA Z8001, and as required by the LEED strategy

.2 Incorporate commissioning requirements in the mechanical specifications for the mechanical contractor's scope of work.

.3 Mechanical Commissioning Plan as per CSA Z80001 to be prepared and submitted by Mechanical Commissioning Agent for further review.

.4 Mechanical Commissioning Agent to utilize the "VCH HVAC System Standard Commissioning & Balancing Documentation for New Construction & Renovation. See Appendix B for details.

.5 Controls Contractor to follow the "VCH HVAC Standards for Building Automation System". See Appendix C for details.

5.5 Renovations and Additions

.1 Maintain the Authority's 24/7 operations throughout the Construction and operational transition phase for the Facility.

.2 All mechanical modification and demolition shall include removal of dead legs that could create an environment for water stagnation and micro-organism growth (capping is not acceptable – for example, a new elbow should be installed rather than continuing to use an existing tee fitting with a short and capped dead leg).

.3 All electrical modification and demolition shall include removal of cables that could create an electrical hazard or challenges in circuit tracing.

.4 All new and existing air and water systems that are modified or extended as part of a renovation shall be rebalanced. When expanding to or modernizing the facilities' hydronic piping distribution, add pressure independent balancing and modulating control valve, or differential pressure control valve (DPCV) across the supply and return of existing hydronic piping. DPCVs shall be installed on the return pipe and partnered with a circuit balancing valve on supply to provide high pressure signal.

.5 The capacity and overall capability of the existing mechanical systems and equipment to service the planned functions shall be assessed and documented during schematic design.

.6 All new and existing air ductwork shall be cleaned prior to occupancy for both new and renovation projects.

.7 Ensure that precautionary and preventative measures take place before and during construction, renovation, and maintenance of Healthcare Facilities in accordance with CSA Z317.13, Infection Control during Construction or Renovation of Health Care Facilities.

.8 Existing Systems and Equipment in compliance with CSA Z317.2:19. Facilities that have equipment that is obsolete, beyond repair, or energy inefficient should arrange for an audit of it's HVAC system, including a benefit-analysis report, to determine the necessary upgrades.

.9 Ensure additions to existing HVAC systems maintain design efficiencies of existing system. Consider opportunity to upgrade to meet sustainability targets.

.10 Ensure that all existing fire alarm / life safety HVAC systems are considered when modifying any interior or exterior walls / doors etc.

5.6 Emergency Power

.1 Review with the Project Manager and FMO Manager or Director during design the mechanical equipment connected to the essential electrical system (vital, delayed vital, and conditional loads).

.2 Connect mechanical equipment to the essential electrical system in accordance with CAN/CSA Z317.2and CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities designating the vital, delayed vital, and conditional loads.

5.7 Identification

.1 Labeling should follow CSA Standards where applicable such as CSA Z305.1 "Non-flammable Medical Gas Piping" and CSA Z317.2-19 "Special Requirements for HVAC systems in Health Care Facilities" Section 6.1.9 .

.2 Where CSA Standards are not applicable, labeling and identification should also follow the VCH BIM Specification, Valve Tags Requirements, and FMO Asset Data Collection - see Appendix D, E, & F.

5.8 Insulation

.1 Insulation should follow CSA Standards where applicable such as CSA Z317.2-19 "Special Requirements for HVAC systems in Health Care Facilities" Sections 6.9.5, and CSA Z317.1-21 Section 6.3.2.2, 6.3.3.19, 6.4.3.2.

.2 Insulation of mechanical equipment, piping, and ducting must also meet applicable energy code requirements such as ASHRAE 90.1, as related to the current BC Building Code or Vancouver Building By-law.

6. MECHANICAL DESIGN CRITERIA

6.1 HVAC Design Criteria

.1 Design mechanical systems to meet the criteria set out in CAN/CSA-Z317.2 (i.e. temperature range, relative humidity, minimum total air changes per hour, minimum outdoor air changes per hour, relative pressurization, filtration requirements, noise level, etc.).

.2 For spaces not addressed by CSA Z317.2, design ventilation systems in compliance with ASHRAE 170.

.3 Design requirements for spaces containing Environmental Tobacco Smoke (ETS) Areas where smoking is permitted is to be designed to meet ASHRAE 62.1-2022, ASHRAE 170, CSA Z317.2-19 or other industry standards.

.4 For sizing air handling equipment, heating and cooling plants for catastrophic event management mode, CSA Z317.2 Section 6.16 applies. Use Figure 2 "Airflow and design parameters for catastrophic event management" for the applicable Class of Health Care Facility with the following exceptions for Class B and greater:

a) Type I areas to maintain 100% of the design airflow and to maintain Table 1 design parameters;

b) Type II and Type III areas to maintain 70% design airflow; and

c) Catastrophic event management mode applies to the entire Facility. That is, if a portion of the Facility needs to initiate internal catastrophic event ventilation mode, the entire Facility will operate under internal catastrophic event mode.

.5 At a minimum, provide isolation valves at the following locations:

a) at each set of piping branches from the main distribution line or riser;

b) at the top and bottom of all risers;

c) at all locations where the branches serve groups of rooms with similar uses;

d) on branches serving individual equipment and terminal devices; and

e) other locations as required for maintenance or emergency shut-off.

6.2 Specific Requirements for Long Term Care Facilities

.1 The system shall incorporate individually zoned heating, cooling and temperature controls for resident bedrooms.

.2 Design mechanical systems in Long Term Care facilities to meet the following criteria:

Mechanical System Design Parameters for Long Term Care Facilities								
Space	Temperature Range °C (Note 1)	Relative Humidity Range (%) (Note 2)	Minimum Total ACH (Note 3)	Minimum Outdoor ACH	Relative Pressurization (Note 4)	All Air Exhausted Directly to Outdoors	Noise Level RC (N) (Note 5)	Remarks

Activity Rooms	22-24	30-60	6	2	Neutral (E)	-	35-40	
Administrative/ Offices	22-24	30-60	6	2	Neutral (E)	-	30-35	
Barber/ Beauty Parlour	22-24	30-60	12	3	Negative (-)	Yes	35-45	
Assisted Bath	24-27	30-60	9	3	Negative (-)	Yes	40-45	
Clean Linen Storage	22-24	30-60	4	1	Positive (+)	-	40-45	
Clean Utility	22-24	30-60	6	2	Positive (+)	-	35-40	
Conference Rooms	22-24	30-60	10	-	Neutral (E)	-	30-35	
Dining	22-24	30-60	6	2	Negative (-)	-	35-40	
Dishwashing	22-24	30-60	10	2	Negative (-)	Yes	40-45	
Examination & Treatment	22-24	30-60	6	2	Neutral (E)	-	35-40	
Housekeeping Closets	22-*	30-60	10	-	Negative (-)	Yes	-	*See Note 1b
Kitchen	22-24	30-60	10	2	Negative (-)	Yes	40-45	
Laundry	22-24	30-60	12	3	Negative (-)	-	40-45	
Lounges	22-24	30-60	6	2	Neutral (E)	-	30-35	
Nursing Stations	22-24	30-60	6	2	Neutral (E)	-	30-35	
Physical Therapy	22-24	30-60	9	3	Neutral (E)	-	35-40	
Public Washrooms	22-*	30-60	9	-	Negative (-)	Yes	40-45	*See Note 1b

Resident Bedrooms	22-24	30-60	4	2	Negative (-)	Yes	30 max	
Corridors	22-24	30-60	3	1	Neutral (E)	-	35-40	
Resident Washrooms	22-24	30-60	9	-	Negative (-)	Yes	35-40	
Soiled Linen Storage	22-24	30-60	10	-	Negative (-)	Yes	-	
Soiled Utility	22-*	30-60	10	-	Negative (-)	Yes	40-45	*See Note 1b
Storage - General	22-24	30-60	2	-	Negative (-)	-	40-45	

Notes:

.3 Temperature Range:

a) Where a temperature range is shown (i.e. 22°C-24°C), select the upper value as the maximum summer design temperature and the lower value as the minimum winter design temperature.

b) No requirement for maximum summer design temperature.

.4 Lower humidity levels may be needed in existing buildings; coordinate with Architect the humidification capability of existing buildings in renovation projects.

.5 Total air change rates do not preclude the use of higher or more appropriate values based on more stringent standards or cooling requirements.

.6 Relative Pressure:

a) E denotes equal or neutral relative pressure to surrounding spaces.

b) + denotes positive relative pressure to surrounding spaces.

c) - denotes negative relative pressure to surrounding spaces.

.7 This number indicates the acceptable range of background noise level in terms of room criteria (RC) assuming a neutral (N) spectrum.

7. HEATING SYSTEMS

7.1 General Requirements

7.2 Heating Criteria

.1 Heating water systems shall conform to CAN/CSA Z317.2.

.2 Provide separate heating equipment for the building heating system, process loads (sterilizers, humidification), and the domestic hot water heating system.

.3 Select heating and reheat coils based on low temperature distribution to maximize hot water loop temperature differential and to provide opportunity to use recovered heat. Schedule heating water supply temperature based on outdoor air temperature. Heating water temperature will be scheduled to 48.9°C (120°F) maximum.

7.3 Heating Plant

.1 Heating Water Boilers

a) The heating source shall contain two or more boiler systems or other heating units. If the largest boiler or heating unit is out of service, the remaining boiler(s) or heating unit(s) is capable of providing a minimum of 100% of the design load.

b) Heating water boilers will be of dual fuel design, high efficiency and will be capable of operating on natural gas or No. 2 fuel oil by operation of valves and controls only. The boilers will be configured for condensing operation when operated on natural gas only. Provisions will be made to allow for the boilers to operate safely on fuel oil and to prevent condensing operation. For sites with a mandate to reduce greenhouse gas emissions, heating boilers will be all electric with no natural gas or No. 2 fuel oil operation at all.

c) Size the heating plant to reflect the seasonal nature of the heating load to allow efficient operation under varying loads. Maximize efficiency as much as possible during non-peak loads.

d) Specify boilers to have a minimum boiler efficiency of 85% and include a packaged control system designed to operate the boiler at peak efficiency possible during non-peak loads. Increased boiler efficiency may be required to meet code (i.e. 90% by Jan 2025).

e) Provide fully modulating burner controls in all boiler sizes where possible.

f) Where condensing boilers are used, control the return water temperature to maximize the number of hours condensing is possible.

g) Boiler selection will be based on life cycle costs, available space in the boiler room, turndown ratio, and efficiency.

h) Design and select boilers to match the type of heating systems to achieve maximum efficiency.

i) Operate boilers to achieve maximum efficiency by running or staging them together at low fire.

j) See Section 33 for approved boilers manufacturers.

k) All Heating Plant Equipment, Auxiliaries, and Piping are to provide for the legal retirements for Lock Out and Confined Space Entry. Confined Space Entry requires either double block and bleed (where the Bleed point is the same size as the lines OR provisions for Blinding and Blanking including spectacle blinds and suitable clearances and pipe supports to that end).

l) All Confined Space Entry Points will meet National Board Standard Section 1 Installation including if required by code, access platforms and in a suitable manner so that Emergency Rescue can effect rescue and safety protective devices can be set up without hindrance (Tripods, Hoisting Equipment, Engineered Anchor Points for Fall Arrest and Retrieval).

m) Heating Water Boiler load control should be such that the operator can easily switch and stage as required during normal operation and periods where a unit(s) is/are offline due to maintenance. The operator would have the option to run the overall program in Auto or on Hand.

7.4 Heating Water System

.1 Antifreeze

a) Provide inhibited propylene glycol antifreeze where freezing conditions exist with appropriate water/glycol concentration.

b) For closed loop systems corrosion inhibitor will also be provided. Where chemical addition is required, the system will have sample points and isolatable pot feeders

.2 Heating Water Pumps

a) Use variable speed drives on pumps and two-way control valves on terminal devices to maintain system design pressure under variable flow conditions. Indicate the sensor location(s) on the plans.

b) Provide N+1 redundancy for heating water pumps.

c) Provide strainers, isolation valves, and check valves for all pumps plus pressure gauges / connections to determine pressure drops across pumps and strainers.

7.5 Terminal Box Reheat Coils

.1 Where terminal boxes have a reheat coil, size the reheat coil based on the lowest scheduled heating water supply temperature. Electric reheat coils should be avoided if possible.

8. STEAM HEATING AND CONDENSATE SYSTEM

8.1 Steam Boilers

.1 Steam boilers should include a packaged control system designed to operate the boiler at peak efficiency possible during non-peak loads.

.2 Provide redundancy such that the required plant capacity (including humidification and sterilization is continuously maintained with one (1) boiler out of service.

.3 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.

.4 For sites with a mandate to reduce greenhouse gas emissions, steam boilers will be all electric with no natural gas or No. 2 fuel oil operation at all.

.5 As with the Heating Boilers, Steam Boilers must provide sufficient information to calculate the efficiency, operate within safe limits and be provided with all instrumentation found in the ASME CSD-1 Safety Controls for Automated Boilers. All Process Variables, and controls be visible on the DDC/DCS/BMS/BACnet User Interface in the System Control Centre or Station. All key information must be trend-able.

.6 The choice between water tube and fire tube units must be based on life cycle costs, available space in the boiler room, turndown ratio, and the following:

Boiler Type	Boiler Size Range
Packaged fire tube, high mass	up to 6,900 kW (700 boiler horsepower)
Packaged water tube, high mass	acceptable for any capacity
Other type	only on non-critical loads with Authority's written approval

8.2 Makeup Water and Chemical Treatment

.1 Feed water to all steam-producing equipment shall be pre-treated and preheated to ensure the water quality meets the minimum requirements of the equipment and to minimize the operations and maintenance requirements for the equipment.

.2 Chemicals used for corrosion control of steam piping shall not be hazardous to health. The level of impurities used for sterilization shall comply with CAN/CSA Z317.2 . Steam quality will also comply with the requirements of CSA Z314.

.3 Chemical treatments of the steam system shall be metered. Batch feed systems shall not be used.

.4 Steam plants shall have provisions for an alternative or standby water supply to allow continued operation for 24 h after failure of the normal water supply. Provide a layby parking stall at the point of connection, sized for heavy single unit (HSU) 11.5 m truck.

8.3 Steam / Condensate Piping and Specialties

.1 Threaded or socket weld gate or globe valves 2" and less must be made of forged steel. Class 800. Yoke nut must be removable during operation or come equipped with a thrust washer to prevent galling.

.2 Flanged gate or globe valves 2" and greater must be made from cast steel. Class 150, 300, 600. Cast iron is not acceptable.

.3 Globe valves of any kind cannot be used for isolation on any steam or condensate system. If they are to be used they must have a gate valve upstream in series to allow for isolation.

.4 All ball or butterfly valves must be designated "lockable" by the manufacturer. A chain wrapped around the handle and around the pipe or structure is not acceptable as lockable.

.5 Butterfly valves may be used as a last resort for steam when space for the rising stem is an issue but they must be premium quality (Adams MAK, HTK) gear operated valves.

.6 Butterfly valves may be used as a last resort for condensate when space for the rising stem is an issue but they must have lugged wafer design, full steel construction and rated for high pressure steam. Butterfly valves equal to or better than Score Valve FSD15--__LA-21X1-LL may be accepted.

.7 Ball valve may be used as a last resort for steam trap discharge when space for the rising stem is an issue. Ball valves equal to or better than MAS CSCR2-250 may be accepted.

.8 Steam PRVs are to be Fisher 92B, 92S or 92C. No exceptions. Main valve bodies may be made of either cast steel or cast iron. Pilot valve bodies must be made of cast steel and come with stainless steel tubing. No exceptions. Cast iron pilots bodies will not be accepted.

.9 All condensate piping must be Sch80 or greater.

.10 Steam traps operating at or above 150psi must be Velan TS300 Thermostatic with integral blowdown.

.11 Steam traps operating between 15psi and less than 150psi must be Watson McDaniel Inverted Bucket.

.12 Steam traps operating below 15psi or on any form of heat exchanger must be Watson McDaniel F&T.

.13 Fittings to be used on steam service operating at or above 150psi or any condensate piping supplying the main ring must be 3000# rated.

.14 Fittings to be used on steam service operating between 15psi and 150psi must be 300# rated or higher.

.15 Fittings to be used on steam service operating below 15psi may be 150# rated or higher.

.16 Fittings to be used on condensate service operating below 150psi must be 300# rated or better.

9. COOLING SYSTEMS

9.1 General Requirements

.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.

.2 Provide cooling to serve data and server rooms. Cooling system should be designed to operate year-round. Provide multiple cooling units where appropriate.

.3 Do not provide mechanical cooling for mechanical equipment rooms unless specifically required to keep equipment within the ambient temperature conditions recommended by the equipment manufacturer (i.e. electrical panels, etc.). Provide a means to free-cool equipment where possible.

9.2 Cooling Plant

.1 Chilled water is the preferred means of cooling when the total building cooling load is over 280 kW (80 ton).

.2 Limit the use of direct expansion (DX) refrigeration in air handling units for cooling capacities up to 105 kW (30 ton). Multiple DX air handling units are acceptable for a total cooling load not exceeding 280 kW (80 ton). Provide staged compressors for capacity control in DX systems. Do not use VRF or VRV systems without prior approval of VCHA.

.3 Do not use of once-through cooling (OTC) equipment that uses potable water in a single pass as a cooling medium. Typical applications include condensors, refrigeration compressor units for walk-in coolers and freezers, ice-making machines, server room cooling systems, air conditioners, heat pumps, and x-ray machines. Consideration may be given for emergency use that minimizes FMO intervention.

.4 Size chillers by taking into account the magnitude and duration of the part-load capacity to optimize chiller efficiency.

.5 Provide a dual relief valve on the evaporator for easy routine maintenance in replacing relief valve without having to reclaim the refrigerant and avoid additional labor cost and downtime.

10. CONDENSER WATER SYSTEM

10.1 Fluid Coolers and Cooling Towers

.1 Open-loop cooling towers are not acceptable. Closed loop fluid coolers shall be provided instead such as spray coil type (closed circuit evaporative fluid cooler).

.2 Provide davit arm system on top of the cooler to facilitate removal of motor, gearbox, and fan.

.3 Select cooling tower locations accounting for prevailing wind and locations of building air intakes (to minimize the risk of exposure of building occupants to the cooling tower plume).

.4 Specify cooling towers with basin heaters to allow reliable operation in shoulder seasons and heat trace makeup water lines.

.5 Provide Side Stream Filtration.

.6 Provide TDS Purging control system.

.7 Provide free-cooling technology to the cooling system where possible.

.8 Provide VFDs on cooling tower fans 5 HP or larger.

.9 Analyze the radiated noise from roof-mounted equipment (fans, fluid coolers, etc.), cooling towers, and transmitted noise from building air intakes/exhausts with respect to adjacent buildings or properties. Comply with the applicable noise control bylaw.

11. CHILLED WATER SYSTEM

11.1 Heat Recovery Chiller System

.1 Design the heat recovery chiller plant to meet the maximum simultaneous Facility demand for all systems served by the cooling plant including heat extracted by all heat recovery coils. To respond to periods of low usage, the chiller plant will be capable of controlling and unloading down to 15% of the combined rated plant capacity.

.2 Chiller control sequences will include chiller staging to maximize the overall plant efficiency at all loading conditions. Chiller control sequences will also include chilled water temperature and system differential pressure reset and variable water flow.

.3 Provide continuously available 24/7 cooling for all areas containing specialized equipment including imaging rooms and continuous internal heat gains such as elevator machine rooms, server rooms, electrical, UPS and Communications Rooms (as applicable) via a process chilled water loop.

.4 Optimize heat recovery from the chiller system such that all heat extracted from the chilled water system/condenser water can be recovered to provide heat to the Facility. Recovered heat uses include all Facility heating, reheat, domestic hot water preheating and domestic hot water heating.

11.2 Chilled Water Pumps

.1 Use variable speed pumps to maintain design system pressure for variable flow distribution systems. Indicate sensor location(s) on the plans.

12. SPACE COOLING SYSTEM

.1 Provide a dedicated chilled water circuit to serve medical imaging machines. The system will incorporate a centrally located filtration system, in accordance with the manufacturer's requirements.

.2 Provide continuously available chilled water or condenser water systems for all areas containing specialized medical equipment, communications rooms, elevator machines, computer 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.

.3 Continuously available 24/7 cooling for all areas containing specialized equipment is preferred to use a process chilled water loop.

13. VENTILATION SYSTEMS

13.1 General Requirements

.1 Provide ventilation systems in accordance with CAN/CSA Z317.2. ASHRAE 170 may be used for the design requirements that is not addressed in CSA Z317.2

.2 All rooftop equipment will be enclosed in a mechanical penthouse. Exceptions include evaporative units (e.g. cooling towers), high plume dilution exhaust fans, and the outdoor section of split units. Any other exceptions must be approved by Vancouver Coastal Health.

13.2 Infection, Prevention, and Control, and Health Considerations

.1 Design ventilation systems that move air from clean to less clean areas and with air patterns designed to direct fresh air towards the breathing zone of the occupants.

.2 Outdoor air intakes shall be located at least 7.6 m (25 ft.) from outlets exhausting air that could be recirculated in an occupied space, plumbing vents, and natural gas or propane combustion equipment exhausts.

.3 Consider the effect of the predominant wind direction and increase distances as appropriate. Do not circulate air from areas of low level care to an area of high level care, or high humidity area to low humidity area.

14. AIRBORNE ISOLATION ROOMS

.1 Class A facilities shall provide at least one airborne isolation room (AIR) for each of the following services or areas:

a) Emergency care
b) Clinics in areas servicing high risk populations
c) Diagnostic imaging (in HCFs servicing high-risk populations)
d) Endoscopy
e) ICU
f) General medicine floors

.2 There shall be a minimum of one AIR per inpatient unit unless the functional program can demonstrate an AIR will not be required based upon a risk assessment.

.3 An AIR shall have a pressure monitoring system and an alarm in accordance with CAN/CSA-Z317.2

.4 AIR anterooms shall comply with the requirements of CAN/CSA-Z317.2 for HVAC systems and relative pressurization.

.5 Utilize "Touch Panel HMI Display Standard Content". See Appendix G for details.

.6 Utilize the attached "Controlled Pressure Test Sheet". See Appendix H for details.

15. AIR HANDLING UNITS

15.1 AHU Construction

.1 Air-handling unit walls shall be acoustically insulated with minimum 50mm thick insulation, without perforation, of solid, double-skin construction, with galvanized steel exterior, stainless steel or painted aluminum interior.

.2 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.

.3 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.

.4 Provide preheat coils using inhibited propylene glycol as the heating medium.

.5 Provide sectional, freeze/burst proof changeover coils for heating and cooling rather than dedicated heating and cooling coils to minimize fan energy. Provide manual isolation valves that will enable isolation and repairs to the damaged sections of coils without stoppage of the system.

.6 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 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.

.8 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.

.9 Provide maintenance access space for an A-frame ladder at above and around the Air-handling unit to facilitate removal of coil, filter, damper, actuator, and sensor.

.10 Preference is to avoid the need a door interlock. If interlock is required, provide door interlock to decrease fan speed down to 20% instead of tripping the unit completely.

.11 Shim air-handling units such that they are level across the length of the housekeeping pad, rather than bolted down directly to the housekeeping pad without levelling.

.12 Air-handling units serving Type I and Type II areas (as defined in CAN/CSA Z317.2,) shall be provided with glazed windows to allow assessment of fan operation, final filter integrity, humidifier operation, and cooling coil drainage.

.13 Air handling units shall be capable to provide 100% outdoor air operation with capability to recirculate 100% of the airflow when outdoor ambient air conditions are non-ideal (weather pollution).

.14 Provide deep traps in each section of an air-handling unit where water might accumulate and that are sized to ensure an air seal is maintained in the drains over the full range of fan operation. Avoid

the use of common headers and gang trapping. Provide trap seals for each drain c/w air gap and shall take into account winter operation.

.15 Air handling units shall be capable of the live measurement of the supply and exhaust air flow rate coming into and leaving the system. This measurement shall be captured and displayed in building automation system.

.16 The heating coil must be oriented upstream the cooling coil to prevent cooling coil freeze-up.

.17 Freezestat must be factory supplied and installed downstream the heating coil which is upstream the cooling coil to prevent cooling coil freeze-up.

.18 Provide a freeze block coil if possible for ultimate freeze protection and eliminates potential for burst coils, potential flooding, and downtime, also eliminating the need for glycol which increases efficiency.

.19 Provide lighting within air handling unit casing to allow for observation through panel view windows.

.20 For air filtration within Air Handling Equipment, provide additional space for future carbon air filtration to address wildfire smoke or other catastrophic event contamination (minimum 12" deep for all central Air Handling Units). Racks for carbon filters shall be provided, located after pre-filters. Carbon filters will not shed dust and in tern will require no post-filter. Carbon filter pressure drop will not exceed 125 Pa at 2 m/s. This is to be provided in addition to all other air filtration requirements to meet this OPR and CSA requirements.

15.2 Humidification and Dehumidification

.1 Do not use duct mounted humidifiers except for spaces with an upper relative humidity limit exceeding 60% as indicated in CSA Z317.2. Locate required duct mounted humidifiers outside of Type I and Type II spaces.

16. ENERGY RECOVERY EQUIPMENT

.1 Where energy recovery equipment is used as an integral part of air handling units, provide enthalpy recovery equipment complete with bypass for times when heat recovery is not effective.

.2 Configure supply and exhaust fans to minimize cross contamination between the exhaust air and outside air streams; ensure the outside air section of the energy recovery device is at a higher pressure than the exhaust section. The AHU control systems will automatically adjust the pressure differential to meet this requirement at steady state operation of the system, otherwise an alarm will inform the operator for further actions.

.3 All contaminated exhaust including radioactive, fume hoods, MDR soiled area, and ED area will not undergo energy recovery unless authorized by VCHA.

17. TERMINAL AIR DEVICES

.1 Where variable air flow (VAV) terminal boxes and perimeter heating elements are located within a given zone, provide temperature control using the same temperature sensor.

18. EMERGENCY GENERATOR ROOMS

.1 Provide airflow to emergency generators rooms to satisfy both the cooling and combustion requirements of the emergency generator(s).

19. ROOMS CONTAINING FUEL OIL STORAGE

.1 Provide ventilation in rooms where combustible fuels are stored within the building.

20. DOMESTIC WATER AND SPECIALTY WATER SYSTEMS

20.1 General Requirements

.1 All products including pipe, valves, fittings, endpoint devices, accessories factory supplied as well as fabricated assemblies that will come in contact with domestic (potable) water shall be tested and certified to NSF/ANSI/CAN 61 and 372 for commercial hot and cold water ratings (as applicable). Any products found to be non-compliant with these requirements will be replaced at the contractor's expense.

.2 Include VCH FMO-Plumbing System Standard Documentation for new construction and renovation projects. See Appendix I.

.3 Plastic pipe, fittings, and solvent cement shall meet NSF 14 and shall be NSF listed for the service intended.

.4 PEX can be used on select location e.g. inside the wall, as drops to the fixture. Sleeve protection of the pipe from puncture is a requirement.

.5 A reliable and adequate alternative water supply shall be provided such that the service to the healthcare Facility is not significantly interrupted in the event of failure of the primary potable water supply in accordance with CAN/CSA Z317.1.

.6 The complete potable water system shall be flushed and treated immediately prior to occupancy in accordance with one of the methods identified in CAN/CSA Z317.1.

a) Process Gray water shall not be used within healthcare facilities, unless approved by the FMO Manager.

.7 Potable water distribution pumps, storage tanks and other main components shall be provided with redundancy.

21. DOMESTIC COLD WATER SYSTEM

.1 Do not exceed 2 m/s (6.5 ft/s) velocity for cold water piping to minimize erosion and corrosion.

.2 Where pressure-booster systems are required, the number and arrangement of pumps should be such that peak demand can be met in the event of failure of one pump. Alarms shall be provided to indicate failure of a pumping unit and low primary water supply pressure. Alarms shall be annunciated to the building automation system as well as sounded in a continuous supervised location.

.3 Plumbing fixture supplies need not be insulated, except fixture supplies on barrier- free lavatories (e.g. stops, supplies, traps, and drains).

22. DOMESTIC HOT WATER SYSTEM

.1 Provide multiple water heating sources (i.e. 2 water heaters) each sized for a minimum of 60% of the design load.

.2 Provide a domestic water heating system that is separate from the building heating system.

.3 Water distribution systems shall be arranged to provide hot water at every hot water outlet on demand (less than 10s for all new or modified DHW / DHWR systems). Avoid the use of electric boost systems for efficiency and to limit the impact on electrical systems.

.4 Design to eliminate dead legs in the piping distribution. Connect hot water recirculation piping as close to the fixture control or mixing valve as possible, running down the wall as necessary.

.5 Hot Water Temperature

a) Hot water temperature shall be in accordance with Table 1, Hot Water Temperatures of CSA-Z317.1.
b) Provide a means to sanitize the hot water tanks and water distribution system in accordance with CSA-Z317.1.
c) Provide mixing valves compliant with the applicable ASSE Standard to prevent thermal shock and scalding.

23. SPECIALTY WATER SYSTEMS

.1 Provide distilled, demineralized, and treated water systems in accordance with CAN/CSA-Z317.1.

.2 Provide provision for the installation of associated chilled water and domestic cold water system components for expensive equipment. see attached Appendix J for schematic diagram for details.

.3 Pipe loops shall be designed to provide sufficient flow velocity and to prevent dead-leg lengths of pipe. Velocity shall be a minimum of 1.5 m/s.

.4 Establish the quantity and quality of water required with the FMO Manager.

24. PLUMBING FIXTURES AND EQUIPMENT

24.1 General Requirements

.1 Coordinate with the FMO Manager to determine the appropriate fixture and trim types.

.2 Coordinate with the FMO Manager to determine where bariatric plumbing fixtures are required.

.3 See Appendix I for detailed plumbing fixture requirements.

.4 Provide provision for regulating the temperature delivered from faucets in accordance with CAN/CSA Z317.1.

.5 Provide fixtures of any one type by the same manufacturer.

.6 Provide barrier-free fixtures where required by the code requirements that are installed in accordance with the requirement of CSA-B651, Accessible Design for the Built Environment and the BC Building Code.

.7 Provide solid water supply tubing to sinks and lavatories for ease of cleaning. No braided flex supplies are permitted in areas where patients are receiving care or treatment, unless covered with a skirt or shroud. No plastic or vinyl supplies are permitted.

.8 Provide back-flow prevention devices.

a) Chemical or Detergent Mixing Station: RPBA (Reduced Pressure Backflow Assembly) shall be installed immediately upstream of the unit. All janitor rooms should have RPBAs for hot and cold piping.

.9 All water closets shall be a certified MAP rating of 1000 flush performance and equipped with a pressure assist.

.10 Hand Hygiene Sink and Faucet Requirements provides approved products for Infection Control purposes and can be obtained from the Project Manager or through the Technical Services group.

.11 Provide vital power to all handsfree fixtures, with a local disconnecting means for servicing such as wire connectors at each fixture.

.12 All Plumbing fixture/equipment that blend hot/cold water shall have check valves with a minimum size of 1/2'' to prevent cross over on hot and cold water.

25. MEDICAL GAS SYSTEMS

25.1 General Requirements

.1 Provide medical gas systems in accordance with CAN/CSA Z7396.1.

.2 Medical gas cylinders will be stored inside the building in a dedicated Cylinder Storage room and not stored outside. Cylinder Storage rooms shall be heated and ventilated in accordance with the greater requirements of the BC Fire Code, CAN/CSA Z7396.1.

.3 Smaller medical gas zone is preferred, provide additional zone valves if required to minimize the area of each zone as approved by FMO Manager.

.4 Provide tie-in valves for future connections.

.5 Proprietary medical gas fittings (such as Lokring) are not allowed unless specifically approved by VCH in writing for a specific application on a project by project basis.

.6 Connect medical gas systems to both normal and emergency power supply.

.7 Medical Gas Outlets

a) Provide the quantity and types of medical gases for a given room in accordance with CAN/CSA Z7396.1 as a minimum unless otherwise directed.

.8 Testing

a) New or altered medical gas piping systems shall be tested and certified in accordance with CAN/CSA Z7396.1 and code requirements.

.9 Renovating Existing Facilities

a) Additions and modifications to an existing medical gas system shall meet the current requirements of the BC Building Code, CAN/CSA Z7396.1 and the local Authorities having Jurisdiction.

b) When adding medical gas or vacuum outlets to existing systems, the Design Consultant shall work with the Facility operators to determine the actual current demand.

26. MEDICAL AIR SYSTEM

.1 The type of central medical air system selected will be based on size and Facility, extent of respiratory therapy, projected rate of consumption, remoteness of Facility and service from medical gas supplier.

.2 Air intake for the medical air compressor will be from a non-contaminated location outside the building complete with silencer, insect screen and elbow turned downward. Refer to CAN/CSA Z7396.1 for alternate intake locations.

.3 Medical air systems shall be used exclusively for patient care and not connected to other compressed air systems.

27. MEDICAL VACUUM SYSTEM

.1 Where medical vacuum outlets are used for the scavenging of waste anesthetic gases, ensure vacuum pumps have oxygen compatible components and sufficient capacity.

.2 Vacuum piping shall be a 19 mm (3/4 in) minimum.

.3 Medical vacuum systems shall be used exclusively for patient care and not connected to other vacuum systems.

28. MEDICAL OXYGEN SYSTEM

.1 The type of central oxygen system selected shall be based on:

a) The size of Facility
b) The type of Facility (i.e. level of care)
c) Extent of respiratory therapy (i.e. mechanical ventilators or anesthesia machines)
d) Projected rate of consumption
e) Remoteness of Facility
f) Frequency of service from medical gas supplier

.2 Use the following tables as a guide to determine the central oxygen source type:

Oxygen Source – Number of Beds	
Number of Beds	**Type of System**
Less than 50	A duplex manifold system using high pressure gas cylinders is usually all that is required for small facilities.
50 – 100	A duplex mini-bulk (liquid cylinders) and a reserve supply of high pressure gas cylinders
101 – 500	A bulk storage tank and a reserve supply of high pressure gas cylinders. Include an emergency oxygen inlet to the pipeline distribution system.
Over 500	A large main bulk storage tank, compete with a smaller (minimum of 24 hour supply) auxiliary bulk storage tank, and high pressure gas cylinders. Include an emergency oxygen inlet to the pipeline distribution system.

Oxygen Source – Consumption Rate	
Consumption (m3/month)	**Type of System**
Less than 250	High pressure gas cylinder
250 - 750	Min-bulk
Over 750	Bulk

29. ANESTHETIC GAS SCAVENGING SYSTEM

.1 Provide anesthetic gas scavenging in accordance with, CAN/CSA Z7396.1. Refer to the 2012 version of this standard.

30. SPECIALTY GASES AND VACUUM SYSTEMS

30.1 Laboratory Gas Systems

.1 Where laboratory gases are supplied and distributed from a common manifold system, provide automatic duty/standby capability complete with a relief valve located downstream of the two high pressure regulators and vented to the outdoors.

.2 Provide separate flammable and non-flammable relief vent discharge piping. Vent all discharge piping to the outdoors. Clearly identify and label lab gas systems piping.

30.2 Dental Compressed Air System

.1 Air compressors for dental air systems shall be duplex and oil-free type.

.2 The dental compressed air system shall not be combined with medical compressed air systems.

30.3 Dental Vacuum System

.1 Dental vacuum pumps shall be duplex and designed to provide at least 19 kPa (5.5" of Hg) at the point of use.

.2 Vacuum exhaust shall be discharged through the roof to the atmosphere away from building intakes.

30.4 Nitrous Oxide

.1 will be provided as canisters only.

31. FIRE AND LIFE SAFETY SYSTEMS

31.1 General Requirements

.1 Design fire and life safety systems in accordance with the requirements of the BC Building Code, the BC Fire Code, and the National Fire Protection Agency.

.2 Refer to CSA-Z317.1 for fire-protection requirements.

31.2 Sprinkler System

.1 Stainless steel piping is the preferred material to be utilized in sensitive or critical areas

.2 Provide pre-action sprinkler system to avoid accidental discharge in rooms where water damage can affect the operation including operating rooms, delivery rooms, recovery rooms, intensive care

units, main electrical rooms, main IT rooms, and rooms containing high value equipment including CT rooms, MRI rooms, linear accelerator rooms and PET scanner rooms. Alternately, electrical rooms may be unsprinklered where the building code and NFPA 13 exemptions permit it.

.3 In areas with low ceiling (bulkheads) or that require cleaning and sanitation of sprinkler heads, concealed sprinkler heads should be used.

31.3 Smoke Control System

.1 Smoke control zones shall correspond to the fire alarm and sprinkler zones. Special consideration should be given to interconnected floor spaces (e.g. atriums) and coordination with adjacent areas.

.2 To be designed and installed in compliance with CSA Z317.2:19., section 5.4 Fire Protection and Smoke Management.

32. FUEL SYSTEMS

.1 Only the following fuel tank configurations are acceptable:

a) Freestanding tank inside a building in a concrete vault with a containment wall.

b) Above-grade tank outside a building, located to minimize risk of damage from floods or wildfires where applicable.

c) Below-grade free standing tank boxed in a pre-cast concrete vault (instead of fully direct buried) with removable slab lids, access manhole with ladder and full maintenance access around the tank.

.2 Provide fuel measurement and leak detection system for bulk fuel storage systems.

33. DRAINAGE SYSTEMS

33.1 General Requirements

.1 Locate equipment that requires accessibility outside of patient care areas (i.e. valves, cleanouts, control dampers, fire dampers, etc.).

.2 All pumps to be connected to BMS and be provided with audible and visual alarms. All sump pumps to have 2m clearance above access hatch and 1m on 3 sides.

.3 All gravity drainage systems shall avoid pumped sumps wherever possible. Sufficient grading of piping systems is to be planned during the design phase to avoid pumping. This avoids issues regarding flooding risk and also maintenance risk / confined space access issues.

33.2 Sanitary Sewer System

.1 Coordinate the requirement for a sampling manhole with the Authority Having Jurisdiction and the Civil Consultant for facilities containing laboratories.

.2 Sewage pumps shall be duplex grinder type with an automatic alternator and a lag pump starting feature, supplied from the essential electrical system in accordance with CSA Z32; and have alarms for the lag pump start and high water level.

.3 Install an in-line grinder (e.g. Muffin Monster) upstream of the sump.

33.3 Clinical and Hazardous Waste Drainage Systems

.1 Hazardous waste shall meet the requirements of CSA Z317.10, Handling of Waste Materials within Health Care Facilities and be piped to a neutralizer and treated prior to discharge or collected in a holding tank for off-site disposal.

.2 Sanitary waste from buildings containing laboratories and infectious areas shall comply with waste water discharge requirements of local bylaws, codes, and environmental and health regulations.

.3 Hospital macerator is not permitted without written approval from Owner. Bedpan washer (e.g. Meiko Topline) is the preferred method of waste disposal. The make and model of the bedpan washer shall be approved first by Owner.

33.4 Storm Drainage System

.1 Avoid the use of controlled flow roof drainage systems.

.2 Provide a minimum of two roof drains per drainage area.

.3 Provide cast iron or aluminum dome strainers over roof drains.

.4 Where storm water is not directly connected to the storm water service main, terminate roof drain exterior discharge outlet with an elbow at least 1.0 m (3 ft.) above grade.

.5 Sump pumps designed for permanent installation shall be duplex, controlled to automatically alternate between lead/lag statuses, and have alarms for the lag pump start and high water level.

34. EXHAUST SYSTEMS

34.1 General Requirements

.1 Provide exhaust fan redundancy/standby capacity in accordance with CAN/CSA Z317.2.

.2 Any exhaust must be labelled and treated as hazardous and vented away from intake to avoid recirculation.

34.2 Fume and Process Exhaust Systems

.1 Design fume exhaust systems in accordance with ASHRAE, Laboratory Design Guide – Planning and Operation of Laboratory HVAC Systems.

.2 Exhaust duct materials:

a) Use corrosion resistant materials for exhaust ducts conveying corrosive fumes and vapor.
b) Use stainless steel for exhaust ducts conveying moisture-laden vapors.

35. APPROVED MANUFACTURERS LIST (AML)

.1) This section is a work in progress – most industry standard, non-proprietary systems will be accepted.

.2) Only reputable original equipment manufacturers with a proven record will be acceptable.

.3) Note that this list is not fully exhaustive as other documents referenced in the OPR require specific equipment by specific manufacturers (i.e. Appendix C HVAC BAS Standards and Appendix I Plumbing Technical Design Requirements).

Equipment	**Manufacturer**
Air Flow Measuring – Air Stations	Air Monitor, Ebtron, Sentinel
Air Handling Units – Custom Built	Haakon, Scott Springfield, Hunt Air, Xnrgy
Air Handling Units – Make-up Air Gas Fired	Engineered Air, I.C.E., Reznor
Air Handling Units – Packaged	Trane, McQuay, Engineered Air
Air Separator	Armstrong, Bell & Gossett, Spirotherm
Air Terminals – Hospital OR	SLD Technology
Air Terminals – Supply Air	EH Price, Krueger, Swegon, Titus, Tuttle & Bailey
Bedpan Washer	Meiko Topline
Boilers Hydronic – Condensing (High Mass)	Cleaver Brooks, Viessman, Teledyne Laars
Boilers Hydronic – Mid Efficiency (High Mass)	Cleaver Brooks, Superior Boiler, Teledyne Laars
Boilers Steam – (High Mass – Fire Tube)	Cleaver Brooks, Superior Boiler
Chillers – Water Cooled Centrifugal	Trane, York (JCI), Daikin
Heat Recovery Screw Chillers – Water Cooled	Trane, York (JCI), Daikin
Cooling Towers	Marley, BAC, Evapco
Dampers – Control	Ruskin, Tamco
Deaerator	Cleaver Brooks, Ecodyne
Dust Collectors	A.A.F., AQC, Donaldson, Kraemer, Murphy, Sternvent

Equipment	Manufacturer
Emergency Equipment (Eye Wash, Showers)	Bradley Acorn, Guardian, Haws, Speakman
Emergency Equipment – Thermostatic Mixing Valves	Bradley Acorn, Guardian, Haws, Speakman, Watts
Fans – General	Greenheck, Loren Cook, TwinCity
Fans – Lab High Plume Dilution	Loren Cook, Strobic
Fans – Parkade Transfer	Systemair, Zoo Fans
Fan-Coil Units	Carrier, Daikin, Dunham Bush, Engineered Air, Enviro Tec, Johnson Controls, Trane, Williams
Faucets	As per FHA Hand Hygiene Sink and Faucet Requirements, Moen
Filters – Air – Containment Housings -Bag-in Bag Out	AAF, Camfil, Contamination Technology Corp., Tri-Dim
Filters – Air – Mechanical	AAF, Cambridge, Camfil, Flanders, Pacific, Viledon
Filters – Domestic Water - Self Cleaning	Orival, Judo, Forstra Filters
Filters – Hydronic – Side Stream	Axiom Industries, AMF Cuno, Guthrie, Summit
Flow Meters – BTU Meter	Onicon, Rosemount
Flow Meters – Electromagnetic Meter	Onicon, Rosemount
Flow Meters – Inline Electromagnetic Meter	Onicon, Rosemount
Flow Meters – Sat Steam Meter	Onicon, Rosemount
Flow Meters – Ultrasonic Meter	Onicon, Rosemount
Gauges - Air	Dwyer, Magnehelic
Headwall	AMICO, Class 1
Heat Exchangers	Armstrong, Bell & Gossett, Alpha Laval
Heat Exchangers – Brazed Plate	Armstrong, Bell & Gossett, Alpha Laval
Humidifiers	Armstrong, Dri-Steam, Neptronic, Pure, Vapac
Humidifiers – Adiabatic	MeeFog
Insulation – Acoustic – Duct – Fibre Free	K-flex, Armacell, Evonik (Solcoustic)
Insulation – Canvas Jacket	Robson, Fattal, Tai-Can

Equipment	Manufacturer
Insulation – Fabric Adhesive Coatings	Robson, Bakor, Childers, Epolux, Foster
Insulation – Low to Intermediate Temp Pipe and Fitting Insulation	Owens Corning, Roxul, Johns Manville, Manson
Insulation – PVC and Metal jacket – Pipe and Fittings	Speedline, Proto, Zeston, Shur-Fit, Belform
Insulation – Thermal – Duct	Johns Manville, Owens Corning
Insulation – Thermal – Pipe and Fittings	Johns Manville, Owens Corning, Shur-Fit
Insulation - Vapor Barrier Jacket Adhesive	Bakor, Epolux, Nacan, Foster, Childers
Insulation - Vapor Barrier – Jacket	Knauf ASJ, Kingspan ASJ, Mason ASJ, Johns Manville AP-T Plus, Owens Corning ASJ, Rocul ASJ, Venture Wrap 1555U
Interceptor - Grease	Mifab, Green Turtle
Interceptor - Oil	Mifab
Medical gases (medical air, instrumentation air and vacuum systems)	AMICO, Class 1, VitalAir
Lab - Nitrogen Generation System	PEAK Scientific, Parker (Canada Division), ON Site Gas Systems
Anesthesia Gas Scavenging System	Air Liquide, Amico
BMS Controls contractor	ESC (Delta Controls), Schneider (Struxureware)
Fire Protection Couplings, Fittings, Valves, PRVs, devices, fire-packs, flex drops, flex drops with M.O.H. (made on heads), sprinkler heads and Vortex dual agent extinguishing system	Victaulic, Bermad
Variable Frequency Drives	ABB
Mechanical Joint/Grooved manufacturers – Domestic/Hydronic, and Compressed/Utility Air	Victaulic
Press joint manufacturers	Victaulic, Viega
Grooved couplings, valves, fittings, strainers, check valves, valves, 2 way/3-way control valves, vibration isolation pump and air handling unit drops and accessories – Domestic and Hydronic	Victaulic, Bermad

Equipment	Manufacturer
Expansion compensators/Joints and Anchors – Grooved – Domestic and Hydronic	Victaulic
Flex Connectors – Grooved	Victaulic
Pump Accessories – Grooved	Victaulic
Hose Reels	Reelcraft
Piping - PEX	Uponor (Wirsbo), Rehau, Viega
Piping - PVC Perforated for Footing Drains	IPEX, Napco
Piping – Sanitary / Storm – PVC System 15 (XFR)	IPEX
Piping – PVC DWV – Double Wall Containment	IPEX
Piping - Reverse Osmosis - 316 Stainless Steel Tubing	Swagelok, Associated Tube Canada, Valex
Plumbing - Backflow Preventers	Febco, Watts, Hersey, Singer, Ames
Plumbing Fixtures - Sinks	As per FHA Hand Hygiene Sink and Faucet Requirements
Plumbing Fixtures – Mop	American Standard, Crane, Fiat, Mustee
Plumbing Fixtures – Flush Valves	Chicago, Crane, Sloan, Toto, Zurn, Moen, Delta Teck
Pumps – Condensate Packages	Bell & Gossett, Paco, Plad, Skidmore, Spirax Sarco
Pumps - Deaerators and Boiler Feed	York Shipley, Cleaver Brooks, Duro
Pumps - Domestic Water Booster	Armstrong, Bell & Gossett, Grundfos, Plad, Quantum Flo
Pumps – Fuel Oil	Roto King, Viking, Worthington
Pumps – Horizontal Base Mounted	Armstrong, Grundfos, Hevvy Pumps, Peerless Pumps
Pumps – Mechanical Seals	A.R. Thomson
Pumps – In-Line Circulators	Armstrong, Bell & Gossett, Grundfos, Taco, Wilo
Pumps – In-Line Grinder	JWC Environmental (Muffin Monster)
Pumps – Fire	Armstrong
Pumps – Jockey	Armstrong

Equipment	Manufacturer
RO water generation system (s) – Dialysis	Canadian Water Technologies
RO water generation system (s) – Non Dialysis	Evoqua, Kinetico, Culligan
Steam – Filter Elements	Parker #200-75SR
Steam – Filter Housings	Parker 23/75R
Steam – PRV	Fisher
Steam – Separators	Spirax Sarco model SC4
Steam – Traps	Velan TS and Watson McDaniel Bucket and F&T
Steam – Valves	Class 200 gate or globe (2" and less): Velan forged steel Class 150, 300, 600 gate or globe (2" and larger): Velan or Kitz Forged or cast steel.
Tanks - Boiler Blowdown	Cleaver Brooks, Penn Separator, York Shipley
Tanks - Domestic Hot Water Storage	PVI, Niles
Tanks – Hydronic Buffer	Clemmer, Enermax Fabricators, Hanson Tank, Laars, Niles Steel Tank, Taco, Wessels, Wheatley
Terminal Units - CV & VAV	E.H. Price, Titus, Trane
Terminal Units – Fume Hood Venturi Valve	Phoenix Controls, Critical Room, Accutrol
Valves – Balancing - Hydronic – Manual and Pressure Independent c/w control valve	Tour Andersson, IMI, Victaulic
Valves – Check – Swing	Bonney Forge, Crane, Hattersley, Kitz, NCI Canada, Nibco, Red-White/Toyo
Valves – Gate	Bonney Forge, Crane, Hattersley, Kitz, NCI Canada, Nibco, Red-White/Toyo, Victaulic
Valves – Globe	Bonney Forge, Crane, Hattersley, Kitz, NCI Canada, Nibco, Red-White/Toyo
Valves - Thermostatic Balancing – Domestic	Tour Andersson, IMI
Valves - Control 2-way & 3-way - Grooved	Victaulic

Equipment	Manufacturer
Valves - Control 2-way Pressure Independent (PICV)	Belimo, Griswold, Tour Andersson
Valves - Differential Pressure Control (DPCV)	Tour Andersson, Victaulic
Valves – Isolation – 2½" and over weld/flanged (valves 4" and larger to be gear operated butterfly valves)	Keystone, Bray, DeZurik
Valves - Isolation – ½" to 36" Pressed or Grooved (Valves 6" and larger to be Gear Operated) Domestic and Hydronic	Victaulic
Valves - Pressure Reducing - Domestic	Bermad, Victaulic, Watts
Valves – Stainless Steel for Reverse Osmosis and High Purity Water Systems	Swagelok, Valex
Welding Exhaust System	Engwald, Micro Air, Nederman, Plymovent

END OF MECHANICAL SECTION

ELECTRICAL

36. GENERAL

36.1 Intent

.1 The Electrical Systems are to be designed and built to meet or exceed all applicable codes, standards, requirements and legislation.

.2 All electrical systems are to be functional, reliable, efficient, flexible, safe, maintainable and expandable with reserve capacity for future modifications.

.3 Systems are to be documented via as-built or record drawings and operational and maintenance manuals.

.4 Electronic CAD versions or BIM models to be transferred to VCH upon completion of as-built updates, including scans of contractor's red line markups. All record drawings to include dimensioned locations of all conduit below-grade or cast into concrete.

.5 Demonstration and training sessions are to be provided for operation staff.

.6 Designs shall demonstrate energy efficiencies and be cognizant of energy usage for all electrical equipment. Utilize energy standards and guidelines as outlined herein to every aspect of the electrical system design. Encourage the use of Energy Star-labeled equipment as a best practice.

.7 Do not sole source or use proprietary equipment or systems for any new Facility or major renovation where existing equipment is being replaced. In cases of renovation, campus or addition type projects, specific equipment or systems may be required. If this is the case, these must be itemized and reviewed with the Consultant and Owner so that the Project Manager can obtain all necessary approvals.

36.2 References

.1 The Codes and Standards listed below provide the designer with references to be reviewed during design. Application of the Codes and Standards are to be justified by the professional(s) leading the design at the time of design development and shall be clearly stated in design reports.

.2 Where conflicts exist between various Codes and Standards, the design report shall indicate the resolution taken and the reasons to support it.

.3 Design shall be based on the latest adopted versions of the following codes and standards:

a) CSA C22.1 Canadian Electrical Code (CEC) – Part 1

b) CSA Z32 Electrical Safety and essential electrical systems in health care facilities

c) CSA 282 Emergency Electrical Power Supply for Buildings

d) CSA Z317.13 Infection Control during Construction, Renovation and Maintenance of Healthcare Facilities.

e) CSA Standard Z317.5 Illumination Systems in Health Care Facilities

f) CSA Z318.0 Commissioning of Health Care Facilities

g) CSA Z8000 Canadian Health Care Facilities

h) BC Building Code (or Vancouver Building Bylaw where applicable)

i) BC Fire Code

j) ANSI/TIA 1179, Healthcare Facility Telecommunications Infrastructure Standard.

k) ANSI/TIA-568-X.0, Generic Telecommunications Cabling for Customer Premises

l) ANSI/TIA-568-X.1, Commercial Building Telecommunications Cabling Standard

m) ANSI/TIA-568-X.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard

n) ANSI/TIA-568-X.3, Optical Fiber Cabling Components Standard

o) ANSI/TIA-569, Telecommunications Pathways and Spaces

p) ANSI/TIA-606, Administration Standard for Telecommunications Infrastructure

q) ANSI/TIA-607, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

r) TIA TSB-162-X, Telecommunications Cabling Guidelines for Wireless Access Points.

s) CSA Z462, Workplace Electrical Safety

t) ANSI/ASHRAE/IESNA, Standard 90.1 – Energy Standard for Buildings except Low-Rise Residential Buildings

u) CSAB651, Barrier-Free Design

v) CAN/ULC-S524, Installation of Fire Alarm Systems

w) CAN/ ULC-S536, Inspection and Testing of Fire Alarm Systems

x) CAN/ ULC-S537, Verification of Fire Alarm Systems

y) CAN/ULC-S1001, Integrated Systems Testing of Fire Protection and Life Safety Systems

z) National Energy Code of Canada for Buildings (NECB)

aa) Local BylawsIEEE 3000 Standards & Colour Books, including:

i. IEEE 242 – Buff Book, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
ii. IEEE 446 – Orange Book, Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications.

iii. IEEE 493 – Gold Book, Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems.
iv. IEEE 602 – White Book, Recommended Practice for Electric Systems in Health Care Facilities.
v. IEEE 1100 – Emerald Book, Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.

.4 Design shall incorporate the following Vancouver Coastal Health guidelines and documents, including:

a) Long-Term Complex Care Building Requirements

b) VCH Elevator Requirements

c) VCH Hand Hygiene Sink and Faucet Requirements

d) Energy and Environmental Sustainability Guidelines:

i. Climate Resilience Guidelines for BC Health Facility Planning and Design
ii. Establishing Design Conditions
iii. Moving Towards Climate Resilient Health Facilities for VCH: Technical Bulletin (2019)
iv. Low Carbon Resilience and Environmental Sustainability (LCRES). Available at: https://bcgreencare.ca/resource/guidelines/

e) VCH Functional Program

f) VCH Project OPR

g) FSS Drawing Standards & Requirements

h) VCH Facilities Indigenous Design Guidelines

i) PHSA IMITS Communications Infrastructure Standards & Specifications

Lower Mainland Health Organizations Integrated Protection Services (IPS) Electronic Security Systems Specifications VCH Electrical Safety Program.

36.3 Schematic Design Report

.1 Schematic design will be used for a Class C estimate (Documents 15%- 20%)

.2 Include the design criteria for electrical services, including voltage, number of feeders, main electrical service size, generator size, transfer switch solution and redundancy options.

.3 Provide a specific description of items to be served by each type of emergency power circuits (UPS, Vital, Delayed Vital, and Conditional)

.4 Provide a description of the UPS systems, including architecture and redundancy provisions, indication of separate/local UPS systems for different areas or load types (i.e. note if separate central or local UPS will be used for IMITS equipment, imaging equipment, etc.).

.5 Provide load calculations for Emergency Generator loads, Normal loads, EV (Electric Vehicle) Charging and UPS loads, and describe any load management systems and provisions for chiller backup power

.6 Substation, switchgear, and generator rooms sized and located on plans with service feeder locations

.7 Communications and sub-electrical room requirements shown on plans.

.8 Lighting type and controls outlined on plans.

.9 Fire Alarm system design and performance of the two stage system.

.10 Provide schematic One-Line Diagram including the size & rating for major feeders and major electrical equipment.

.11 Provide electrical room locations and layouts for major electrical equipment, with physical space reviewed for fit and accessibility of all equipment.

36.4 Design Development Submission

.1 Design Development will be used for a Class B estimate (Documents 25% - 33%)

.2 The Design Development Submission must fully convey the design intent of all Electrical systems.

.3 All design-related issues, technical criteria and performance shall be included in Design Development Report.

.4 Minimum requirements to be provided are:

a) Developed (>30%%) Floor plans, reflected ceiling plans.

b) Developed (>30%) Single line riser/Distribution layout, basic panel information, lighting requirements and layout, communications, fire alarm, nurse call and security requirements.

c) Emergency power system design, sizing, and transfer switch solution details should be clearly presented.

d) Provide coordination study/arc flash requirements and labelling to new electrical panels/switchgears.

36.5 Post-Disaster Electrical Design

.1 For acute care hospitals (Class A facilities), the Electrical and Project Site service systems should be designed with redundancy such that the Facility can continue to operate if the external electrical services fail for any reason that include but are not limited to:

a) Two separate incoming power supplies from Utilities.

b) Two separate incoming communication supplies from Utilities.

.2 For acute care hospitals, emergency generator system will support the full Facility operation including air conditioning load while all generators are operable at full capacity. Generator system

shall be redundant with sufficient capacity to serve all delayed vital and vital loads as well as cooling for critical areas in the event of a single generator failure.

.3 For non-acute health care facilities, emergency generator system will have sufficient capacity to serve all delayed vital and vital loads as well as cooling for critical areas.

.4 For acute care hospitals, the emergency generator plant shall have the electrical capacity and fuel storage to support Facility full load operation for 72 hours or more when all generators are online. Other classes of health care facilities with emergency generators shall have the capacity and fuel storage to support Facility full load operation for 24 hours or more.

36.6 Key Design and Performance Requirements

.1 In new acute care facilities, the Design Builder (electrical contractor) or the Virtual Design & Construction group shall produce a device, equipment, conduit and cable tray layout model in REVIT to level 300 and provide pad and equipment layout, hanger and supports locations, and junction/pull box locations. Individual branch circuit conduits and boxes may be excluded, while all feeder routing (generally 53mmC and larger) shall be included. Include space for maintenance and removal / replacement of electrical equipment (including generators, transformers, MCCs, and switchgear). Ensure that all stress, seismic and thermal accommodations are coordinated. Provide the Owner with the Revit model along with equipment shop drawings.

.2 Branch wiring for power, lighting and life safety: Home runs/branch circuit wiring to power panels and lighting control panels with multiple circuits to be shown on record drawings.

.3 Life Safety Systems: Identification of fire-rated feeders/cables to be shown. Fire-rated feeders/cables to be Mineral Insulated (MI) type or Vitalink MC Cable, or standard conductors installed in a fire-rated drywall assembly or concrete encasement

.4 Fire Alarm Interface: Location of connections to other equipment such as fire dampers, air-handling units, smoke doors, sprinkler pumps, elevators, etc. shall be shown. Locations of power supplies, control transformers and circuit IDs for ancillary devices shall be shown on record drawings.

.5 Building Control Systems: Location, identification, type and approximate sizes of equipment control panels, control devices and outlets for control systems requiring 120V power connections, such to be shown.

.6 Block Diagrams for all electrical systems, Communications and Electronic Safety and Security Systems, to be provided.

.7 The electrical systems are to support the Facility's operation upon initial occupancy and throughout the life of the Facility; allowing for reasonable maintenance, equipment replacements, modernizations and expansion. Expected life, parts availability and service support shall be at least 30 years for power distribution components, and at least 20 years for electronics-based systems such as UPS and lighting control. Design electrical rooms and equipment with space and capacity for future expansion and renovations, reserving at least 20% of the initial space and capacity for future needs.

.8 The systems shall be designed to permit maintenance, repair and replacement of all electrical equipment without requiring work to be done on live equipment. Suitable provisions may include the following:

a) Infrared scanning windows for cable terminations on high voltage equipment, main transformers, and the line side of 600V main switchgear breakers.

b) Accessible pull boxes where CTs can be clamped onto the incoming feeders for each panel, to allow spot metering without exposure to any uninsulated live components.

c) Demand meters built into each branch panel mains to eliminate the requirement for spot metering in the future.

.9 Electrical systems and distribution equipment are to be located in secure, dedicated vaults, rooms and closets with sufficient clearance, access routes and access panels to allow for the installation, removal and replacement of equipment, the use of wheeled carts for transporting tools and parts, and to provide maximum flexibility for power distribution to floor area served. Electrical panel not located in specified electrical rooms will be reviewed on a case by case basis.

.10 Rooms housing electrical distribution equipment shall not contain communications equipment, mechanical equipment or control panels, ducts, pipes, shafts or water mains unless the equipment is serving the room. For equipment serving the room (e.g. fan coils), keep hydronic, condensate piping out of the room as much as possible. Electrical distribution equipment serving mechanical equipment may be located in mechanical rooms with mechanical piping, with piping not routed above electrical equipment unless top/side entry conduits are sealed and enclosure hoods are installed. Provide separate communication rooms for major data and electronic equipment.

.11 For new construction, rooms housing major electrical equipment shall not be located below the established flood plain, and in all cases shall not be located below grade unless approved by the Authority.

.12 Electrical equipment shall not be located in or below Janitor rooms, water closets or other rooms with fluids, and shall only be located in mechanical equipment rooms if required to service mechanical equipment. All electrical equipment is to be suitably protected from leakages from the sprinkler system. Any major electrical equipment greater than 750 Volts shall not have sprinkler system or water lines located within the room. Avoid sprinkler systems and water lines in electrical rooms containing equipment less than 750 Volts and greater than 2000 Amps. Coordinate with Architectural and Mechanical divisions to ensure all codes are addressed.

.13 Include preliminary short circuit, protective device coordination and arc flash study and use preliminary results to design means to limit arc flash levels to 12cal/cm2, or 40cal/cm2 on the line side of 600V mains if impracticable to reduce it below that level. If this cannot be achieved, proposed solutions shall be submitted to the Owner for review and approval. Perform power studies using ETAP, SKM Power Tools, or EasyPower software and provide the full as-built electronic computer model and associated library files to the Owner for use in regular study updates in the future. Provide final power studies based on as-built conditions at the conclusion of the project. Provide all final study electronic model files including library files to the Owner

.14 Incorporate safety by design for main switchgear and other areas with high arc flash levels, using elements such as arc resistant switchgear, remote racking, infrared scanning windows, arc detection relays, or other methods to reduce electrical hazards to FMO staff and contractors during common maintenance and operation tasks.

.15 Provide target illumination levels for all interior and exterior lit spaces at the time of submission of the Design Development Report.

.16 Provide target Interior and Exterior Lighting Power Densities at the time of submission of the Design Development Report.

.17 Harmonic distortion and noise: As a minimum, undertake the following steps:

a) Identify non-linear loads, including Uninterruptible Power Supplies (UPS's), computers, rectifiers, variable frequency drives, and electronic ballasts or LED drivers, and consider their effects on power distribution system.

b) Provide harmonic filtration, either with the specified equipment, or separately, to limit total harmonic distortion at the utility Point of Common Coupling (PCC) as per IEEE 519-2014, "Recommended Practice and Requirements for Harmonic Control in Electric Power Systems", and at additional points specified elsewhere in this document.

.18 Electric motor starters, drives and controllers provided packaged with mechanical equipment are to be reviewed by the Electrical Consultant for conformance with required performance characteristics outlined within this design guide and coordinated with the Mechanical Consultant in a similar fashion to all other aspects of the mechanical design.

.19 Redundancy will be incorporated into systems and equipment such that the failure of a single piece of major equipment or major conductor will not impair the operation of the Facility nor the clinical or administrative activities. The design shall have the following characteristics:

a) Power Distribution Basic Requirements:

i. The power distribution system shall consist of at least two source branches (utility power and generator power) and three (3) load branches (vital, delayed vital, and conditional power), in addition to UPS power branches. A normal utility power load branch may also be used in smaller facilities with limited emergency power requirements.
ii. All load branches will be capable of being automatically or manually restored from the emergency generators if utility power is lost.
iii. 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.
iv. The tie breakers between switchgear buses will be interlocked with the source breakers to prevent paralleling of multiple incoming power sources.
v. Design and construct each Electrical Room with sufficient empty floor and wall space to accommodate an additional 30% of the initial power distribution equipment

footprint to be added in future renovations or additions. This space must be arranged to allow installation of each equipment size and shape initially installed.

vi. Included in each switchgear lineup will be one (1) prepared space that will accept a draw-out vacuum circuit breaker in the future to serve future renovations or additions.

vii. Provide a redundant system of 125-V DC battery-backed power supply and charger for the protective relays and controls. A redundant central UPS system may alternately be used for control power. Small local UPS systems may not be used for switchgear power supplies.

viii. All switchgear and CDP (including 600-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 to which they will be extending the bus from.

ix. 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.

x. Splitters and fuses shall not be used for power distribution circuits unless VCH approves an exemption.

xi. A project shall not be permitted to use the last slot for each phase in a panelboard unless it is to feed a new panelboard.

xii. 120 / 208V panelboards installed as part of a project shall have a sufficiently sized junction box mounted above, with spare 35mm or larger conduits installed between it and the panel, with sufficient space for future fit-out of all circuits in the panel including any derating requirements due to fill. These are in addition to the conduits being used to install the project wiring.

b) CDPs & MCCs

i. Centralized Distribution Panelboards (CDPs) in this document refers to all power panelboards that feed other CDPs or branch circuit panelboards.

ii. Each vital, delayed vital or UPS CDP, panelboards serving elevators, and 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.

iii. Each conditional CDP will be of equal or larger ampacity to any Equipment connected to it via manual transfer switches or tie breakers.

iv. Each CDP will include one spare breaker of the largest size labelled "Maintenance only"

c) Power Transformers

i. 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 the required spare capacity reserved for future use.

36.7 Identification

.1 Equipment to be identified in a clear, consistent manner. Where a site has an existing site standard, the existing standard shall be used.

.2 Identify all conduits in ceiling spaces so that markings remain visible from line of sight of every connected access point (box, conduit body, wireway, etc.) at minimum 5m spacing, after space fit-out is complete. For spaces with concealed conduit, labels must be visible through access panels or removed ceiling tiles.

.3 Where a site standard does not exist, conduit identification shall use colour bands as follows:

a) Utility (normal) power: navy blue

b) Essential/generator power (any branch): wide band navy blue, narrow band black

c) UPS power: orange

d) Fire alarm: red band or painted red

e) Data: green band

f) Other technology systems (security, paging, nurse call, etc.): white band with system designation in black text

.4 All receptacles shall be marked with the circuit and panel source identification with permanent lamicoids located above the receptacle.

.5 All distribution equipment shall include the source distribution equipment name and location on its identification lamicoid

.6 Small colour-coded dots shall be installed to identify all pull box locations/types and emergency power luminaires from below the ceiling.

.7 Where long-time pickup current ratings of breakers are not equal to the breaker frame or trip unit maximum rating, this rating shall be permanently marked adjacent to the corresponding breaker (and relay if applicable) and clearly noted on any power system HMI or remote metering interface for these breakers.

36.8 Operation and Maintenance Manuals

.1 Ensure all data required for the Operation and Maintenance of the equipment is collected and meets the Owner's requirements for O&M manuals.

.2 At a minimum, O&M manuals shall include the following information:

a) Full schematics, control schedules, points lists, and final shop drawings;

b) A compete list all replaceable parts with part numbers and contact info for ordering replacements and service, and spare parts provided;

c) Maintenance procedures, recommended maintenance schedules, complete operating instructions, and custom operating procedures for programmed systems;

d) Complete information for the final as-built system configuration and settings, with copies of the program/configuration files if available. This includes VFDs, lighting controls, etc.;

e) Copies of typewritten schedules for all panelboards and any other distribution equipment that does not have information for each protective device and load shown on the single line diagrams;

f) Testing and commissioning reports and checklists.

g) A training attendance sign-off sheet. This sheet shall identify the site, time and date as well as a listing of all those in attendance, and electronic and/or paper copies of any available training materials.

.3 Provide a complete set of project record drawings, provided as two full-sized printed sets as well as electronic files (file format: .DWG/.RVT and .PDF) showing location of all equipment, devices, circuiting, controls, demarc connections, schematics, riser diagrams, conduit and box locations. An electronic set of CAD files / BIM models along with associated library, XREFs and linked files shall be included.

i. Lighting control and fire alarm zones shall be clearly identified on the record drawings.
ii. Project record drawings shall include dimensioned in-slab conduit and box locations.
iii. As-built drawings (red lined) shall be prepared by the contractor during construction and passed to the consultants to incorporate them into the record drawings. Scanned electronic copies of these redline drawings shall be provided to the Owner as well.

36.9 Spare Parts and Maintenance Materials

.1 Include spare parts and maintenance materials to the building operator.

.2 Verify parts availability for equipment that is installed. Avoid use of equipment that is close to obsolete, or that parts are hard to obtain.

36.10 Starting and Testing

.1 Include electrical starting and testing requirements, as per direction of the Commissioning agent or Compliance team.

36.11 Equipment and Systems Demonstration

.1 Ensure that proper demonstration and instruction procedures are performed for maintenance personnel as per direction of the Commissioning agent or Compliance team.

36.12 Commissioning

.1 It is the intent of the Owner to solicit proposals for Commissioning Consultant Services and Independent Commissioning Authority to meet Leadership in Energy and Environmental Design (LEED) Fundamental and Enhanced Commissioning requirements.

.2 Over and above LEED commissioning requirements, the Commissioning Authority is required to undertake commissioning in accordance with CSA Z320 – Building Commissioning for all systems including:

a) Electrical power and distribution

b) Emergency power and distribution

c) Transfer switch operation

d) Lighting levels

e) Lighting control including daylight sensor calibration, occupancy sensor calibration and astronomical time clock settings and adjustments

f) Clock System

g) Functional testing of Security and Card Access Systems

h) Testing of Surveillance System

i) Sound Systems

j) Integrated systems testing involving architectural, mechanical and electrical system coordination such as elevators, vertical conveyance, smoke control and extraction, door operation, security system overrides.

k) As a minimum, meet standard CAN/ULC-S1001, Integrated Systems Testing of Fire Protection and Life Safety Systems.

37. POWER DISTRIBUTION AND SERVICE

37.1 General

.1 Harmonic Distortion and noise

a) Identify non-linear loads, including Uninterruptible Power Supplies (UPS's), computers, rectifiers, variable frequency drives, elevator systems (variable speed drives and/or regenerative systems) and electronic ballasts or Light-emitting diode (LED) drivers, and consider their effects on power distribution system. Meet IEEE 519, "Recommended Practice and Requirements for Harmonic Control in Electric Power Systems" at the utility Point of Common Coupling, and additionally at all power distribution equipment buses feeding electronic motor drives, UPS systems, or with more than 50% of load coming from computer equipment power supplies. Provide corrective measures as required.

.2 Uninterruptible Power System

a) Minimize battery requirements for UPS by feeding unit from emergency power system. Size UPS batteries for maximum 30 minute outage, except in special cases.

b) Provide local UPS to serve individual loads, or a centralized UPS system for groups of loads. As a minimum provide centralized UPS for IT equipment, Nurse Call and Security (i.e. Equipment located in Telecommunication Rooms).

c) Where larger centralized UPS is used, provide redundancy and a sectionalized load-side distribution system. The UPS shall have hot swappable components, i.e. all UPS components shall be capable of being replaced without interrupting power to the UPS loads.

d) UPS batteries shall be lithium-ion type unless VCH permits an exemption.

.3 Batteries for Standby Applications

a) Make standby battery provisions for:

i. Fire alarm system.
ii. Communication systems.
iii. Switchgear station power supply, if applicable.
iv. Engine-generator start-up.
v. Systems or equipment which requires uninterrupted service.
vi. Emergency lights and exit signs (only where generator power is not available or in electrical rooms with essential power distribution equipment, surgical suites, or other areas required by code).
vii. Operating room surgical lights (UPS power with battery-equipped unit lighting for ambient backup lighting)
viii. Gas shut off solenoid valves.

b) Provide maintenance-free, sealed lead acid batteries where discharge of hydrogen is not acceptable.

c) Maintain battery operating ambient temperature above 20°C.

d) Provide battery chargers with bulk charge overcharge protection and float charge features.

37.2 Single Line Drawings

.1 Provide electrical single line diagrams, as part of the Contract Documents, indicating the following:

a) Configuration, type, voltage and amperage ratings of switchgear, transformers, panelboards and motor control centres (MCCs).

b) Type, size and amperage ratings of services and feeders.

c) Type, frame size and trip rating of overcurrent protective devices.

d) Available fault current at switchgear, panelboards, transformer secondaries and overcurrent devices.

e) Service and distribution grounding.

.2 Arrange single line diagrams in a riser format, so that equipment on the lowest floors of the facility are shown at the bottom of the drawings and equipment is grouped to reflect which rooms it is located in. Show all equipment within a room on a single drawing if possible, and use clear drawing references to identify feeders connecting to equipment on other drawings.

.3 Provide copies of single line diagrams from Record Drawings, recording actual construction as built in both PDF, CAD, print and electronic versions.

.4 Incorporate into Operating and Maintenance (O & M) Manuals.

.5 Frame and hang in each major electrical equipment room, with equipment in the room highlighted.

.6 For existing buildings, any changes to the power distribution system is to be reflected on the original or latest building Single Line Diagram and a new Record Drawing provided with updated revision number and date. New Digital and paper copies to be updated for site Facilities Staff.

37.3 Protection and Control

.1 Ensure priority tripping and coordination of overcurrent and ground fault devices on feeders. Provide final consolidated trip curves for services sized 600 kVA and over and multi-building sites.

.2 Ensure adequate fault duty ratings of all switchgear, panels, MCCs and overcurrent devices. Provide calculation results for each as part of an up to date short circuit study.

.3 Provide all services and feeders with ground fault protection as required by the Canadian Electrical Code. Where ground fault protection is provided on services and feeders ensure protection is also provided for downstream feeders and loads that are susceptible to nuisance ground faults, including 400A and larger mechanical distribution boards and MCCs.

.4 Provide under voltage protection on Emergency system main breakers. Provide single phase motor protection using differential overloads or phase loss shutdown relays.

.5 For services over 750V, provide relaying using relay accuracy class CTs with test block and solid state relays with trip indication for each function.

37.4 Power Service

.1 Sizing

a) Provide detailed calculations for main services, transformers, and switchgear including a summary of connected loads, seasonal and overall demand factors applied, and spare capacity allowances. Include calculations at each major design milestone (SD, DD, CD).

b) Transformer and Entry

i. Service Entry:

1. Consult with the local Utility to provide the highest level of service reliability and discuss results with the Authority and the Project Manager.

2. Service entrance feeders entering the Facility, primary and/or secondary service, shall be installed below grade, in rigid conduit concrete encased.

ii. Location:

1. Owned Authority Primary Service: Dry Type transformers located indoors in the main electrical room.

iii. Transformer:

1. Make provisions for fan cooling on main service transformers in excess of 750 kVA

2. Size transformers for calculated capacity without the use of fan-cooling. Make use of fan-cooled rating of transformer in the design of system redundancy.

3. Secondary voltage (listed in order of preference):

a) 347/600V, three phase, four wire.
b) 120/208V, three phase, four wire.
c) 120/240V, single phase, three wire.

37.5 Switchgear, Switchboards, Distribution Panelboards, Motor Control Centres and Branch Circuit Panelboards

.1 Switching and Overcurrent Devices

a) Provide industrial duty, draw out type power circuit breakers, complete with electronic trip units and trip indication, for main service and feeders 600 Amps and over in new installations.

b) Fixed mounted with side access enclosure products may be used in existing facilities where space is a concern.

c) Use circuit breakers with maintainable contacts, complete with electronic trip units and trip indication for all main service or feeders 400 Amps and over and under 600 Amps.

d) Provide molded case thermal magnetic breakers (or solid-state type) for feeders under 400 Amps.

e) Provide metal clad switchgear with draw-out air or vacuum circuit breakers for all medium voltage equipment.

f) Obtain VCH approval for the use of metal enclosed switchgear with interrupter switches.

g) Obtain VCH approval for the use of fused equipment. (Consideration will only be given where fault duties of equipment require a limitation of the available fault current).

h) Breaker lifting equipment and remote racking features shall be provided for all drawout switchgear breakers.

.2 Bussing: Use solid copper.

.3 Metering: Provide panel mounted digital Owner's metering for all services, main transformers, CDPs and panelboards, as follows:

a) Meter to display true root means square (RMS) values for phase voltage (line to line and line to neutral), phase currents, kVA, kVAR, kW, PF, Hz, MWh, kW demand and kVA demand.

b) Provide networked meter data solution with sufficient storage to archive and easily access/download 15 minute interval data for all meter parameters for at least 10 years

c) For facilities with existing meter data aggregation systems, provide metering solutions that archive meter data in the same database and allow it to be accessed using the same software interface.

d) If the meter manufacturer has it available, models that include a disturbance direction detection feature shall be selected.

.4 Accessories: Provide lifting equipment for all industrial type draw-out breakers, medium voltage switches and stacked medium voltage starters.

.5 Working Clearances: As per Safety Codes Act.

.6 Housekeeping Pads: Provide all floor mounted equipment with a concrete housekeeping pad, minimum 89mm height, extending at least 25mm beyond the equipment enclosure

.7 Location: locate main service and distribution equipment in dedicated electrical room.

.8 Panelboards

a) Copper bussing.

b) Feeder and breaker ampacity feeding panelboards shall match the minimum ampacity of the panelboard they feed.

c) Breakers to be "bolt-on".

d) Maximum number of breaker positions in a single tub to be 42. Double wide is acceptable.

e) Do not use feed-through panel designs.

f) Avoid locating branch circuit panelboards in corridors or public spaces. Do not locate in Janitor Closets, Multi-purpose or Storage rooms.

g) Include completed Panelboard Schedules with anticipated demand for each circuit, using the VCH-provided template.

h) Panelboards are required to be located on the same floor as the loads they serve.

i) All doors to be lockable by means of a padlock. Any integral key locks must be approved and keyed in accordance with the Owner's requirements.

.9 600V Switchgear

a) Free standing, rigid, dead-front enclosure

b) Indoor construction of non-walk-in type conforming to CSA Type-1 suitable for use in a sprinklered area.

c) Will be designed, factory-assembled and tested in accordance with CSA C22.2 No.31-10 "Switchgear Assemblies"

d) Each vertical section to be divided into three compartments from front to rear:

i. Front compartment containing circuit breakers and/or auxiliary equipment
ii. Bus compartment in the middle
iii. Cable compartment at rear containing the bus extensions from breaker load terminals to cable terminals.

e) Main 600V Vital and Delayed Vital switchgear: Will be provided with motorized draw-out type power circuit breakers complying with ANSI/IEEE C37.13 at all main, tie, and outgoing feeder breaker positions and labeled to work continuously at 100% rated current. All vital or delayed vital power system breakers upstream of automatic transfer switches shall be of draw-out power circuit breaker switchgear construction.

f) Main 600V conditional and normal switchgear: Will be provided with motorized draw-out type power circuit breakers complying with ANSI/IEEE C37.13 at all main and tie breaker positions and labeled to work continuously at 100% rated current. All conditional or normal power system main or tie breakers upstream of automatic transfer switches shall be of draw-out power circuit breaker switchgear construction.

g) Drawout-style molded case circuit breakers shall not be used.

h) Circuit breakers 200A and larger will be equipped with solid-state protective relays with adjustable time and current elements for long time, short time, instantaneous, and ground fault pickup settings. The protective relays will also have integral digital metering capable of displaying voltage, amperage, kVA and kilowatt parameters and retaining the maximum recorded value of each parameter. The metering function of the circuit breaker trip units will be connected to the overall metering system and the building management system with all meter data transferred to a central archive and management repository, which can be viewed and analyzed from an onsite HMI, at minimum 15-min intervals.

.10 Colour coded lamacoid mimic bus single line diagram riveted on the front; and engraved lamacoid nameplates for cubicle and circuit identification on front and rear sections.

.11 The requirements for 600V switchgear in sentence (9) above are applicable to the following equipment:

a) The main 600V switchgear which are directly connected to the generator sets and which are located directly upstream of the automatic transfer switches, and

b) The main 600V switchgear which are located downstream of and directly connected to the automatic transfer switches, and which serve/feed the vital, delayed vital, conditional and normal power branches.

.12 Provide minimum one double-ended emergency 600V switchgear lineup. Connect so it will directly feed all automatic transfer switches and a permanent load bank or quick-connect terminals for portable load banks that can also be used for connection of a temporary generator.

.13 Switchgear and CDPs: Provide minimum 20% of overall space for future breakers.

.14 Motor Control Centres (MCCs): Provide minimum 20% of overall space for future use. In addition ensure each MCC can be extended a minimum of one vertical section for future use.

.15 Branch circuit panelboards: Provide minimum 10% spare breakers and minimum 10% prepared space for future breakers, with all components needed to connect future breakers either pre-installed or provided as spares. The number of spares shall be based on the total number of poles in the panelboard (rounded up), e.g. 5x1P breakers and 5x pole spaces in a 42-circuit panelboard.

.16 Recessed Panelboards

a) Provide a minimum of three 35mm empty conduits stubbed to ceiling pace per panelboard tub.

b) All doors to be lockable, with Owner approved hasp and lock system, with the hasp and lock provided by the contractor.

37.6 Dry Type Distribution Transformers

37.6.1 Location

.1 Locate distribution transformers on housekeeping pads in designated electrical rooms only.

.2 Transformers over 45 kVA: Floor mounted on vibration isolators. Allow for removal by wheel mounted equipment.

.3 Do not locate distribution transformers in ceiling spaces.

.4 Coordinate transformer heat removal with Mechanical.

37.6.2 Size and Type

.1 Three-phase delta-wye connected.

.2 Sized for continuous loading not to exceed 80% of nameplate kVA rating.

.3 Windings to be copper.

.4 Temperature rating of 150°C rise.

.5 Maximum 500 kVA.

.6 Equipped with four 2.5% taps; two above and two below nominal for voltage adjustment.

.7 Transformers serving a high percentage of receptacle loads feeding computer workstations shall be K-13 rated at a minimum.

.8 Provide harmonic mitigating transformers for installations which include greater than 5% total demand distortion (TDD) harmonic current content at full load.

37.6.3 Secondary Voltage (listed in order of preference)

.1 347/600V, three phase, four wire.

.2 120/208V, three phase, four wire.

.3 Other voltages only as required for specialized equipment (e.g. imaging, lab equipment).

.4 120/240V, single phase, three wire is not permitted, except in small non-acute care buildings or when used for specialized equipment

37.6.4 Acoustical Considerations

.5 Ensure adequate acoustic ratings, treatment, location and mounting of transformers and Generators

.6 Use flexible conduit connection to transformer for primary and secondary feeders. (Liquid tight flex conduit in wet areas).

37.7 Feeders

.1 Size feeders for a maximum 2% voltage drop from service entrance to branch circuit panelboard under full load conditions.

.2 Use copper conductors. Aluminum conductors are not permitted.

.3 Provide a bonding conductor and a full capacity neutral. Neutral may be omitted for 600V or 480V 3-phase, 3-wire systems.

.4 Provide double neutrals on panelboards or central distribution panels with 50% or more of their load from electronic power supplies

37.8 Power Factor

.1 Correct power factor to at least 0.95 lagging where normal loading yields a power factor of less than 0.90. Ensure power factor is not leading at any time.

.2 In cases where VFD's are not used for motors 10HP and larger, or for other loads with full load power factor below 0.9 provide fixed power factor correction capacitors at the load, on load side of starter where applicable. Fire pumps are excluded from this requirement.

37.9 Motor Protection and Control

.1 Group motor starters in common areas within mechanical or electrical rooms.

.2 Utilize motor control centres (MCCs) for groups of four or more motors that require individual motor starters. Provide individual enclosed motor starters for individual motors.

.3 Provide labelling on MCC's to match motors.

.4 Starters to be National Electrical Manufacturers Association (NEMA) rated.

.5 Do not use fuses for individual motor overcurrent protection.

.6 Provide single phase protection for all three phase motors either by relaying, or differential overloads.

.7 Variable Frequency Drives (VFDs):

a) Install bypasses for all VFDs 5HP or larger, or that serve critical functions.

b) For motors 10HP and above, provide reduced current starters or VFDs. Provide integral harmonic cancellation devices such as filters, to limit the THD within the values specified by IEEE 519. For the purpose of this requirement, the Point of Common Coupling (PCC), referred to in IEEE 519, will be the electrical distribution board, MCC or panelboard to which the variable speed drive is connected.

c) Whether supplied by the electrical or mechanical sub-trade, drives to be of six (6)-pulse, pulse-width modulation (PWM) type. Drives 30 HP and larger to be rated for 690V +/- 15%.

i. Provide minimum 5% iron core reactor (load side) built into all drive installations.
ii. Provide a 5% AC input line reactor for 5-20HP motors, or other means to reduce line-side harmonics by the equivalent amount.
iii. Provide a line-side passive harmonic filter for >20-100HP motors, or other means to reduce line-side harmonics by the equivalent amount.
iv. Provide an active filter for motors 100HP and larger.
v. Provide load side sine wave filters where applying VFDs to existing non-inverter-duty rated motors.

d) Provide drive rated (symmetrical) cable between drive and motor terminals in installations over 75ft; to obtain maximum benefit ensure this cable is correctly installed as per manufacturer's instructions.

e) Ensure that a harmonic digital simulation is completed to demonstrate that with the drives supplied, the limits set out in IEEE 519 are met.

37.10 Surge Protective Devices

.1 Provide surge protective devices (SPD's) either integral buss mounted or separate mounted on the distribution equipment. Coordinate suppression with anticipated energy levels and sensitive loads.

.2 Provide surge suppression in one of the following manners:

a) **Level 1** Install surge suppression on utility incoming mains.

b) **Level 2** For areas containing a large group of electrically sensitive loads, provide surge protection on panelboards serving the area.

c) **Level 3** Provide individual pieces of sensitive equipment, not otherwise protected, with local surge suppression module (computer power bar or wall plug-in style – not part of the construction budget).

.3 Coordinate surge protective devices within the same power distribution system.

.4 Provide, as a minimum, Level 1 SPDs in all buildings.

.5 Provide a disconnecting means for each surge protective device to allow servicing or replacement without an outage to the bus where it is connected.

37.11 Emergency Power

.1 General

a) With all emergency generators online, the generator capacityshall be sufficient to support the entire Facility electrical distribution system including cooling, with at least 10% of total capacity reserved as spare for future growth.

b) A load management system shall be provided to shed non-essential loads in priority sequence when one generator is out of service. At a minimum, EV charging, non-essential cooling systems and conditional loads must be included in a minimum of 4 sequential steps of similar size. Load management control system interface shall display recent peak loads to assist the operator in decision-making when manually restoring loads.

c) Exclude unrelated electrical and mechanical equipment from generator room.

d) Provide vibration isolation for generator control panel or remote mount from generator set skid.

e) Provide emergency power to mechanical loads as outlined in section 3.0 – Mechanical.

f) Emergency power availability / capacity study must be completed prior to any design that includes new loads on an emergency power branch.

.2 Criteria for generator installation

a) Specify a dedicated indoor, climate-controlled, fire-rated room.

b) Locate generator room away from noise-sensitive areas and as close to grade level as possible (to facilitate access), while being located above the flood construction level. Do not install generators below grade.

c) Locate transfer equipment and main emergency distribution in close proximity to (but not within) emergency generator room.

d) Where feasible, provide wired glass view between switchgear and generator room.

e) Skin tight, weatherproof enclosures are NOT acceptable. In certain instances, sound attenuated, environmentally controlled, walk-in enclosures may be considered upon review and approval of the Authority.

f) Make provisions at grade, in a location accessible by large trucks, for connection to a load bank to facilitate annual full load testing. Provide a permanent load bank for facilities with generation capacity over 1MW.

g) Provide a dedicated breaker for the load bank and single pole cam-type connectors in exterior mounted enclosure for temporary load bank connections.

.3 Generator Sizing

a) Generators shall be sized using Prime Power ratings.

b) The emergency power system will include a minimum of two (2) or more synchronized diesel generator units of equal capacity, each one capable of supplying power to 100% of the Vital branch and Delayed Vital branch load, with 25% or the prime kW rating reserved as capacity for future growth or optional conditional load.

.4 Acoustic Considerations

a) Provide hospital grade exhaust silencers.

b) Mount generator set on combination steel spring and neoprene vibration isolation.

.5 Transfer Equipment

a) Provide closed transition, soft load transfer design that meet one of the following design styles:

b) Draw out type automatic transfer switch complete with bypass isolation feature to allow servicing without the interruption of power.

i. Provide automatic transfer switch complete with two-sided by-pass.
ii. Select either three-pole or four-pole application based on project ground fault protection strategy.
iii. Shall have adjustable base load design for annual load test requirements.

c) Draw out air circuit breaker transfer scheme with bypass breakers for redundancy and servicing without the interruption of power.

i. Shall have interlocks and tie breaker to increase redundancy.
ii. Shall have adjustable base load design for annual load test requirements.

d) Provide elevator pre-transfer signaling feature for use in test mode, with manual bypass option for operators control choice.

e) Provide redundant elevator power sources so that at least one elevator in each bank remains available when any single power distribution component is de-energized for maintenance.

f) All above-grade elevator emergency power circuits shall have a 2-hour fire rating.

g) Make provisions for connections to an external load bank or generator to facilitate repairs and testing.

.6 Additional Considerations for the Emergency Power System

a) Identify load classifications (power branches) as:

i. Vital
ii. Delayed Vital
iii. Conditional
iv. Normal
v. UPS

b) Provide redundant power circuits to the mechanical systems described in Section 3.2.2 so that the systems can remain operational with any single electrical component de-energized for service. Redundancy can be achieve through the use of diverse power branches, tie breakers, or manual transfer switches.

c) Provide the means for cooling systems to operate during utility power outages such that safe building temperatures can be maintained for staff and the public, without significant oversizing of emergency generators to accommodate this load. Potential means to achieve this may include:

i. Using the generators' redundant capacity for cooling purposes, with chillers manually transferred to generator only when all generators are online and sufficient capacity exists.
ii. Providing conditional power to the chillers with load shedding schemes in place to trip chillers or lower setpoints as needed to maintain sufficient generator capacity for more critical loads.
iii. Providing an exterior quick-connect station to allow a portable generator to be brought to site to power the chillers.

37.12 Branch Wiring/Devices

.1 General

a) Use hospital grade receptacles for patient care areas and specification grade convenience receptacles.

b) Identify all receptacles as to panel and circuit number on plastic engraved lamacoid tag, permanently affixed to wall directly above device cover plate; tag to be same width as cover plate.

c) Use stranded copper conductors, minimum size #12 AWG, RW90 insulation, in EMT conduit for branch and feeder wiring unless otherwise noted.

d) Use stranded copper conductors for all control and extra low voltage wiring.

e) #12 AWG and smaller stranded conductors to use crimped ferrule ends for connections.

f) Aluminum conductors are not permitted.

g) Conduit shall not be cast into concrete slabs.

h) DB2 conduit shall be used in concrete below grade, Rigid PVC (unplasticized) shall be used for direct-buried conduit.

i) Liquid-tight flexible metallic conduit, TECK may be used for only the minimum length needed (maximum 3m) for final luminaire drops, transformer and motor connections.

j) Do not use non-metallic sheathed cable (NMD) or electrical non-metallic tubing (ENT).

k) Minimum size conduit to be 21 mm.

l) Maximum Circuits: Nine (9) in home run. Dedicated neutrals for all circuits and ensure grouping of circuits in home runs are as efficient as possible.

m) Provide a separate 20A circuits for countertops, coffee makers, refrigerators and microwave ovens.

n) Install a bonding conductor in all feeder and branch wiring conduits.

o) Reserve sufficient spare capacity in of home run conduits to allow the future installation of 25% additional current-carrying conductors with 25% additional cross-sectional conductor area, without resulting in the derating of the initially-installed conductors.

p) Switches and receptacles to be minimum specification/commercial grade.

.2 Provisions for Mechanical

a) Provide heat tracing for piping or connect immersion heater in accordance with the mechanical sections of this document.

b) Coordinate with the control system designer for interface with electrical systems such as lighting and fire alarm.

c) Coordinate UPS requirements for head end of BMS in consultation with Mechanical Consultant.

d) Where there is a three phase service, ensure motors larger than 0.5HP are three phase, and motors 0.5HP and smaller are single phase, 120V.

e) Review connection requirements for electric motor starters, drives and controllers provided packaged with mechanical equipment.

f) Coordinate fire suppression, smoke control and smoke extraction strategies.

38. LIGHTING

38.1 General

.1 Identify any specialized lighting requirements at the design development stage. The design should also consider maintainability of the lighting and control system, and be cautious with features available in industry.

.2 For reliability, consider mean time between failure and mean time to repair over many years. Consider whether additional or replacement devices will be available for the system during this time.

.3 Line voltage / stand-alone control components are preferred for locations with simple switching requirements. Automated lighting systems to be reviewed and approved by FMO.

.4 All lighting systems installed shall have local control for programming, a local service dept with a contract in place, and clinical users in the units shall be instructed on programming. FMO will not be responsible for programming changes and clinical area special requests.

.5 Lighting controls will be non-addressable. Where a Digital Addressable Lighting Interface (DALI) would achieve a required function, work with VCH for approval and for establishing the extent of the system. With technology and products changing quickly, availability of replacement components is a concern, so systems with DALI2 certification by DiiA are preferred to ensure multi-vendor interoperability.

.6 if DALI is approved for use, ensure the following functions are incorporated in consultation with FMO:

a) Remove any feature which can cause the operating room lighting to unintentionally jump to 100% brightness, for example, during Stage 2 fire alarm event, testing, or lighting card failure.

b) Ensure the user can adjust the lighting schedule in high acuity and light sensitive areas.

c) Ensure the lighting system does not unintentionally revert back to a default setting after the user makes changes to the schedule or the brightness.

.7 If a low voltage control system is to be provided, conventional relay-based low voltage control systems appear to be proven for maintainability for a building to last for many years.

.8 Only use the task-ambient approach where work surface and task orientations are predetermined and as agreed to by the Authority.

.9 Designs should be generally based on target illumination levels as described in the IES Lighting Handbook and CSA Z317.5. Where there is a conflict between the two standards, the higher lux levels shall be used.

.10 Designs shall be supported by reference to the appropriate section of the Handbook.

.11 Design to minimize direct and reflected glare.

.12 Design files shall include the following information which may be requested by the Province for review:

a) Complete a photometric plot showing illumination values on an appropriate grid scale to demonstrate compliance with IES recommended best practices.

b) Include tabular format of information summarizing the values provided and a description of design assumptions and recommendations.

38.2 Lighting Design Parameters

.1 Use the following criteria to select minimum average maintained values within spaces:

a) Visual Task: Medium contrast or small size

b) Occupants Ages: 25 to 65 years

c) Task Duration: Prolonged periods

d) Reflectance's: Coordinate with actual finishes

e) Maintained Values: Use the following criteria for calculation of maintained values:

f) Light loss factor: 0.90

.2 Determine the Interior and Exterior Lighting Power Densities and show compliance with current allowances as indicated in the National Energy Code.

38.3 Lightning Protection

.1 Provide lightning arrestors on all primary medium voltage services after vacuum breakers.

.2 Review requirements for need of a lightning protection system by completing a risk assessment as described in CSAB72, "Installation Code for Lightning Protection Systems".

.3 If lightning protection is required, provide details including plan drawings showing all rods, conductors, down drops and connection points.

38.4 Uniformity

.1 All areas in a space need not be to minimum average maintained values if functions permit.

.2 Lighting levels may be non-uniform. For example, circulation areas in an office may be of a lower level than recommended for the work surface.

38.5 Daylighting

.1 Use daylighting complete with sensor control, wherever feasible and provide detailed information in the Design Development Report.

.2 Provide an outline of how daylighting is to be integrated into the Facility, how automatic control is achieved, and how glare is controlled.

38.6 Interior Lighting Sources

.1 Only use sources which are readily available from local distributor's stock.

.2 Light-emitting diode (LED) type lighting shall be used throughout. Do not use incandescent, HID or compact fluorescent lamp sources, unless permitted by written permission by VCH.

.3 Colour Rendering Index (CRI) to be minimum 85. Generally Correlated Colour Temperature (CCT) to be 3500K. Minimum lamp life of 36,000 hours. (Rated Average Life – 12 hour start).

.4 For exit signs use LED type.

38.7 Diffusers

.1 Use framed diffusers in recessed luminaires wider than 305 mm.

.2 Use polycarbonate diffusers for exterior luminaires.

.3 High efficiency, low brightness diffusers are preferred in areas containing electronic work stations.

38.8 LEDs and Drivers

.1 Ensure LED lighting equipment meets the following specifications:

a) Luminaires must meet existing VCH site standards.

b) LED lighting shall be selected from production-proven models available at the time of construction and not prototypical or unproven technology.

c) LED luminaires shall have photometric data produced by an independent testing agency and tested in accordance with IES LM-79 Electrical and Photometric Measurements of Solid-State Lighting Products.

d) LED luminaires shall have test results produced by an independent testing agency and tested in accordance with IES LM-80 Measuring Lumen Maintenance of LED Light Sources.

e) LED drivers for exterior applications shall be suitable for operation to –40°C.

f) For interior linear LED lighting, include as a minimum, the following additional items:

g) Lumen maintenance as per IES TM-21-11 "Projecting Long Term Lumen Maintenance of LED Light Sources" to be minimum of 30,000 hours at L90, 60,000 hours at L80, or 90,000 hours at L70 for integrated LED luminaires, and 60,000 hours at L70 for non-integrated (LED ready) luminaires.

h) Provide a Colour Rendering Index (CRI) of 85 or higher. Generally, Correlated Colour Temperature (CCT) to be 3500K.

i) The luminaire must have replaceable drivers and LED arrays. For recessed fixtures, they must be serviceable from below.

j) Ensure that the manufacturer will have compatible LED arrays and drivers readily available from a local supplier for a minimum of 10 years.

k) Luminous efficacy of the source to be a minimum of 85 lumens per watt (delivered fixture lumens).

l) Dimming should only be provided where necessary. Review flicker implications throughout lighting levels for each driver type especially at lower levels. Flicker to be minimized. To help reduce flicker, consider Constant Current Reduction (CCR) instead of Pulse Width Modulation (PWM).

m) LED drivers for surgical suite lighting shall be located in remote cabinets (outside of surgical areas or the sterile core) to improve maintenance access and infection control.

38.9 Interior Lighting Control

.1 Lighting control to be a dedicated wired system. Do not use breaker switching.

.2 Use low voltage switching for all multiple circuits that require master control. Do not locate relays in ceiling space. Relays to be located in an enclosed panel in an electrical room/closet next to branch circuit panel.

.3 Provide switching for conference rooms, board rooms, groups of common offices and large areas common to a single user.

.4 Provide time clock or programmed switching for large general use areas.

.5 Provide motion sensor control for night lighting, exterior man doors and low use areas where economics are favourable.

.6 Minimize night lighting (un-switched lights) to main entrance, service entrances and key areas where interior lighting control switches are located.

38.10 Emergency Lighting and Exit Signs

.1 Where emergency power is not available, provide battery powered emergency lighting unit equipment.

.2 Unit equipment and circuiting to follow CEC 46-300.

.3 Provide battery powered emergency lighting units with a minimum one hour capacity in all electrical, generator and mechanical rooms.

.4 Integral battery power back-up ballasts/drivers in Luminaire is not acceptable.

.5 Exit signs to be LED type

38.11 Exterior Lighting

.1 Use LED type lighting. Use fully shielded (zero uplight component) luminaires with a CCT of 3000K or less for building exterior, parking, roadway and area lighting. Where possible select lower drive

current to increase LED life and reduce glare. Ensure luminance levels are controlled to help reduce glare for those viewing towards luminaires. The use of warmer color temperatures (eg. 2700K) is encouraged. Where color rendering is of less importance consider amber or narrowband amber LEDs.

.2 Use fully shielded, maximum 3000K CCT LED luminaires for all building exterior, parking, roadway and area lighting.

.3 Control of exterior luminaires shall be designed, as a minimum, with photo sensor "on/off" control. Consider supplementing this control with the use of motion sensors or programmed time control.

.4 Design to the latest IES standards, specifically refer to ANSI/IES RP-29 – Lighting for Hospitals and Healthcare Facilities.

38.12 Lighting Controls

.1 Provide patients or residents with control of the lighting environment in their rooms.

.2 Provide patient corridors with distinct levels to accommodate day, evening, and late night activities.

.3 Provide adjustable lighting control at Nurses' Station to suit time of day and activities.

.4 Design low ambient lighting level with task lighting for night shift.

38.13 Specific Requirements for Long Term Care Facilities

.1 Use the following criteria to select minimum average maintained values within spaces:

a) Occupants Ages: 65 years +

b) Use of fluorescent lights is discouraged

c) Provide opportunities for a min. of 1000 lux of light to residents early morning and late afternoon.

d) Provide easy access to outdoor daylight which remains visually available to residents from the main activity areas, as well as a window in their bedroom.

e) Consider a variable lighting design that varies both the intensity (lux) as well as the spectral wavelength during different times of the day. Increasing light exposure throughout the day and evening is likely to have the most beneficial effect on sleep and on circadian rhythms in patients with dementia. Low intensity dawn - dusk simulation (DDS), a 'naturalistic' form of light therapy designed to embed sleep in its accustomed phase, could improve the disturbed circadian rest - activity cycle, nocturnal sleep and/or cognitive functions in dementia.

f) Provide correct light spectrum during sunlight supplement periods. 509 nanometers (nm) has been found to produce the most significant reaction from the retinohypothalamic tract which controls the circadian rhythms. Fluorescent bulbs have different spectrum distributions. Lamps with a higher blue content (daylight 5600-6000k) for example are more circadian effective than warm white light.

.2 Light distribution must be kept even in hallways to prevent shadows that may cause falls.

.3 Lighting levels in resident communal areas shall be consistent, as uneven lighting levels between areas can create visual adjustment problems

.4 Lighting should be used to accentuate artwork and other wayfinding landmarks.

.5 Resident rooms shall have individual switches to control lighting.

.6 General illumination shall be provided at all entrance doors to resident accessible rooms (e.g. bedroom entrance doors).

.7 Provide easy access to outdoor daylight which remains visually available to residents from the main activity areas, as well as a window in their bedroom.

.8 Light Emitting Diodes (LED) as a light source are preferable for providing bright light environments LED's as a light source provide the best solution to vary both color as well as light intensity, thus can produce a light solution best tailored to support biological effects.

.9 Provide only a yellow amber night light at the floor level to assist care givers during late night supervision. Provide a gentle LED rope light lit path (or similar solution) to the resident washroom that is motion sensitive.

.10 In the evening use table lamps with a warm light, approximately 2700K

.11 Increase overall illumination levels to increase vision and contrast.

39. COMMUNICATIONS

39.1 General

.1 Communications infrastructure shall meet the latest version of the PHSA Information Management / Information Technology Services (IMITS) "Communications Infrastructure Standards & Specifications". Should a conflict arise between the design requirements of this OPR and the IMITS standards, IMITS requirements shall take precedence.

39.2 Electronic Security Systems (ESS) shall meet the latest version of the Lower Mainland Health Organizations Integrated Protection Services (IPS) Specifications [the latest version at the time of publishing is v3, revised September 1, 2022]Distributed Antenna System (DAS)

39.2.1 Intent

.1 A network of service antennas connected at intervals along shielded coaxial transmission lines and all connected to head-end electronics amplifying the signals to be distributed. Often refers to a system that includes both passive distribution system and active amplifying electronics.

39.2.2 References

.1 ANSI/BICSI-006-2015 Distributed Antenna System (DAS) Design and Implementation Best Practices

39.2.3 General Requirements

.1 The DAS will be an independent system that will support cellular, paging, and private two-way radio services.

.2 The DAS can be either passive, active, or a hybrid system having both passive and active segments.

39.2.4 Passive DAS

.1 Composed of standard and radiating coaxial cables in various diameters (such as 3/8", 1/2", 7/8", etc.), couplers and power splitters which are employed to branch the base station power to indoor type omni and/or panel antennas in remote locations.

39.2.5 Active DAS

.1 Composed of point to point optical fiber cables connecting one (1) or more local fiber optic interfaces located in the base station to one (1) or more AC or DC power operated active heads in remote locations. The remote active heads in turn are each connected to one or more antennas.

.2 Has an interface unit which converts RF signals to optical signals. This interface unit is typically co-located with the base transceiver station equipment. Optical fiber distribution is used to feed remote active heads which convert the optical signals back to RF signals which are then connected to individual antennas or to a small passive distribution system. Active systems may be multiband.

39.2.6 Operating frequency bands and RF levels

.1 The cellular services will operate in the LTE, HSPA and 5G bands offered by Bell, Rogers, and TELUS. The range of frequencies supported by the DAS will extend from the UHF band 450 MHz to 3800 MHz.

.2 The DAS will be configured to support operation of equipment in the following frequency bands

a) Public Safety 700 MHz
b) 700 MHz LTE
c) SMR 800 Mhz
d) 850 MHz Cellular
e) 900 MHz Land mobile radios
f) 1900 MHz PCS
g) 1700/2100 MHz AWS
h) 2600 MHz LTE
i) 900 MHz Paging

.3 The DAS will have capability to add new frequency bands in the future by adding expansion modules in the DAS hub without adding any new coaxial and fiber optic cabling, service antennas or fiber optic DAS remote units.

.4 Provide a design that all channels in every frequency band are in operation simultaneously and at maximum forward power. Signal levels will be better than -95 dBm in at least 95% of the coverage areas after DAS implementation.

39.3 Wired Panic Duress System

39.3.1 Intent

.1 Fixed panic duress in locations determined in consultation with the Authority so that staff will have ready access to initiate emergency assistance calls where their safety may reasonably be expected to be at risk.

39.3.2 References

.1 ADA UL/cUL Listed S7255 UL2017 UL294 CSA c22.2 No. 205

.2 ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices

.3 References in "General" subsection in "Communications" shall be consulted.

39.3.3 General Requirements

.1 Provide fixed, hard-wired, push-button panic/duress stations for staff and or public to initiate emergency assistance calls in designated areas.

.2 Provide fixed hard wired under counter panics buttons.

.3 Integration to either intrusion system or access control system will allow for monitoring and response protocols.

.4 Alarm notification will be received in multiple locations simultaneously including security office, security radios, and local audible and visual annunciators at staff workstations.

.5 The wired panic duress system will integrate with the video surveillance system to associate the device which is in alarm mode with the nearest camera to that device as it is activated. Those cameras will be displays as pop-up events on the security workstation in the facility security office. The cameras will record at the highest frame rate and resolution possible for a period of 30 seconds pre alarm to 90 seconds post alarm.

.6 The wired panic duress system will report the alarm through the access control system and display the exact location on a map and to the security radios which will announce the exact location using an alarm report integration in the radio system. Alarms will be addressable to pinpoint the location of the alarm.

.7 Panic buttons will be equipped with strobe light and alarm activation annunciation.

.8 All fixed panic buttons will be hard-wired, supervised for faults, suitably sized, and suitable for its environment.

.9 The exterior station enunciators shall be weatherproof and suitable for the environment.

.10 Alarm notification will be received in multiple locations simultaneously.

.11 The wired panic duress system will report the alarm location and time to the security desk.

39.4 Real Time Location Systems (RTLS)

39.4.1 Intent

.1 Location Services will be delivered through Real Time Location System that will be used to automatically identify and track the locations of tagged objects and people within the Facility.

.2 RTLS in a healthcare environment is often used in the following applications:

a) Patient Wandering

b) Object Tracking System

c) Infant Protection System

d) Wireless Staff Duress System

39.4.2 References

.1 Federal Communication Commission (FCC)

.2 FCC Part 15 – Radio Frequency Device

.3 Underwriters Laboratories (UL) UL-294 – Access Control System Units

39.4.3 General Requirements

.1 The RTLS will be server based and allow any Authority connected workstations to access the system for supervision, mapping and reporting purposes. System workstations to have the ability to program tags, enter new users, acknowledge alarms, and run reports.

.2 Design and install a complete RTLS solution for the Facility that does not utilise an 802.111 wireless network or the physical Authority network.

.3 The RTLS system will support multiple frequency modalities to utilize both active and passive tag technologies that accurately locates Patients, Staff, and/or equipment without interference. Such as Bluetooth low energy, Ultrawide Band, passive RFID, ultrasound.

.4 The RTLS solution will not negatively impact any of the Authority's wireless networks or other systems.

.5 Provide a complete structured cabling infrastructure that will allow the installation of the complete RTLS network, including receivers, repeaters, exciters, and keypads as applicable.

.6 The RTLS solution requires Seamless integration to the access control system to lock down doors and elevators as necessary to prevent Patient wandering.

.7 All programming by the manufacturer's authorized value added reseller (VAR) must be completed before commissioning of the building. The VAR will also be responsible for the programing of any RTLS tags/badges required during construction up until commissioning acceptance.

.8 Contractor to coordinate with elevator vendor, nurse call vendor, staff communication vendor, and access control vendors for system integrations.

39.4.4 RTLS Applications in Healthcare Facilities

.1 Patient Wandering

.1 The patient wandering system shall be able to monitor the location of patients that wear an active tag. Tag readers installed at specified locations will be able to determine the location of each tag in the system. Locations are presented on a map in the system software.

.2 The system shall monitor the entry and exit of tags through the creation of gates. Gates are doors, elevators or any entry way that is installed with system controlled hardware. The system shall be able to grant/deny/schedule access or raise a system alert based on tag assignment.

.3 The patient wandering RTLS system shall be integrated with the access control to automatically lock doors and hold elevators as patients approach to prevent unauthorized exist. The system shall also alert at the appropriate workstation of the alarm if a door is open and if the patient tag is in close vicinity of the doors or elevators.

.4 The patient wandering tag shall cause the RTLS system to generate an alarm under any of the following conditions

.5 Unauthorized exit through a gate.

.6 Tag's signal not detected by the system for a programmable time period.

.7 Tag's battery is low.

.8 Patient wandering tag shall be waterproof, programmable. The tag shall also incorporate a tamper detection mechanism that is enabled

.2 Wireless Staff Duress

.1 The wireless staff duress system shall be able to monitor the location of staff that wear an active tag. Tag readers installed at specified locations will be able to determine the location of each tag in the system. Locations are presented on a map in the system software.

.2 Staff are assigned active tags with push buttons that can be configured to raise a call or duress alert when pressed.

.3 The display unit shall operate the system when the server goes offline for RTLS. The display unit is to alert alarms from controllers and acknowledge alarms in offline mode.

.4 The wireless staff duress tag/badge shall cause the RTLS system to generate an alarm under any of the following conditions:

a. Buttons on the badge is pressed.
b. Badge/tag signal not detected by the system for a programmable time period.
c. Badge/tag battery is low.

39.5 Nurse Call

39.5.1 Intent

.1 The nurse call system will provide patient assist, code blue and staff assist functions in patient bedrooms and other locations as required by the Authority.

.2 All workflows are in collaboration with the Authority.

.3 System is tested and commissioned per UL1069 and manufacturer recommendations.

39.5.2 References

.1 Systems specified in this section will meet or exceed the requirements of the following:

a) UL-1069 Hospital Signalling and Nurse Call Equipment

39.5.3 General Requirements

.1 Nurse call system to be complete with all power supplies, control boards, patient stations, emergency call stations, code blue stations, staff stations, zone dome lights, duty stations, chime stations, master console stations, wire, cable, outlet boxes, software/firmware, and license to form a complete operating system.

.2 Provide a full feature audio and visual nurse call system with full duplex communication between nurse call consoles and half duplex communication between nurse call devices.

.3 Provide master console stations and annunciation panels that are individually programmable to allow multiple call classification and priority levels.

.4 Provide escalation of nurse call notifications to higher priorities if they are not answered.

.5 All code calls will be annunciated visually and/or audibly on/at the:

a) Workstation registration

b) Care team stations

c) Hallway marquees and associated tone stations

d) Room dome lights associated with call origin

e) Zone lights

f) Tone stations

.6 Overhead paging automatically through fire alarm speakers.

.7 Integrate into the existing hospital information system.

.8 Provided with HL7 standard interfaces.

.9 Provide a separate physical network, separate from the Authority's IMIT network.

.10 Provide standard operating procedures for each clinical workflow, and program the nurse call system to facilitate each standard operating procedure.

.11 Nurse call system supplier shall allow for system programming sessions to coordinate call classifications, system operation with the Authority.

.12 All wiring to be terminated in terminal strips or blocks, and to be neatly installed, laced and tagged where required.

.13 All terminals in terminal panels and junction boxes to be made with solderless connectors to terminal blocks with a separate terminal for each conductor.

40. FIRE DETECTION AND ALARMS

40.1 General

.1 Design the most effective fire alarm system to meet the Facility's requirements.

.2 Fire alarm system to be a dedicated physically isolated system that operates independently.

.3 System shall be designed and tested as per the regulations under the current Safety Codes Act.

.4 Use addressable technology in Class A circuit (Return Loop Circuit) wiring for initiating devices. Where loops are used for multiple fire alarm zones use Data Communication Link style C. Where fault isolation modules are used, they shall be addressable. Review capabilities of manufacturers' devices.

.5 Visible signal devices to be provided and synchronized.

.6 Provide static graphic mounted in frame securely fastened to the wall adjacent to annunciator at firefighter's entrance. Graphic to clearly show all fire zones, sprinkler valve locations, "You Are Here" indication, and a north arrow.

.7 Fire Alarm System zones to be shown on the fire alarm floor plans and graphic.

.8 Show all devices on floor plans which include relays, monitoring modules, booster panels, and fault isolation modules, etc. Isolation modules shall only be applied at locations where required.

.9 On record drawings, show the wiring routing path between each device for all devices.

.10 All devices shall be labelled on the external fixed portion of the device with applicable loop/address number or circuit number. Refer to Appendix A for identification requirements.

.11 Coordinate smoke duct detectors/sample tubes, quantity and location, with mechanical consultant to ensure air velocities and pressure differentials are compatible.

.12 Ensure all fire detectors are easily accessible for testing and maintenance, including duct smoke detectors and detectors in elevator shafts. Provide access hatches to allow elevator smoke detector testing without having to enter the elevator shafts.

.13 Program by-pass switches at central panel for ancillary device controls. Coordinate with requirements of user (e.g.; Smudging, mental health secure door control bypass, hallway door hold open bypass).

.14 Provide detailed Sequence of Operation for the Fire Alarm System and related ancillary systems, such as elevator homing, smoke control, fan shutdowns, release door magnetic type locks (if authorized in writing by FMO) and door holders.

.15 Coordinate fan shutdown and smoke control system design with Mechanical. For a basic system, both to be controlled by the Fire Alarm system. For complex systems, a dedicated control system may be required.

.16 Clearly indicate in the contract documents which edition of CAN/ULC S524 and CAN/ULC S537 is referenced for British Columbia. Refer to BC Building Code for edition reference, confusion can be remedied for the parties involved if they have the correct standard with them during construction and provide fair preparation for what the engineers expectations will be during verification.

.17 Record drawing showing all devices with addresses, loop numbers and wiring routing.

.18 All requirements of CAN-ULC S537,

.19 Other requirements as per the Safety Codes Act.

.20 Provide wiring diagram and sequence of operation on inside of fire alarm panel door or in a separate enclosure next to the panel. Clearly identify wiring at all panels and junction boxes identifying zone/loop numbers/etc.

.21 For 24 hour facilities without a 24 hour staffed command station:

a) Provide annunciation at each nursing station with summary information for entire Facility as well as the required patient room information.

40.2 Specific Requirements for Long Term Care Facilities

.1 Resident room doors should not have restrictive door closers.

.2 Fire alarm manual stations should be of the guarded type to deter accidental operation and vandalism.

41. ELECTRIC VEHICLE (EV) CHARGING

.1 EV charging stations shall meet the Lower Mainland Health Care Organizations (LMHO) EV Charging Station Design Specifications unless specified in this document.

.2 Use only models and features approved by VCH and their EV services provider.

.3 kW rating – All chargers must be capable of at least 6.24kW/30A per charger (continuous), load managed at the panel level with up to a 1:4 ratio for 7.2kW chargers (i.e. 1.8kW per charger when all chargers are in use to minimize the load), or a 1:3 ratio for chargers with lower power ratings. Circuit-level load sharing is not permitted as it does not optimize charging rates. EV charging panels shall be dedicated to EV charging circuits and equipped with a meter for demand and energy use.

.4 One out of every ten staff/public chargers shall be dedicated, non load-managed Level 2 AC chargers with a 10kW to 19.2kW output rating to accommodate people who need a significant charge during a short stay. Chargers rated 11.6kW (56A@208V) or under do not require a disconnect under CEC rule 86-304.

.5 Charge connectors to be SAE J3400 (NACS) type unless the Owner requires chargers with SAE J1772 or alternate connector types. Confirm final quantities and locations of each connector type and charger rating with Owner.

.6 All staff/public chargers to be capable of billing for usage and recording charge session data, with OCPP (open charge point protocol) capability, card payment processing, and load shedding/demand response functionality.

.7 The external connection needed for the specific chargers must have an Ethernet, Wi-Fi and cellular connection as standard. The charger shall be capable of networked or standalone operations.

.8 EV chargers to be on conditional power, except for chargers reserved for Ambulance or FMO vehicles (to be on delayed vital).

.9 Ambulance traction power and/or auxiliary power charging requirements to be coordinated between VCH and BC Ambulance Service.

.10 DC Fast Charging stations only required as directed by the Owner.

42. APPROVED MANUFACTURERS LIST (AML)

.1 This section is a work in progress, please email the FMO representative to request updates most industry standard, non-proprietary systems will be accepted.

.2 Only reputable original equipment manufacturers, preferably in North America, with a proven record will be acceptable. The Health Authority has evidence of high failure rate on certain products manufactured outside North America.

42.2 Electrical AML

Equipment	Manufacturer
Generators	MTU, Cummins, CAT
Generator Integration	IEM, ABB
Transfer Switches	Asco, Russelectric

Equipment	Manufacturer
High Voltage Switchgear and Service Entrance Equipment	Schneider, ABB, Prime
Protective Relays	SEL, Schneider-Square D
Low voltage equipment (including switchgear, MDPs, CDPs, panelboards)	Schneider, ABB
Fire Alarms	Simplex, Siemens
Lighting - Exterior	Signify, Bega, BK, AWL, Hubbell, Hydrel, Lithonia, Holophane
Lighting – Clinical and Patient Care Areas	Viscor, Newstar, Alva, HEW, Innerscene, Insight, Color Kinetics, Beta Calco, Selux, Nulite, Healthwerx, Cree, Kenall, Pinnacle, Amico, Paco, Hubbell, C3 Lighting, Balanced Care, CoeLux
Lighting – Back of House and Offices	Viscor, Signify, HE Williams, Vision Engineering, Healthwerx, Cree, Metalux
Lighting – Exit Signs and Emergency Battery Packs	Beghelli, Emergilite
Lighting – Low Voltage Control	Hubbell, Leviton, Philips
Lighting – Line Voltage Control	Douglas, Hubbell, Leviton
Metering	Schneider-Ion
Transformers	Delta, Hammond, Square D
UPS	Schneider-APC, Eaton-Powerware
Variable Frequency Drives	ABB
Power Studies	Schneider, Prime

END OF ELECTRICAL SECTION

May 2, 2024

Appendix A

CCDC Master Specification – Division 01

1.0 INTRODUCTION

The *CCDC Master Specification for Division 00 – Procurement and Contracting Requirement* was first published in 2018. This *CCDC Master Specification for Division 01 – General Requirements* supplements the Division 00 Master Specification. Both are based on the TEK·AIDs for Division 00 and 01 formerly published by Construction Specifications Canada (CSC). CSC formally requested that CCDC assume responsibility for the publishing and future updating of its Division 00 and 01 TEK·AID master specification. CCDC subsequently undertook to revise the CSC master specification to ensure compatibility with other CCDC publications and to reflect industry-wide consensus on current procurement and contracting best practices, with input from *Owners* and all CCDC constituent organizations.

The contribution of CSC in developing the forerunner to this CCDC publication, and in recognizing the industry-wide benefits of it becoming a CCDC publication, is gratefully acknowledged.

The standard text for both Division 00 and 01 is fully editable and is intended to be used as a tool for creating project specific procurement and contracting documents, and general requirements *Specifications*, for construction projects in Canada. Users are assumed to be procurement authorities, *Owners*, or their *Consultants*. Use of a CCDC standard form contract is also assumed.

The *CCDC Master Specification for Division 01 – General Requirements* is not necessarily comprehensive enough to address all Division 01 General Requirements that may potentially be required. Large, complex projects, or those with unique or special requirements, will no doubt require additional Div. 01 Sections or require additional provisions to be added to the master specification sections provided. It may be used with forms of contract other than those published by CCDC, and with other procurement methods, but will require more extensive editing to suit.

2. ORGANIZATION AND PRESENTATION

2.1 MasterFormat

The *CCDC Master Specifications for Division 00 and Division 01* are organized into Sections according to *MasterFormat*. *MasterFormat* is the North American standard that provides a master list of numbers and titles for organizing construction information in a standardized sequence. *MasterFormat* may be obtained at www.MasterFormat.com.

MasterFormat titles and numbers are organized into basic groupings of related construction information called divisions and sections. Each division is identified by a fixed number and title indicating the location of a primary element of the system, e.g. Division 01 – General Requirements. Within each division there are numbered sections. Each section covers one specific subject or a small group of associated subjects, e.g.
Section 01 11 00 - Summary of Work.

The inherent consistency and flexibility of this classification system allows for the organization and assembly of the written part of the *Contract Documents* in a numerical sequence that is universally recognized and understood in the North American design and construction industry.

2.1.1 Language, Terminology and Capitalization

The *CCDC Master Specification for Division 01* is written in the simple imperative grammatical mood, generally directed to the *Contractor*.Where applicable, the *CCDC Master Specification for Division 01* uses terminology consistent with defined terms in the CCDC standard forms of contract. These terms are capitalized wherever they appear.

2.1.2 Master Specification Conventions

Common master specification conventions including explanatory ***Spec Notes*** and square brackets are used to explain and identify optional text to facilitate editing, as described below.

3. EDITING

3.1 Editing - Generally

Like all master specifications, the *CCDC Master Specification for Division 01* is intended to be used selectively and edited for project specific use. First, by selecting the sections that will be applicable to a given *Project* and then editing those Sections to suit the needs of the user and the *Project*. To provide maximum editing flexibility, the master specification sections are published in MS Word format.

3.2 Spec Notes

Spec Notes are addressed to and intended to guide the user. They appear in a red text box to distinguish them from the master specification text itself. ***Spec Notes*** generally provide a brief introductory explanation of the intended use of each Section. Within the body of the Section they immediately precede the master specification article, paragraph, or sub- paragraph to which they pertain and they explain various options to assist the editing process. They also identify the need for coordination where coordination is required and provide other supplementary guidance information.

Ensure that all ***Spec Notes*** are removed as part of the editing process and do not appear in the final *Project Specification*.

3.3 Square Brackets

Square brackets appear at various locations within the text to indicate where the user must make project specific choices. Text enclosed within a single set of square brackets indicates that inclusion of that text is optional; it may be deleted or it may stand. Similarly, text enclosed within multiple sets of square brackets within the same paragraph indicates that more than one option is available; the unwanted option(s) must be deleted. Blank spaces enclosed by square brackets indicate that project specific or other optional text must be inserted at that location. Ensure that all square brackets are deleted in the editing process so that none appear in the final *Project Specification*.

All master specification text, whether or not enclosed in square brackets, can and should be edited to suit project specific requirements.

3.4 Paragraph and Page Numbering

Paragraphs and pages are numbered automatically within the word processing application. Nevertheless, check to ensure that proper sequential numbering has been maintained at each paragraph indent level following editing.

3.5 Other Editing Considerations

As part of the editing process, the header information in each master specification section should be edited to remove the edition date of the section and the “CCDC Master Specification” reference. Project specific identifiers should be substituted.

When adding new text in editing, use consistent terminology, including use of CCDC defined terms and ensure consistent capitalization. Follow good specification writing practices for all new text, including proper spelling and grammar (use the simple imperative mood). Maintain the “End of Section” convention to indicate the point where each section ends.

The Division 01 master specification contains some subject matter that is closely related to subject matter that is typically addressed in the Conditions of Contract in Division 00. The Division 01 master specification text has been carefully coordinated with the CCDC Conditions of Contract in this regard. Exercise caution when editing Division 01 sections to avoid creating duplication or conflict with the General Conditions in Division 00.
Division 01 can and should be used to add more detailed and complementary administrative requirements related to subject matter addressed in the General Conditions.

4. DISCLAIMER AND LIMITATIONS OF USE

The *CCDC Master Specification for Division 01* requires appropriate selection and editing of Sections to suit the requirements of individual users and their projects. Users are responsible for determining its suitability for a particular *Project* and for all necessary editing to suit. Not all matters and variations necessary for the procurement of construction services for a particular *Project*, on behalf of a particular user, in a particular locale, are necessarily addressed.

CCDC and its constituent organizations make no representations or warranties with respect to the accuracy or completeness of the master specification text and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose and shall not be liable for any loss of profit or any incidental, consequential or other damages arising from its use.

DIVISION 01 – GENERAL REQUIREMENTS

Section Number	Section Title
01 11 00	Summary of Work
01 11 20	Contract Assignment
01 11 22	Assignable Contracts
01 14 00	Work Restrictions
01 21 00	Allowances
01 25 00	Substitution Procedures
01 26 00	Contract Modification Procedures
01 29 00	Payment Procedures
01 31 19	Project Meetings
01 32 00	Construction Progress Documentation
01 33 00	Submittal Procedures
01 35 00	Special Procedures
01 35 73	Delegated Design Procedures
01 40 00	Quality Requirements
01 51 00	Temporary Utilities
01 52 00	Construction Facilities
01 56 00	Temporary Barriers and Enclosures
01 57 00	Temporary Controls
01 61 00	Common Product Requirements
01 71 00	Examination and Preparation
01 73 00	Execution
01 73 29	Cutting and Patching
01 74 00	Cleaning and Waste Management
01 77 00	Closeout Procedures
01 78 00	Closeout Submittals
01 79 00	Demonstration and Training
01 91 13	General Commissioning Requirements
01 91 26	Integrated System Testing

END OF SECTION

SPEC NOTE: This Section includes identification of the work of this Contract, work by others and work by the Owner that affects this Contract, Owner-supplied Products, as well as various other miscellaneous requirements not addressed elsewhere in the Contract Documents.

SPEC NOTE: As with all Division 01 Sections, ensure this Section is coordinated with the technical Specifications, Drawings, and the applicable General Conditions of Contract. This Section assumes use of a CCDC standard form contract and in particular CCDC 2 – 2020. If using a different CCDC contract or a non-CCDC contract, some of the provisions in this Section may be included in the General Conditions of Contract, in which case they should be deleted from this Section. Exercise caution when editing this Section to ensure that provisions of the General Conditions are not duplicated here unnecessarily and that no conflicts are created with the General Conditions.

1. DEFINITIONS AND WORK OF THE PROJECT

SPEC NOTE: Use this article when the Project involves multiple construction contracts. If work of this Contract must accommodate other future work, ensure that requirements such a structural provisions, utilities, areas of site to be kept clear, site preparation, etc. are addressed in the Drawings and Specifications.

1.1 Capitalized terms used in this Division 01 will have the meanings given to them in the General Conditions of Contract, and:

1.1.1 "**Authority Having Jurisdiction**" or "**AHJ**" means the government body responsible for the enforcement of any part of the Laws, standards or the official or agency designated by that body to exercise that function.

1.2 Work of the Project, of which Work of this Contract is a part, comprises the following:

1.2.1 Name: [ ]

1.2.2 Duration: [ ] [weeks]/[months]

1.3 Work of the Project includes the following separate contracts that have been or will be performed by others:

Contract No	Nature of works	Awarded to	Status of works
			Already complete
			Scheduled to be completed during the work of this Contract
			Comprises the Work of this Contract
			Has not been awarded

2. WORK OF THIS CONTRACT

SPEC NOTE: Use the following paragraphs to identify the Project name and location, including municipal address and Owner provided legal description if required. This paragraph is not intended to be a "scope of work".

2.1 Work of this Contract comprises the following:

[ ]

2.2 Municipal Address: [ ]

2.3 Legal Description: [ ]

3. SCHEDULE OF VALUES

3.1 The Contractor shall ensure that schedule of values submitted pursuant to GC 5.2.4 and 5.2.5

3.1.1 submitted in electronic format in the form of both [.pdf] and [.xls] files

3.1.2 the contents of the schedule shall include

3.1.2.1 Current MasterFormat divisional breakdown of the Works

3.1.2.1.1 Division 1 – General Requirements shall exclude the Contractor's Fee

3.1.2.2 Cash Allowances

3.1.2.3 Contractor's Fee

4. OUTLINE CONSTRUCTION PHASE HEALTH AND SAFETY PLAN

4.1 Submit the following information prior to the construction start off meeting:

4.1.1 Method statements on how risks from hazards identified in the pre-construction information and other hazards identified by the contractor will be addressed.

4.1.2 Details of the management structure and responsibilities.

4.1.3 Arrangements for issuing health and safety directions.

4.1.4 Procedures for informing other contractors and employees of health and safety hazards.

4.1.5 Selection procedures for ensuring competency of other contractors and designers for shop drawings.

4.1.6 Procedures for communications between the project team, other contractors and site operatives.

4.1.7 Arrangements for cooperation and coordination between subcontractors.

4.1.8 Procedures for carrying out risk assessment and for managing and controlling the risk.

4.1.9 Emergency procedures including those for fire prevention and escape.

4.1.10 Arrangements for ensuring that all accidents, illness and dangerous occurrences are recorded.

4.1.11 Arrangements for welfare facilities.

4.1.12 Procedures for ensuring that all persons on site have received relevant health and safety information and training.

4.1.13 Procedures for ensuring that all relevant persons on site have received the pre-requisite Infection Control training.

4.1.14 Arrangements for consulting with and taking the views of people on site.

4.1.15 Arrangements for preparing site rules and drawing them to the attention of those affected and ensuring their compliance.

4.1.16 Monitoring procedures to ensure compliance with site rules, selection and management procedures, health and safety standards and statutory requirements.

4.1.17 Review procedures to obtain feedback.

4.1.18 Obtains criminal record check including Subcontractors.

5. CONTRACT DRAWINGS

5.1 The contract drawings shall be the tender drawings updated for all tender addendums where applicable. Further drawings and documents may be added as deemed necessary by and at the discretion of the Owner.

6. OTHER DOCUMENTS

6.1 Other documents relating to the Contract but not included in the tender documents may be seen by appointment during normal office hours at the office of [ ]

6.2 The documents available for inspection include:

6.2.1 [Health and Safety File(s)]

6.2.2 [Existing mains and services drawings]

6.2.3 [Soils and ground water report]

6.2.3.1 [TheOwner does not warrant or accept any liability whatsoever for the accuracy of the reports. Notwithstanding this the Contractor must, before entering into a contract with the Owner, make or carry out all such enquiries and investigations as he deems necessary to check the accuracy of these reports]

6.2.4 [Site investigation report]

6.2.5 [Hazardous material report]

6.2.6 [Archaeology report]

7. DIVISION OF WORK

7.1 Division of the Work among Subcontractors and Suppliers is solely Contractor's responsibility. Consultant and Owner assume no responsibility to act as an arbiter to establish subcontract limits between Sections or Divisions of the Work.

7.2 Contractor shall provide a list with the details of all Subcontractors 'personnel and the sections or Divisions of the Work for which they will be responsible.

7.3 The list shall be provided prior to the construction start off meeting.

8. SPECIFICATIONS LANGUAGE AND STYLE

8.1 These specifications are written in the imperative mood and in streamlined form. The imperative language is directed to Contractor, unless stated otherwise.

8.2 Complete sentences by reading "shall", "Contractor shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.

8.3 Fulfill and perform all indicated requirements whether stated imperatively or otherwise.

8.4 When used in the context of a Product, read the word "provide" to mean "supply and install to result in a complete installation ready for its intended use".

8.5 The following terms used in the Specification shall mean:

8.5.1	Remove	Disconnect, dismantle as necessary and take out the designated products or work and associated accessories, fixings, supports, linings and bedding materials. Dispose of unwanted materials. Excludes taking out and disposing of associated pipework, wiring, ductwork or other services.
8.5.2	Fix	Unload, handle, store, place and fasten in position including all labours and use of site equipment.

8.5.3	Supply and fix	Includes all labour and site equipment for unloading, handling, storing and execution. All products to be supplied and fixed unless stated otherwise.
8.5.4	Keep for reuse	Do not damage designated products or work. Clean off bedding and jointing materials. Stack neatly, adequately protect and store until required by the Owner for use in the Works as instructed.
8.5.5	Make good	Match existing as stated below: execute local remedial work to designated work, make secure, sound and neat, excludes redecoration and/ or replacement.
8.5.6	Replace	Supply and fix new products matching those removed. Execute work to match original new state of that removed.
8.5.7	Repair	Execute remedial work to designated products. Make secure, sound and neat. Excludes redecoration and/ or replacement.
8.5.8	Refix	Fix removed products.
8.5.9	Ease	Adjust moving parts of designated products or work to achieve free movement and good fit in open and closed positions.
8.5.10	Match existing	Provide products and work of the same appearance and features as the original, excluding ageing and weathering. Make joints between existing and new work as inconspicuous as possible. Contractor shall take responsibility for ensuring that the prices include for all necessary site inspections and surveys to ascertain - inter alia - the nature, dimensions, kind, quality and composition of the material required for completing the works to the satisfaction of the Consultant.
8.5.11	System	Equipment, accessories, controls, supports and ancillary items, including installation, necessary for that section of the work to function.
8.5.12	Possession	Contractor assumes full responsibility for all aspects of the Place of Work as reflected in the drawings

8.5.13 Possession of Place of the Work: The date upon which the Contractor will assume full responsibility for the Place of the Work from all safety, security and insurances perspectives and begin construction of the Work or Section and will regularly and diligently proceed with and complete the same on or before the Ready-for-Takeover Date.

9. CONTRACT DOCUMENTS FOR CONSTRUCTION PURPOSES

9.1 Owner will supply Contractor with a complete set of Contract Documents in electronic form before commencement of the Work. Contractor may print hard copies for construction purposes as required.

9.2 [Owner will also provide Contractor with three (3) hard copy sets of Contract Documents for construction purposes. Additional hard copy sets shall be at Contractor's expense for the cost of printing, handling and shipping.]

9.3 The Contractor shall not rely on scaled dimensions for the purposes of installation and manufacturing

10. DATE FOR POSSESSION OF PLACE OF THE WORK

10.1 The date for possession of Place of the Work is [ ]

11. DATE FOR POSSESSION OF PLACE OF THE WORK

11.1 Date for possession of sections:

11.1.1 Section: _____ : Date: _____ .

11.1.2 Section: _____ : Date: _____ .

11.1.3 Section: _____ : Date: _____ .

12. DEFERMENT OF POSSESSION OF PLACE OF THE WORK

12.1 The maximum period of deferment is [ ] weeks

13. DEFERMENT OF POSSESSION OF PLACE OF THE WORK

13.1 Date for possession of sections:

13.1.1 Section: _____ : maximum period is [ ] weeks.

13.1.2 Section: _____ : maximum period is [ ] weeks.

13.1.3 Section: _____ : maximum period is [ ] weeks.

14. REQUEST FOR INSPECTION

14.1 The Contractor shall provide a minimum of [10] working days notice to the [Owner][and][Consultant] of the anticipated dates of inspection on whole or parts of the Work

15.

16. DOCUMENTS AT THE SITE

16.1 Keep the following documents at Place of the Work, stored securely and in good order and available to Owner and Consultant in [hard copy] [and] [or] [electronic] form:

16.1.1 Current Contract Documents, including list of contract Drawings, Specifications and addenda.

16.1.2 Change Orders, Change Directives, and Supplementary Instruction.

16.1.3 Reviewed Shop Drawings, Product data and samples.

16.1.4 Field test reports and records.

16.1.5 Construction progress schedule.

16.1.6 Meeting minutes.

16.1.7 Manufacturer's current literature and certifications for all products to be used in the Works.

16.1.8 Permits, inspection certificates, and other documents required by Authorities Having Jurisdiction.

16.1.9 Current as-built drawings.

16.1.10 Material Safety Data Sheets (MSDS) for all controlled Products.

16.1.11 Waste transfer documentation

16.1.12 [Daily register of security clearance status for all construction personnel accessing the site].

criminal record check

daily log

climate record

17. CONTRACTOR'S USE OF PREMISES

SPEC NOTE: If necessary, use Section 00 14 00 – Work Restrictions to specify details of additional restrictions on the Contractor's use of the premises.

17.1 Do not use Place of the Work for any purpose other than carrying out the Work. In the event of change, review and approve alternate routes, access routes cross reference to the application drawings

17.2 Except as otherwise specified in the above Section 11, the Contractor has unrestricted use of Place of the Work from time of Contract award until Ready-for-Takeover.

17.3 Details of Contractor's proposed site facilities location and any areas designated for the storage of building materials must be submitted to and approved in writing by the [Owner] [Consultant] before works commence. [Contractor's site organization staff must include one or more persons with appropriate knowledge and experience of mechanical and electrical engineering services to ensure compatibility between engineering and the Works generally]. Submit resumes or other documentary evidence relating to the staff concerned when requested.

17.4 Confine Construction Equipment, Temporary Work, storage of Products, waste products and debris, and all other construction operations to limits required by laws, ordinances, permits, and Contract Documents, whichever is most restrictive. Do not unreasonably encumber Place of the Work.

17.5 The Contractor shall provide the appropriate level of security for the Place of the Work at all times, having regard to the location and local conditions of the Place of the Work (including potential for criminal activity, weather, access points and the like)..

18. MANAGEMENT OF THE WORKS

18.1 The Contractor accepts responsibility for coordination, supervision and administration of the Works, including subcontracts.

18.2 In addition to the constant management and supervision of the Work provided by the Contractor's person in charge, all significant types of work must be under the close control of competent trade supervisors to ensure maintenance of satisfactory quality and progress. Provide maximum possible notice before changing either the person in charge or any trade supervisor.

18.3 Coordination shall mean arrange, obtain and monitor a schedule with each subcontractor, supplier, owner's FMO group, local authority and any Authority Having Jurisdiction and supply information as necessary for coordination of the work, including any required breaking into or connecting to existing services

18.4 The Contractor's person in charge, as formally identified at the start of construction, shall be responsible for and attend the Place of Work at all times when workers are within the Place of Work for purposes of supervision and to ensure all activities, as outlined in 01 11 00 Clause 5, are

complied with. In the event that the identified person in charge is unable to fulfil these responsibilities then the Contractor shall immediately notify and request approval from the Health Authority representative to change the person in charge which approval shall not be unduly withheld.

19. DAILY LOG

19.1 Keep a site daily log on a day-to-day basis which shall record all persons entering the site, the purpose of their visit and, in the case of work people, the work they were engaged upon with the number of hours spent on various operations shown separately and confirmation of criminal records check

20. CLIMATIC CONDITIONS

20.1 Take accurate records and retain on site of

20.1.1 daily maximum and minimum air temperatures (including overnight)

20.1.2 delays due to adverse weather, including description of the weather, types of work affected and number of hours lost

21. OWNER-SUPPLIED PRODUCTS

SPEC NOTE: Where applicable, include the Product specifications, the Owner's purchase agreement, or both, in the Bid Documents as information (see Section 00 31 00 – Available Project Information). Where applicable, include appropriate technical specifications for Owner-supplied Products to specify, as required, Shop Drawing review by Contractor, storage and handling, warranties, assembly on site, installation requirements, and all other provisions for which the Contractor is to be responsible, as fully as for any Contractor supplied Product. Use the following paragraphs to delineate basic responsibilities between Owner and Contractor that are applicable to all Owner- supplied Products.

SPEC NOTE: Use this article if the Owner will assume responsibility to supply Products to the Contractor for installation by the Contractor and there is no assignment of the Owner's purchase agreement to the Contractor. The Owner will procure, pay for, and arrange delivery of the Owner- supplied Products. The Products may also come from the existing facility in the case of a renovation, or from the Owner's storage elsewhere.

21.1 Owner Responsibilities:

21.1.1 Order and pay for Owner-supplied Products not already in Owner's possession.

21.1.2 Arrange and pay for delivery of Owner-supplied Products Free on Board (FOB) the site, within time frames required by Contractor's progress schedule. If delivered sooner than required by Contractor's latest progress schedule submitted to Owner, arrange and pay for delivery to a temporary storage location and subsequent delivery to the site.

21.1.3 Advise Contractor in writing of the value of Owner-supplied Products for Contractor's insurance purposes.

21.1.4 Arrange and pay for delivery to Contractor of reviewed Shop Drawings, Product data, samples, [and] manufacturer's installation instructions [, and].

21.1.5 Inspect deliveries jointly with Contractor.

21.1.6 Submit claims for transportation damage.

21.1.7 Arrange for replacement of damaged, defective or missing items identified at time of delivery.

21.1.8 Arrange for manufacturer's field services.

21.1.9 Arrange for delivery of manufacturer's warranties to Contractor for inclusion in operation and maintenance manual.

21.2 Contractor Responsibilities:

21.2.1 Designate in progress schedule, time frames for delivery of Owner-supplied Products to the site and for receipt of related submittals. If the site is not ready to receive delivery of Owner-supplied Products within the time frame indicated in the latest progress schedule submitted to Owner, arrange and pay for delivery to a temporary storage location and subsequent delivery to the site.

21.2.2 Review all required submittals and notify Consultant of any observed discrepancies or anticipated problems.

21.2.3 Ensure that course of construction insurance is adequate to cover Owner-supplied Products.

21.2.4 Receive and unload Owner-supplied Products at the [site] or [another location ie loading bay].

21.2.5 Inspect deliveries jointly with Owner. Record and notify Owner and Consultant of shortages and visibly damaged or defective materials.

21.2.6 Handle Owner-supplied Products at site, including uncrating and storage. Dispose of waste materials and debris.

21.2.7 Take appropriate precautions to protect Owner-supplied Products from loss or damage.

21.2.8 Repair or replace items damaged on site.

21.2.9 Assemble, install, connect, adjust, and finish Owner-supplied Products as specified.

21.2.10 Arrange for inspections required by Authorities Having Jurisdiction as specified.

21.2.11 Arrange for or perform testing as specified.

21.2.12 Workmanship warranty for installation.

21.3 Schedule of Owner-supplied Products:

SPEC NOTE: Provide a description of all Owner-supplied Products here. If the value of Owner-supplied Products is known, specify values here also, thus fulfilling the Owner's obligations under 1.9.1.3 above.

21.3.1 [ ].

21.3.2 [ ].

21.3.3 [ ].

END OF SECTION

SPEC NOTE: Include this Section ONLY in a contract that the Owner intends to subsequently assign to another contractor. For example, if an elevator contract is pre-bid several months before bids are called for the general (or prime) contract, and the elevator contract is subsequently to be assigned to the general (or prime) contractor when the general contractor is known, include this Section in the Bid Documents for the elevator contract only.

SPEC NOTE: This Section assumes use of a CCDC standard form of contract containing an assignment General Condition that permits the Owner to assign this Contract with the Contractor's written consent.

SPEC NOTE: Include Section 01 11 22 – Assignable Contracts in the contract that will receive the assignment of this Contract, for example, in the prime contract that will receive the assignment of the elevator contract.

SPEC NOTE: An assignment agreement signed by all three parties, that is by this Contractor, by the Contractor receiving the assignment of this Contract, and by the Owner, will be required to make the assignment legally effective. The assignment agreement will also provide the Contractor's "written consent" to the assignment that is required by the General Conditions for this Contract. The Owner should obtain legal advice in drafting the assignment agreement, an unsigned copy of which should be included in the both contracts, that is in this Contract to be assigned and in the contract that will receive the assignment. The assignment agreement is not provided as part of the CCDC Master Specification but it should be included in Division 00 as Section 00 73 26 – Assignment Agreement, in both contracts.

1.1 SUMMARY OF CONTRACTUAL RELATIONSHIPS

1.1.1 This Section specifies administrative provisions related to the exercise of Owner's right to assign the Contract to another contractor ("prime contractor").

1.1.2 Upon award of the Contract, Contractor shall execute an agreement with Owner for performance of the Contract.

1.1.3 [At a later date, Owner will enter into] [Owner has entered into] an agreement with prime contractor for performance of prime contract, the terms of which provide for the assignment of the Contract to prime contractor.

1.1.4 Owner intends to exercise its right under the Contract to assign the Contract to prime contractor, with Contractor's written consent by means of an assignment agreement in the form provided in Section 00 73 26 – Assignment Agreement.

1.1.5 Upon assignment of the Contract, Contractor shall become a subcontractor to prime contractor as set out in the assignment agreement.

1.2 PRIME CONTRACT AND PRIME CONTRACTOR

1.2.1 Name of Prime Contract: [ ]

1.2.2 Name of Prime Contractor: [to be determined upon award of the prime contract]

1.3 ASSIGNMENT OF CONTRACT

1.3.1 Project schedule calls for the prime contract to be awarded by [date]. Schedule is subject to change.

1.3.2 Contractor will be named as a "designated Subcontractor" and the Contract will be called an "assignable contract" in the contract documents for the prime contract.

1.3.3 The cost of the Contract will be included in the prime contract under a cash allowance. Prime contractor will, by the terms of the contract documents for the prime contract, be required to

accept an assignment of, and assume complete responsibility for, the Contract.

1.3.4 As soon after award of the prime contract as Owner considers practicable, Owner will assign the Contract to the prime contractor.

1.3.5 The assignment will be made legally effective by means of an assignment agreement, to be signed by prime contractor, Contractor, and Owner.

1.3.6 Owner will give Contractor at least [number][in words] Working Days' notice in advance of the effective date of the assignment.

1.3.7 Upon assignment, all monies payable to Contractor as of the date of the assignment and all other Owner's obligations under the Contract shall become obligations of prime contractor, subject to the terms of the assignment agreement.

1.3.8 [Ready-for-Takeover] of the Contract, if not attained before the assignment, will be delayed so as to be attained concurrently with the date of [Ready-for-Takeover] of the prime contract. Time of release of holdback for the Work of the Contract, commencement of warranty for the Work of the Contract, and other conditions of the Contract may therefore be affected and determined by the construction schedule for the prime contract, subject to the terms of the assignment agreement.

END OF SECTION

SPEC NOTE: Include this Section ONLY if this Contract will receive one or more contracts to be assigned to the Contractor for this Contract. For example, if an elevator contract is pre-bid several months before bids are called for the general (or prime) contract, and the elevator contract is subsequently to be assigned to the general (or prime) contractor when that contractor is known, include this Section in the Bid Documents for prime contract only.

SPEC NOTE: This Section assumes that Section 01 11 20 – Contract Assignment was included in the contract(s) that will be assigned to this Contract. For example, Section 01 11 20 should have been included in the Bid Documents for the elevator contract that is to be assigned to the Contractor for this Contract.

1. SUMMARY OF CONTRACTUAL RELATIONSHIPS

1.1 This Section specifies administrative provisions related to Owner's assignment of one or more other contracts (the "assignable contract(s)") to the Contract.

SPEC NOTE: An assignment agreement signed by all three parties, that is by this Contractor who is receiving the assignment, by the contractor whose contract is being assigned, and by the Owner, will be required to make the assignment legally effective. The assignment agreement will also confirm this Contractor's written consent to the assignment. The Owner should obtain legal advice in drafting the assignment agreement, an unsigned copy of which should be included in the both contracts, that is in the contract to be assigned and in this Contract that will receive the assignment. The assignment agreement is not provided as part of the CCDC Master Specification but it should be included in Division 00 as Section 00 73 26 – Assignment Agreement, in both contracts.

1.2 Owner has entered into one or more assignable contracts with one or more other entities ("designated subcontractors or suppliers") for performance of Work or supply of Products for the Project.

1.3 Owner intends to exercise its right under each assignable contract to assign such contract to Contractor by means of an assignment agreement in the form provided in Section 00 73 26 – Assignment Agreement.

1.4 Upon the assignment of each assignable contract, each designated subcontractor or supplier shall become a Subcontractor or Supplier to Contractor as set out in the assignment agreement.

2. ASSIGNABLE CONTRACTS AND DESIGNATED SUBCONTRACTORS/SUPPLIERS

SPEC NOTE: Identify in the following paragraphs the contract, the designated subcontractor or supplier, and the contact information for each contract that will be assigned to the Contractor.

2.1 Assignable contract : [name] with contract no. [ ]

2.1.1 Designated Subcontractor/Supplier:
Subcontractor/supplier Name: [name]
Address details: [address 1]
[address 2]

2.1.2 Contact details
Contact name: [ ]
Telephone No.: [ ]
Email address: [ ]

2.2 Assignable contract : [name] with contract no. [ ]

2.2.1 Designated Subcontractor/Supplier:
Subcontractor/supplier Name: [name]

	Address details:	[address 1	]
		[address 2	]
2.2.2	Contact details		
	Contact name:	[	]
	Telephone No.:	[	]
	Email address:	[	]

3. ASSIGNMENT

3.1 As soon after award of the Contract as Owner considers practicable, Owner will assign each assignable contract to Contractor.

3.2 Each assignment will be made legally effective by means of an assignment agreement, to be signed by Contractor, the designated subcontractor or supplier, and Owner.

3.3 Owner will give Contractor at least [5] [ ] Working Days' notice in advance of the effective date of the assignment.

3.4 Upon assignment, all monies payable to the assigned Subcontractor or Supplier as of the date of the assignment, and all other Owner's obligations under the assignable contract, shall become obligations of Contractor, subject to the terms of the assignment agreement.

4. CONTRACT DOCUMENTS

SPEC NOTE: Ensure that the contract documents for each assignable contract are disclosed to the Bidders for this Contract, by including them as available project information in Division 00.

4.1 Contract documents for each assignable contract are provided as information under the Contract. Refer to Section 00 31 00 – Available Project Information.

4.2 Upon assignment, the contract documents for each assignable contract shall become Contract Documents under the Contract.

5. CONTRACT TIME AND SCHEDULING

5.1 Refer to the contract documents for each assignable contract for contract time provisions for each assignable contract.

5.2 Coordinate scheduling with each designated subcontractor or supplier and incorporate each assignable contract into the construction schedule for the Contract, so as to achieve [Ready-for-Takeover], including the work of each assignable contract, within the Contract Time for the Contract.

6. CONTRACT PRICE AND COSTS

SPEC NOTE: Ensure that Section 01 21 00 – Allowances includes a cash allowance for each assignable contract, in the amount anticipated to be payable by the Contractor after the effective date of the assignment to the designated subcontractor or supplier.

6.1 Include the cost of each assignable contract as a cash allowance in the Contract Price for the Contract, as specified in Section 01 21 00 - Allowances.

END OF SECTION

SPEC NOTE: Use this Section, where applicable, to specify restrictions that will affect the Contractor's construction operations and use of the premises, including required work sequencing, restrictions resulting from full or partial occupancy of the premises by the Owner, Owner/Contractor responsibilities after partial Owner occupancy, restricted hours of work, noisy work restrictions, maintaining life safety systems, and similar such requirements. Where applicable, add additional articles to address other Owner and Project specific restrictions on the Contractor's work force at the work site, such as restrictions related to smoking, eating, dress, loud music, etc.

SPEC NOTE: Exercise caution when editing this Section to ensure that no conflicts are created with the General Conditions of Contract.

SPEC NOTE: Elaborate on specified requirements and show on Drawings extent of limits on use of premises in as much detail as may be required.

1. RESTRICTIONS ON USE OF PREMISES

1.1 Limit use of premises [for Work,] [for storage,] [and] [for access,] to allow;

1.1.1 Owner occupancy.

1.1.2 Partial Owner occupancy.

1.1.3 Work by other contractors.

1.1.4 Public usage.

1.1.5 [ ].

1.2 Coordinate use of premises under direction of [Owner] [Consultant].

2. ADJACENT BUILDING USES

2.1 The following adjacent or nearby uses or activities have been identified:

2.1.1 [ ]

2.1.2 [ ]

3. WORK SEQUENCE

3.1 The Contractor shall ensure that he is fully aware of and makes full allowance for the sequences and methods, etc., it is necessary to adopt for carrying out works of this scope, type and nature and in this location and within the timescales required, as no subsequent claim on the grounds of insufficient knowledge will be entertained. The Consultant is available for full discussions in this respect.

SPEC NOTE: Consider the following paragraphs when a specific sequence is required for the Work of this Contract. Edit as appropriate.

3.2 Schedule and construct Work in stages to accommodate Owner's [continued] [intermittent] use of premises during construction.

SPEC NOTE: Use the following paragraph only for work to which the public has access. Edit as appropriate.

3.3 Schedule and construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

3.4 Required stages:

3.4.1 [Refer to staging diagrams].

3.4.2 [ ].

SPEC NOTE: Select one of the following paragraphs as applicable.

4. OWNER OCCUPANCY

4.1 Owner will occupy premises during entire construction period.

4.2 Cooperate with Owner in scheduling operations to minimize disruptions and to facilitate Owner usage.

[OR]

5. PARTIAL OWNER OCCUPANCY

5.1 Schedule designated portions of Work for Owner's use prior to [Ready-for-Takeover] [Substantial Performance of the Work].

SPEC NOTE: List designated areas and any mandatory completions dates. Coordinate with designations on Drawings.

5.1.1 Designated Areas:

5.1.1.1 [ ], completed by [ ].

5.1.1.2 [ ], completed by [ ].

5.1.1.3 [ ], completed by [ ].

5.2 Owner will occupy designated areas for purpose of [storage of furnishings and equipment] [installation of equipment] [ ].

SPEC NOTE: Consider who will be responsible upon partial Owner occupancy for operation and maintenance of HVAC, electrical, and other systems, fire protection, utilities, security, insurance, work site safety, and other such matters.

5.3 Upon occupancy of designated areas, Owner will provide or be responsible for:

5.3.1 [ ].

5.3.2 [ ].

5.3.3 [ ].

5.3.4 [ ].

5.4 Upon occupancy of designated areas, Contractor will provide or be responsible for:

5.4.1 [ ].

5.4.2 [ ].

5.4.3 [ ].

5.4.4 [ ].

6. RESTRICTED HOURS OF WORK IN OCCUPIED FACILITIES

SPEC NOTE: Edit as required to suit Owner and Project specific requirements.

6.1 Work may not be performed [after] [during] Owner’s normal business hours which are [Monday to Friday]

[ ] from [8:00] [ ] to [05:00] [ ].

6.2 The contractor should assess the requirement for after-hours work based on the nature of the work and experience working in a fully operational hospital.

6.3 Request permission for after-hours work from the [Owner] [Consultant] by submitting details of dates, times, types and locations of work to be done at least [3] days prior to commencing this work. Do not commence work until permission has been granted.

6.4 Allow for hours of work restrictions in construction progress schedule.

7. EXPLOSIVES

7.1 The use of explosives is not permitted

8. NOISE CONSENT

8.1 Consent granted by the authority having jurisdiction relating to the Works may be implemented providing the following conditions are met:

8.1.1 The request for consent is endorsed by the Owner prior to submission to the authority having jurisdiction.

8.1.2 The provisions outlined in the Contract Documents shall remain in full force and effect and, in the event of a conflicting provisions, the Contract shall prevail.

8.1.3 [ ]

9. NOISE AND VIBRATION WORK RESTRICTIONS IN OCCUPIED FACILITIES

9.1 Schedule excessively noisy work to avoid disturbance to building occupants by performing excessive noise generating work outside of Owner's business hours.

9.2 Contractor is responsible for installation of vibration monitors to verify compliance with minimum vibration threshold

9.3 Noise levels from the shall not exceed [ ]dB(A) when measured from [ ]

9.4 Fit compressors, percussion tools and vehicles with effective silencers of a type recommended by manufacturers of the compressors, tools or vehicles.

9.5 Do not use

9.5.1 Pneumatic drills and other noisy appliances without the Owners consent during the hours of [ ] and [ ]

9.5.2 Radios or other audio equipment or permit employees to use in ways or at times that may cause nuisance

9.5.3 Use of power actuated devices.

10. PESTICIDES

10.1 The use of pesticides is not permitted

11. NUISANCE

11.1 The Contractor shall prevent nuisance from smoke, waste, vermin and other causes.

11.2 The Contractor shall prevent hazardous build-up of surface water on site, in excavations and to surrounding areas and roads.

12. ASBESTOS CONTAINING MATERIALS

12.1 The Contractor shall immediately report any suspected materials discovered during execution of the Works that are not reflected in the [ ] Report included in the tender documents.

12.2 The Contractor shall not disturb the suspected materials discovered pursuant to Section 12.1

12.3 The Contractor must comply with methods for safe removal or encapsulation of the materials as directed by hazmat consultant.

13. SMOKING/VAPING ON AND ADJACENT TO THE PREMISES

13.1 In accordance with the Owner's Smoke-Free Policy, smoking/vaping on Owner's premises is not permitted.

13.2 Smoking/Vaping is not permitted within one (1) residential/commercial block of Owner's premises unless on/in a Local Authority designated smoking area (where applicable)

14. BURNING ON SITE

14.1 The burning of any materials on site is not permitted without Owner's advance consent.

15. FIRE PREVENTION

15.1 The Contractor shall prevent personal injury or death, and damage to the Works or other property from fire.

16. MOISTURE

16.1 The Contractor shall prevent water/sewer ingress or wetness/dampness where this may cause damage to the Works and/or adjacent premises.

16.2 In the event of moisture occurring, the Contractor shall immediately dry out the Works by controlling humidity through the application of heat to prevent:

16.2.1 Blistering and failure of adhesion

16.2.2 Damage due to trapped mould inducing moisture

16.2.3 Excessive movement

17. INFECTED MATERIALS

17.1 The Contractor shall, where instructed, remove materials affected by fungal/insect attack from the Works in order to minimize the risk of infecting other parts of the Works and adjacent premises.

18. ELECTROMAGNETIC INTERFERENCE

18.1 The Contractor shall follow the shutdown protocol and prevent excessive electromagnetic disturbance to apparatus and medical equipment outside the site.

19. LASER EQUIPMENT

19.1 The Contract shall install, use and store construction laser equipment in accordance with the relevant regulations and the manufacturer's instructions.

19.2 The contractor shall ensure that any laser beam is not set at eye level and is terminated at the end of its useful path

19.3 The Contract shall not use laser equipment without the Consultant's approval and subject to the submission of an acceptable method statement on its safe use

20. MAINTAINING LIFE SAFETY SYSTEMS IN OCCUPIED FACILITIES

20.1 The Contractor shall maintain operational life safety systems and public access to exits in occupied areas during all stages of the Work.

20.2 The Contractor shall determine nature and exact locations of existing fire and smoke sensors prior to the commencement of the Work. Avoid direct or indirect jarring while working in adjacent areas and exercise caution to avoid triggering these devices.

20.3 The Contractor shall be responsible for costs incurred by Owner on account of false fire alarms activated as a result of the execution of the Work without adequate precautions.

SPEC NOTE: For occupied facilities, add additional articles as required to address maintaining building services, site or building access restrictions including security screening, parking restrictions, use of existing elevators and washrooms, and other Project specific restrictions. Coordinate with other Sections addressing temporary facilities, access roads, parking areas, traffic regulations, etc.

21. EXISTING BUILDING SERVICES

21.1 Details of existing services (which may include gas, water, steam, electricity, telecommunications, drains (foul and surface water), ducts, tubes, tunnels and the like) shown on drawings included in the contract documentation are indicative and are provided for information purposes only.

21.2 The Contractor shall, before starting work, check and mark positions of all existing services.

21.3 Obtain relevant details from service authorities, statutory undertakers or other owners. In the event relevant details are not available undertake a scan of the area using a method that provides the relevant information to ensure safe working conditions.

21.4 Identify existing services using markers and signboards that provide relevant information regarding type, width/depth or headroom.

21.5 Work adjacent to existing services shall be undertaken in compliance with service authority/statutory undertaker's recommendations by adequately protecting and preventing damage to the services.

21.6 The Contractor shall not tamper or interfere with the operation of any existing services.

21.7 If damage results from execution of the Work then the Contractor shall:

21.7.1 Notify the Owner and appropriate statutory authority or other owner

21.7.2 Make arrangements for the damage to be remedied without delay to the satisfaction of the statutory authority or other owner

21.8 Replace marker tapes or protective covers, if disturbed during execution of the Works, to the service authority's/statutory authority's recommendations.

21.9 [No material, tool and equipment shall be transported through corridors] or [Material, tool and equipment shall be transported through designated areas]

END OF SECTION

SPEC NOTE: Use this Section to specify cash allowances and contingency allowances. Both are sums of money that the Contractor is required to carry in the Contract Price, but when specified under a CCDC standard form contract, there are significant differences between them:

- A cash allowance is for something known to definitely be required but which cannot be specified with adequate detail to permit accurate pricing by the Contractor at the time of the bid call, or which otherwise needs to be deferred. However the cost of the item can be estimated and specified as a cash allowance amount in the contract. When more information subsequently becomes available to permit the item to be more accurately priced, the Owner approves expenditure of the cash allowance. A cash allowance excludes any amounts for the Contractor's overhead and profit related to the item. The Contractor must carry the overhead and profit separately in the Contract Price.
- ~~A contingency allowance is for something completely unknown. It may or may not ultimately need to be spent in whole or in part. In other words, a contingency allowance is an amount, carried in the Contract Price, which the Owner may use to pay for some or all changes in the Work. Unlike a cash allowance, the Contractor's overhead and profit, and all other costs for which the contingency allowances is to be used, are included in the contingency allowance amount.~~

SPEC NOTE: This Section assumes use of a CCDC standard form contract and unmodified Part 4 Allowances. Part 4 Allowances includes important provisions related to the administration of cash allowances and contingency allowances. This Section provides additional details and requirements related to allowances that are specific to the Project and to facilitate administration of this Contract. Exercise caution when editing this Section to ensure that provisions of the General Conditions of Contract are not duplicated here unnecessarily and that no conflicts are created with the General Conditions of Contract.

1. CASH ALLOWANCES FOR SUPPLY ONLY OF PRODUCTS

1.1 Amount of each cash allowance includes:

1.1.1 Cost of Products as invoiced by the Supplier, including delivery and applicable taxes but excluding Value Added Taxes.

1.2 Amount of each cash allowance does not include costs of the following items, which costs shall be included in the Contract Price and not in the cash allowance:

1.2.1 Unloading, handling and storage on site.

SPEC NOTE: Use this article to specify cash allowances where the allowance amount includes the cost of supply and delivery of the Product only, as invoiced by the Supplier. Installation and other related costs, including overhead and profit for the cash allowance, are included separately in the Contract Price.

1.2.2 Installation and all other related costs.

1.2.3 Overheads and profits related to the cash allowance.

SPEC NOTE: Specify the amount of the cash allowance and describe what it is intended to be used for. Reference the technical Specification Section in which the installation of the Product and other related requirements are specified (the cost of which is NOT included in the allowance amount).
Ensure that the technical Specification Section includes a reference back to this Section for the amount of the cash allowance. Do not specify the amount of the cash allowance more than once in more than one location. If more than one cash allowance for supply only of Products is required, repeat the following as necessary.

1.3 Allow the stipulated sum of $[ ] for the supply of:

1.3.1 [ ].

1.3.2 Refer to Section [ ] – [ ] for installation and other related requirements.

2. CASH ALLOWANCES FOR SUPPLY AND INSTALLATION OF PRODUCTS

SPEC NOTE: Use this article to specify cash allowances where the allowance amount includes the cost of the supply and delivery of the Product, its installation, and other related costs. The Contractor's overhead and profit for the cash allowance is included separately in the Contract Price.

2.1 Amount of each cash allowance includes:

2.1.1 All costs to provide the specified Products, including supply, installation, and related costs, excluding Value Added Taxes.

2.1.2 Subcontractor's and sub-Subcontractor's overheads and profits related to the cash allowance.

2.2 Amount of each cash allowance does not include Contractor's overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

SPEC NOTE: Specify the amount of the cash allowance and describe what it is intended to be used for. Do not specify the amount of the cash allowance more than once in more than one location. If more than one cash allowance for supply and installation of Products is required, repeat the following as necessary.

2.3 Allow the stipulated sum of $[ ] for the supply and installation of [ ].

2.4 When actual value exceeds Cash Allowance value, Subcontractor and Sub-Subcontractor's overhead and profit shall be the allowable % stipulated in the Supplementary Conditions to CCDC 2 2020 GC 6.1.3.1.

3. CASH ALLOWANCES FOR SERVICES

SPEC NOTE: Use this article to specify cash allowances where the allowance amount includes the cost of services only, for example, inspection and testing services to be paid for by the Contractor. The Contractor's overhead and profit for the cash allowance is included separately in the Contract Price.

3.1 Amount of each cash allowance includes:

3.1.1 All costs related to the services, excluding Value Added Taxes.

3.1.2 Subcontractor's and sub-Subcontractor's overheads and profits related to the cash allowance.

3.2 Amount of each cash allowance does not include Contractor's overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

SPEC NOTE: Specify the amount of the cash allowance and describe the services for which it is intended. Do not specify the amount of the cash allowance more than once in more than one location. If more than one cash allowance for services is required, repeat the following as necessary.

3.3 When actual value exceeds Cash Allowance value, Subcontractor and Sub-Subcontractor's overhead and profit shall be the allowable % stipulated in the Supplementary Conditions to CCDC 2 2020 GC 6.1.3.1.

3.4 Allow the stipulated sum of $[ ] for [ ] services.

4. **CASH ALLOWANCES FOR ASSIGNABLE CONTRACTS**

4.1 Owner has entered into assignable contracts, which will be assigned to this Contractor as specified in

SPEC NOTE: Use this article only if one or more assignable contracts are to be assigned to this Contract, as specified in Section 01 11 22 – Assignable Contracts.

Section 01 11 22 – Assignable Contracts.

4.2 Amount of each cash allowance includes the amount payable by Contractor to the designated Subcontractor after assignment of the assignable contract, excluding Value Added Taxes.

4.3 Amount of each allowance does not include the Contractor's overhead and profit, and other related costs, which costs shall be included in the Contract Price and not in the cash allowance.

SPEC NOTE: Specify the amount of the cash allowance and identify the assignable contract for which it is intended. Do not specify the amount of the cash allowance more than once in more than one location. If more than one cash allowance for assignable contracts is required, repeat the following as necessary.

4.4 When actual value exceeds Cash Allowance value, Subcontractor and Sub-Subcontractor's overhead and profit shall be the allowable % stipulated in the Supplementary Conditions to CCDC 2 2020 GC 6.1.3.1.

4.5 Allow the stipulated sum of $[ ] for the assignment of [].

5. EXPENDITURE OF CASH ALLOWANCES

SPEC NOTE: If a cash allowance for assignable contracts is the ONLY type of allowance specified, deleted this article.

5.1 Owner, through Consultant, will provide Contractor with documentation required to permit pricing of a cash allowance item.

5.2 Owner, through Consultant, may request Contractor to identify potential Suppliers or Subcontractors, as applicable, and to obtain at least three competitive prices for each cash allowance item.

5.3 Owner, through Consultant, may request the Contractor to disclose originals of all bids, quotations, and other price related information received from potential Suppliers or Subcontractors.

5.4 Owner, through Consultant, will determine by whom and for what amount each cash allowance item will be performed. Obtain Owner's prior written approval in the form of a Change Order before entering into a subcontract, amending an existing subcontract, or performing own forces work included in a cash allowance. Upon issuance of the Change Order, the Contractor's responsibilities for a cash allowance item shall be the same as for other work of the Contract.

END OF SECTION

SPEC NOTE: Use this Section to specify procedures relevant to the submission, review and acceptance of proposed substitutions after contract award. If substitutions will also be considered during the bid period, add appropriate content to Section 00 21 13 – Instructions to Bidders regarding substitution procedures during the bid period. Applicable parts of this Section may be referenced in the Instructions to Bidders.

1. DEFINITION

In this Section "Substitution" means a Product, a manufacturer, or both, not originally specified in Contract Documents by proprietary name but proposed for use by Contractor in place of a Product, a manufacturer, or both, specified by proprietary name.

2. SUBSTITUTION PROCEDURES

2.1 Substitutions to the manufacturers or vendors listed in Appendix [ ] (Acceptable Manufacturer and Vendors List) are not permitted without prior written acceptance from the Owner.

2.2 Contractor may propose a Substitution wherever a Product or manufacturer is specified by proprietary name(s), unless there is accompanying language indicating that Substitutions will not be considered.

2.3 Contractor may propose a Substitution wherever a Product or manufacturer is specified by proprietary name(s) and accompanied by language such as "or equal", "or approved equal", or other similar words. Do not construe such language as an invitation to unilaterally provide a Substitution without Consultant's prior acceptance in writing. Do not order or install any Substitution without a Supplemental Instruction or Change Order.

2.4 The Owner [and] [Consultant] will consider a proposal for substitution when the following conditions are satisfied. If the following conditions are not satisfied, the Owner [and] [Consultant] will return the proposal without action, except to record non-compliance with these requirements

2.4.1 Submission includes all of the information specified in this Section under Submission Requirements For Proposed Substitutions

2.4.2 The proposed substitution should not adversely affect the construction schedule.

2.4.3 The proposed substitution meets contractual obligations per consultant design and any coordinated components of the work, performance, building code and regulatory requirements.

2.4.4 The proposed substitution provides specified warranty.

2.4.5 If substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.4.6 The proposed substitution does not affect future expansion and functional clearances.

2.4.7 If the proposed substitution requires changes to the Work, such change will not result in additional costs or extension of time.

2.4.8 If the proposed substitution requires review or redesign services associated with re-approval by the governmental authority, such change will not result in additional costs or extension of time.

2.4.9 Maintenance and service parts and labour of the proposed substitution will be locally available for proposed substitution.

2.4.10 Function appearance, and quality of proposed substitution are equivalent or superior to specified item.

2.4.11 Manufacturer of proposed substitute product has capabilities comparable to the specified manufacturer, and

2.4.12 Provides a benefit to Owner.

2.5 If Contractor fails to order a specified Product or order a Product by a specified manufacturer in adequate time to meet Contractor's construction schedule, Owner [and] [Consultant] will not consider that a valid reason to accept a Substitution.

2.6 If Consultant accepts a substitution and subject to Owner's agreement, the change in the Work will be documented in the form of either a Supplemental Instruction or Change Order as specified in Section 01 26 00 – Contract Modification Procedures.

2.7 If a Substitution is accepted in the form of a Supplemental Instruction or Change Order, Contractor shall not revert to an originally specified Product or manufacturer without Consultant's prior written acceptance.

2.8 The [Owner] [Consultant] will notify the Contractor in writing of decision to approve or reject each substitution request. The [Owner] [Consultant] may, in its discretion:

2.8.1 Respond to indicate that the proposed substitution is acceptable;

2.8.2 Respond to indicate that the proposed substitution is acceptable subject to the Contractor's compliance with any conditions identified by the Owner;

2.8.3 Respond to indicate that the Owner does not consider the proposed substitution to be acceptable;

2.8.4 Respond to request clarification, further information or additional material; or

2.9 Substitution proposals will not be considered when they are indicated or implied on Submittals, without separate written request, or when acceptance will require revision to the Contract Documents. The Owner's [Consultant's] review of Substitution Proposal submittals does not constitute acceptance of substitutions.

2.10 Substitutions, if accepted by the Owner, will be undertaken by the Contractor at the Contractor's sole cost and expense.

3. SUBMISSION REQUIREMENTS FOR PROPOSED SUBSTITUTIONS

3.1 Include with each proposed Substitution the following information:

3.1.1 Identification of the Substitution, including product name and manufacturer's name, address, telephone numbers, and web site.

3.1.2 Provide a letter indicating the reason for proposing the Substitution and the expected **decrease** to the Contract Price and Project Schedule.

3.1.3 Manufacturer's Product literature for the Substitution, including product data sheets, material descriptions, drawings, compliance with applicable codes and reference standards, samples, performance and test data.

3.1.4 Investigate and document compatibility of proposed substitution with related equipment, materials and systems including environmental considerations. Engage a qualified testing agency to perform compatibility tests where documentation is not available.

3.1.5 A summarized comparison of the physical properties and performance characteristics of the specified Product and the Substitution, with any significant variations clearly highlighted.

3.1.6 .

3.1.7 Company specializing in manufacturing the proposed substitute equipment shall not have less than

three (3) years documented experience.

3.1.8 A copy of the manufacturer's warranty

3.1.9 Details of five (5) similar installations for projects completed at least 2 years prior to the date of submission where the Substitution has been used.

3.1.10 Executed Vendor/Manufacturer Sign-Off form (see Appendix [ ])

3.1.11 [If applicable, estimated life cycle cost savings resulting from the Substitution.]

3.1.12 [ ]

END OF SECTION

SPEC NOTE: Use this this Section to specify administrative procedures related to modifying the contract by means of Change Orders, Change Directives, and Supplemental Instructions, which are all defined terms in CCDC standard form contracts.

SPEC NOTE: This Section assumes use of a CCDC standard form contract and unmodified Part 6 Changes in the Work. Part 6 Changes in the Work includes important provisions regarding modifications. This Section provides additional details and requirements specific to the Project and to facilitate administration of this Contract. Exercise caution when editing this Section to ensure that provisions of the General Conditions of Contract are not duplicated here unnecessarily and that no conflicts are created with the General Conditions.

1. SCHEDULE OF LABOUR RATES

SPEC NOTE: The purpose of this requirement is to provide, at the outset of the contract, an agreed upon basis for valuing the labour component of all Change Orders, so as to eliminate the need to negotiate labour rates on each individual Change Order. It may be unnecessary for contracts where relatively few Change Orders with a labour component are anticipated. It is likely also unnecessary where a unit price or cost plus form of contract is used. Delete this article if not required.

1.1 Prior to the first application for payment, submit for the Consultant's review a schedule of labour rates for all trades and classifications of trades, such as journeymen, apprentices, and foremen that will be employed in the Work. Provide a breakdown of payroll burden component of labour rates.

1.2 Labour rates shall reflect the salaries, wages, and benefits paid to personnel in the direct employ of the Contractor, Subcontractors, and sub-Subcontractors, stated as hourly rates, that will be used when:

1.2.1 preparing price quotations for Change Orders, and

1.2.2 determining the cost of work attributable to Change Directives.

1.2.3 Labour rates stated in the schedule of labour rates shall be consistent with rates that will actually be paid, and payroll burden costs that will actually be incurred, in the normal performance of the Work, during regular working hours. Labour rates shall not include any additional overhead and profit component.

1.2.4 Where collective agreements apply, the labour rates shall not exceed those established by collective agreement.

1.2.5 Obtain the Owner's written acceptance of the schedule of labour rates before submitting the first Change Order quotation.

1.2.6 Accepted schedule of labour rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.

1.2.7 The Contractor may request amendments to the accepted schedule of labour rates if changes in the labour rates that will actually be paid, or payroll burden cost that will actually be incurred, in the normal performance of the Work can be demonstrated. Obtain the Owner's written acceptance of such changes.

2. SCHEDULE OF EQUIPMENT RATES

SPEC NOTE: The purpose of this requirement is to provide, at the outset of the contract, an agreed upon basis for valuing the equipment cost component of all Change Orders, so as to eliminate the need to negotiate equipment rates on each individual Change Order. It may be unnecessary for contracts where relatively few Change Orders with a significant equipment cost component are anticipated. It is likely also unnecessary where a unit price or cost plus form of contract is used. Delete this article if not required.

2.1 Prior to the first application for payment, submit for the Consultant's review a schedule of equipment rates for Contractor owned Construction Equipment.

2.2 Equipment rates shall reflect the rates that will be used when:

2.2.1 preparing price quotations for Change Orders, and

2.2.2 determining the cost of work attributable to Change Directives.

2.2.3 Equipment rates stated in the schedule shall be consistent with local equipment rental market rates and shall not include any additional overhead and profit component.

2.2.4 Obtain the Owner's written acceptance of the schedule of equipment rates before submitting the first Change Order quotation.

2.2.5 Accepted schedule of equipment rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.

2.2.6 The Contractor may request amendments to the accepted schedule of equipment rates if changes in local equipment rental market rates can be demonstrated. Obtain the Owner's written acceptance of such changes.

3. VALUATION OF CHANGES BASED ON AGREED UNIT PRICES

SPEC NOTE: Include this article only if it is anticipated that unit prices may be requested, after contract award, for the purpose of valuing changes. The benefit of agreeing on unit prices at the outset of the Contract is that it should reduce the need to individually negotiate acceptable rates and prices for each proposed change in the Work.

3.1 The Consultant may, at the outset of the Contract or at any other time, request the Contractor to submit unit prices anticipated to be required in valuing changes in the Work.

3.2 The Contractor shall submit such unit prices promptly upon request.

3.3 The unit prices shall be valid for a specified duration.

SPEC NOTE: The following sentence assumes that allowable percentage fees for overhead and profit are specified in this Section. See article 1.6. If article 1.6 is deleted, consider modifying this sentence to require the unit prices to include overhead and profit.

3.4 The unit prices shall exclude all fees for overhead and profit [and shall be subject to the percentage fees specified in this Section under Fees for Overhead and Profit – Change Orders].

3.5 The Consultant will evaluate the Contractor's quoted unit prices and, if accepted by the Owner in writing, the agreed unit prices shall be used to value subsequent proposed changes in the Work wherever they are applicable.

4. METHOD OF CONTRACT PRICE ADJUSTMENT - CHANGE ORDERS

SPEC NOTE: If CCDC 2 or CCDC 18 with a stipulated price is being used, select the following paragraph.

4.1 Unless otherwise agreed, the adjustment of the Contract Price on account of a proposed change in the Work shall be based on a quotation for a fixed price increase or decrease to the Contract Price regardless of the Contractor's actual expenditures and savings.

SPEC NOTE: Include the following paragraph only if the stipulated price contract also includes unit prices for parts of the Work, e.g. if Section 00 41 45 – Bid Form – Combined Stipulated and Unit Price was used.

4.2 If unit prices included in the stipulated price contract are applicable to the proposed change, the adjustment of the Contract Price shall be based on those unit prices, to the extent they apply. [If the actual quantities to which the unit prices apply vary from the estimated quantities by more than [ ]%, the unit prices shall be subject to negotiation.]

[OR]

SPEC NOTE: If CCDC 4 or CCDC 18 with Unit Prices is being used, select the following paragraph, which deals only with changes in the Work of a given Unit Price item, as described in the Drawings, Specifications or Schedule of Prices. Changes in quantity and unit price measurement should be addressed separately in Section 01 22 00 – Unit Prices (not included in CCDC Master Specification for Division 01).

4.3 Unless otherwise agreed, the adjustment of Unit Prices affected by a proposed change in the Work shall be based on a quotation for an increase or decrease to existing Unit Prices, or new Unit Prices, as applicable, regardless of the Contractor's actual expenditures and savings.

[OR]

SPEC NOTE: If CCDC 3 – Cost Plus Contract is being used, select the following paragraph.

4.4 If necessary and unless otherwise agreed, the adjustment of the Guaranteed Maximum Price (GMP) or the Target Contract Price on account of a proposed change in the Work shall be based on a quotation for an increase or decrease to the GMP or Target Contract Price. The increase or decrease shall include an adjustment to the Contractor's fixed fee, if any, as agreed by the Owner and the Contractor.

5. CHANGE ORDER PROCEDURES

5.1 Upon issuance by the Consultant to the Contractor of a proposed change in the Work, and unless otherwise requested in the proposed change or unless otherwise agreed:

5.1.1 Submit to the Consultant a fixed price quotation for the proposed change in the Work within [5] [ ] days after receipt of the proposed change in the Work.

5.1.2 If requested in the proposed change, provide a detailed breakdown of the price quotation including the following to the extent applicable, with appropriate supporting documentation:

5.1.2.1 Estimated labour costs, including hours and applicable hourly rates based on the accepted schedule of labour rates.

5.1.2.2 Estimated Product costs, including Supplier quotations, estimated quantities and unit

prices.

5.1.2.3 Estimated Construction Equipment costs.

5.1.2.4 Enumeration of all other estimated costs included in the price quotation.

5.1.2.5 Estimated credit amounts for labour and Products not required on account of the proposed change.

SPEC NOTE: Include following sentence only if percentage fees for overhead and profit are specified in this Section. See immediately following article.

5.1.2.6 [Fees, not exceeding the applicable percentages for overhead and profit as specified in this Section.]

5.1.2.7 Where applicable, Subcontractor quotations, also including a detailed breakdown of all of the above.

5.2 Include in the quotation the increase or decrease to the Contract Time, if any, for the proposed change, stated in number of days.

5.3 Include in the quotation the number of days for which the quotation is valid.

5.4 The quotation will be evaluated by the Consultant and the Owner and, if accepted by the Owner, be documented in the form of a signed Change Order.

6. FEES FOR OVERHEAD AND PROFIT – CHANGE ORDERS

SPEC NOTE: It is recommended that fees for overhead and profit included in Contractor quotations for Change Orders be established contractually by including this article and inserting appropriate percentages where required.

Refer to Supplementary Conditions to CCDC 2 2020 GC 6.1.3

7. METHOD OF CONTRACT PRICE ADJUSTMENT - CHANGE DIRECTIVES

7.1 Unless the Owner and the Contractor reach an earlier agreement on the adjustment to the Contract Price by means of a Change Order that cancels the Change Directive, the adjustment in the Contract Price for change carried out by way of a Change Directive shall be determined as specified in the General Conditions of Contract after the change in the Work is completed.

8. CHANGE DIRECTIVE PROCEDURES

8.1 If a Change Directive is issued for a change in the Work for which a proposed change was previously issued, but no Change Order has yet been signed, the Change Directive shall cancel the proposed change and any Contractor quotations related to that change in the Work.

8.2 When proceeding with a change in the Work under a Change Directive, keep accurate records of daily time sheets for labour and Construction Equipment, and invoices for Product and Construction Equipment costs. Submit such records to the [Owner] [and] [Consultant] [daily] [weekly], until the Change Order superseding the Change Directive is issued. All records must

8.2.1 Reference the Change Directive under which the work is authorized

8.2.2 Must be signed by the Contractor's person in charge as evidence that the names of the workers, the time daily spent by each and the equipment and products employed are correct.

8.3 Change Directive shall be submitted 10 Working Days before the completion of the Change Directive work.

9. FEES FOR OVERHEAD AND PROFIT – CHANGE DIRECTIVES

SPEC NOTE: Fees for overhead and profit on Change Directives are specified in this article separately from those allowable on Change Orders as specified in article 1.6. This is because the Contractor's fee for Change Directives must be specified in the Contract Documents, as referenced in GC 6.3 of the CCDC 2 General Conditions of Contract, whereas specifying fees for Change Orders is recommended but not essential. Specifying them separately also allows greater precision of language and greater clarity. If both articles are included, as recommended, the same percentages should be specified for both, for simplicity and ease of contract administration.

9.1 Refer to Supplementary Conditions to CCDC 2 2020 GC 6.1.3

10. SUPPLEMENTAL INSTRUCTION

10.1 The Consultant may issue Supplemental Instruction to provide clarifications to the Contract Documents, provide additional information, or make minor variations in the Work not involving adjustment in the Contract Price or Contract Time.

10.2 If the Contractor considers a Supplemental Instruction to require an adjustment in Contract Price or Contract Time, the Contractor shall promptly notify the Consultant and the Owner in writing within 5 Working Days and shall not proceed with any work related to the Supplemental Instruction pending receipt of a Change Order, a Change Directive, or a Notice in Writing of a dispute and instructions to proceed, in accordance with the Contract.

11. EXTENSIONS OF TIME

11.1 Together with a notice of delay required under GC 6.5, the Contractor will include details on any other concurrent delays.

11.2 The notice of concurrent causes should provide:

11.2.1 relevant particulars of the expected effects, if appropriate, related to the concurrent causes;

11.2.2 an estimate of the extent, if any, of the expected delay in the completion of the Work beyond the Ready-for-Takeover date; and

11.2.3 all other relevant information required by the Owner acting reasonably.

END OF SECTION

1. GENERAL

1.1 The Request for Information is a formal process used during the construction phase of the project to facilitate communication between the Contractor, Consultant and Owner with regards to requests for additional information about the content of the Contract Documents which is standard document submitted by the Contractor requesting information or clarification to the Drawings and Specifications.

1.2 This section defines the categories of requests and methods used to convey information between the parties reading the Contract Documents after execution of the Agreement.

1.3 Contractor will identify RFIs for two specific categories of request as follows:

1.3.1 Requests for Information (RFI(I)) concerning items required to perform the Work that

1.3.1.1 are not indicated on Drawings or contained in Specifications;

1.3.1.2 cannot be ascertained after Contractor has exhausted their due diligence to locate required information;

1.3.1.3 are not apparent in the Contract Documents or subsequent to site reviews performed by the Contractor

1.3.2 Requests for Clarification (RFI(C)) made in accordance with contractual obligations for Consultant's third party obligations for providing interpretations of the Contract Documents listed in Article A-3 of the Agreement

1.4 This section does not apply to:

1.4.1 enquiries and requests for clarification arising during the Bid Period which are considered as Enquiries defined in Division 00.

1.4.2 questions arising from

1.4.2.1 shop drawing

1.4.2.2 sample submittals

1.4.2.3 relating to product options or substitutions.

1.5 RFI's deemed proper, at the Consultant's sole discretion, will be considered by the Consultant

1.6 Consultant's response to an RFI has the same status as a Supplemental Instruction defined under the Contract.

2. DEFINITIONS

2.1 Proper RFI's contain the following:

2.1.1 Detailed written statements clearly stating the nature of the information or clarification requested.

2.1.2 Identify Drawings by drawing number, drawing name and location on the drawing sheet.

2.1.3 Identify Specifications by section number, section title, and listing page and paragraph numbers.

2.1.4 Site dimensions or conditions that are different from those indicated within Contract Documents and that affect request for information or clarification.

2.1.5 Contractor's suggested solution where request impacts construction means, methods, techniques, sequences and procedures, or as required for coordinating the various parts of the *Work*.

2.2 Improper RFI's contain requests for information that

2.2.1 Contain ambiguous language

2.2.2 Contain numerous errors

2.2.3 Contains incomplete information that does not identify specific components of the Drawings or Specifications

2.2.4 are sent to a party other than the Consultant.

2.3 Unnecessary RFI's contain requests for information that

2.3.1 Is apparent within the Contract Documents or reasonably inferable

2.3.2 Is apparent from site observations;

2.3.3 entails change of contractual responsibility

2.3.4 change of design

2.3.5 is vague or ambiguous

2.3.6 asks for a response to shop drawings and substitutions.

3. ADMINISTRATIVE REQUIREMENTS

3.1 Pre-Construction Meetings attended by the Contractor, the Consultant and Owner in accordance with Section 01 31 19 – Project Meetings must be convened by the Contractor to discuss the following:

3.1.1 Review the Consultant's RFI form and required content for timely response, limitations of content, categories of requests that will be considered as valid RFIs.

3.1.2 Review the Consultant's submission requirements, name and email address of primary contact and mode of transmission (fax, email, FTP site).

3.1.3 Review the Consultant's process for receiving, handling and responding to RFIs including the following:

3.1.3.1 In-House (Consultant) prime contact for accepting and dispersing RFIs, and out-source responsibility to Subconsultants and specialist consultants.

3.1.3.2 Confirmation of reasonable response times necessary to process and complete RFIs.

3.1.3.3 Electronic/digital project management software, submission processes and record keeping requirements.

3.1.4 Establish a baseline for reasonable quantities of RFI submissions based on project circumstances and complexities as well as methods for discussing adjustments to timeframes for processing requests during peak requests.

3.1.5 Review methods to resolve

3.1.5.1 complex issues arising from RFI process

3.1.5.2 methods for prioritizing critical responses

3.1.5.3 establishing mutually acceptable response times where multiple RFIs are issued.

3.2 Coordinate requirements for timely response period based on number or complexity of RFIs issued during the course of the Work:

3.2.1 Consultant will endeavor to respond within [5][….] Working Days or other time-frame agreed upon prior to issuing any RFI's

3.2.2 Consultant will request additional response time, which request will not be unreasonably withheld by the Contractor, where multiple RFIs are received within a short period of time.

3.2.3 RFIs received after 2:00 PM will be considered as received on the following Working Day.

3.2.4 Consultant's response may include a request for additional information from the Contractor, which will result in a mutually agreed upon increase to the time required to respond to the RFI.

3.2.5 RFI must state a date and time where need for response is different than indicated by the Consultant, or where greater urgency is required by the Contractor or Subcontractor.

3.2.6 Consultant's stated response time or other time proposed by Subcontractor or the Contractor does not represent a guaranty that RFIs will be addressed within the stated time period.

3.3 Contractor is responsible for preparing and maintaining a log of RFIs and providing a copy to the Consultant when requested indicating any unanswered, incomplete, or outstanding RFI's and

3.3.1 Use RFI Log during project meetings and identify an agenda point during regular site meetings to discuss status of pending and upcoming RFIs.

3.3.2 Consultant will maintain a similar record of responses to RFIs, indicating a log of actions or reasons for non-response based on definitions contained in this Specification section.

4. EXECUTION

4.1 Contractor's responsibilities include

4.1.1 Conduct pre-submission review of requests from Sub-Contractors, manufacturers and suppliers to confirm validity of the request

4.1.1.1 RFIs sent directly to Consultant, or Sub-Consultant, by Subcontractor, manufacturers and suppliers without the Contractor's prior review will not be accepted and will be returned unanswered.

4.1.1.2 RFIs sent directly to Sub-consultants by the Contractor will not be accepted and will be returned unanswered; unless agreed to before submission of RFI.

4.1.2 Indicate correct use of Interpretation or Clarification based on definitions listed above.

4.1.3 Determine urgency of each RFI and allow time in the schedule for the Consultant's or Sub-Consultant's response time as outlined in this section or include the RFI as a component of the next regularly scheduled project meeting

4.1.3.1 Consultant will endeavour to provide a response as a component of the meeting minutes.

4.1.3.2 Consultant may defer the discussion regarding coordination of complex or numerous RFI points to a special project meeting convened by the Consultant.

4.1.3.3 any schedule delay caused by a failure to allow sufficient response time will not constitute the basis for claiming additional time or cost

4.1.4 Prepare Consultant's standard RFI form by completely filling in all required fields and clearly stating the nature of the request and provide as part of the RFI

4.1.4.1 additional or covering information necessary to provide clarity to request in a timely manner

4.1.4.2 drawings or sketches, drawn to scale, indicating suggested solutions for coordination issues of items like pipe and duct routing, or clearances for other work shown diagrammatically requiring specific locations

4.1.4.3 Include requests from Subcontractors, manufacturers and suppliers as a part of Contractor submission.

4.1.5 Notify the Consultant immediately about any disagreement regarding Consultant's assessment of an RFI as Improper or Unnecessary and request a meeting to discuss

4.1.6 Notify the Consultant immediately about any concerns arising from Consultant's response that has potential to affect Contract Price or Contract Time.

4.1.6.1 Do not prepare RFIs with the anticipation that responses will automatically justify increased Contract Price or extensions to Contract Time.

4.1.7 Do not proceed with any work associated with the affected RFI until a Change Order is prepared and approved, or a Change Directive is issued where urgency for continuation of the Work dictates.

4.1.8 Claims for change to Contract resulting from a failure to identify affects to Contract Price or Contract Time within 10 Working Days from issue of response from Consultant will not be considered by the Owner.

4.2 Consultant's responsibilities include

4.2.1 Consultant will only respond to properly prepared RFIs by one of the following methods:

4.2.1.1 Directly on the submitted form or using additional attachments as appropriate to address concerns identified where no change to the Contract is anticipated.

4.2.1.2 Retaining original RFI and issuing a Proposed Change Notice where Contractor indicates that a change to Contract is required.

4.2.1.3 Respond by indicating that additional information or additional time is required to address the subject indicated in the RFI.

4.2.1.4 Completion of response will close the RFI.

4.2.2 Consultant will attempt to respond where content does not relate to means and methods for delivery of the Work

4.2.3 Consultant will return Improper and Unnecessary RFIs directly to Contractor unanswered with a notation "Not Reviewed" accompanied by specific reasons and/or follow-up action (where applicable) thereby closing the RFI.

4.2.3.1 Subject to Contractor notification, convene a meeting, outside of the regular scheduled project meeting, to discuss any disagreements regarding the Consultants assessment

END OF SECTION

SPEC NOTE: Use this Section to expand on the payment provisions provided in the General Conditions of Contract.

SPEC NOTE: This Section assumes use of a CCDC standard form of contract and unmodified Part 5 Payment. Part 5 Payment includes important contractual provisions. This Section provides additional details and requirements related to payment that are specific to the Project and to facilitate administration of this Contract. Exercise caution when editing this Section to ensure that provisions of the General Conditions of Contract are not duplicated here unnecessarily and that no conflicts are created with the General Conditions.

1. DATES OF APPLICATION FOR PAYMENT

1.1 The Contractor will submit an application for payment on the 28th day in each month or the nearest Working Day in that month.

1.2 The Contractor should submit the draft application for initial review by the Consultant a minimum of 3 working days prior to the established dates above.

2. SCHEDULE OF VALUES

SPEC NOTE: Include this article only for stipulated price contracts, that is CCDC 2 or CCDC 18 with stipulated price option. It may also be applicable to a unit price contact, that is CCDC 4, which may include lump sum items of work, in which case edit this article to suit.

2.1 Within [10] [15] working days following contract award, submit for Consultant's review an initial schedule of values. Modify the initial schedule of values if and as requested by Consultant. Obtain Consultant's written acceptance of the initial schedule of values prior to the first application for payment.

2.2 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of work performed and Products delivered to Place of the Work.

SPEC NOTE: Detailed requirements for the schedule of values may be specified in 1.1.3 below by simply referencing either CCDC 24 or a format to be provided by the Consultant or Owner.
Alternatively, detailed requirements may be specified without reference to any particular format, by using the more detailed text in 1.1.4 and following, edited as desired.

2.3 Provide the schedule of values in an electronic spreadsheet format based on [the format provided and content described in latest edition of CCDC 24 – A Guide to Model Forms and Support Documents] [a format provided by [Consultant] [Owner]].

[OR]

2.4 Provide the schedule of values in an electronic spreadsheet format that provides for inclusion of the following information:

2.4.1 Identifying information including title and location of the Work, name of Contractor, number and date of application for payment, and period covered by the application for payment.

SPEC NOTE: Select one of the following three paragraphs to specify the desired approach.

2.4.2 A work breakdown structure based on [Contractor, Subcontractor and sub- Subcontractor work] [Specification sections] [and material and labour] breakdown. [Include separate line items for

closeout procedures including closeout submittals, demonstration and training, start-up and testing, and commissioning [collectively valued at minimum [ ]% of Contract Price].]

[OR]

2.4.3 A work breakdown structure provided by [Consultant] [Owner].

[OR]

2.4.4 A work breakdown structure that is sufficiently detailed and comprehensive to facilitate Consultant's evaluation of applications for payment at an appropriate level of detail.

2.4.5 Provisions for approved Change Orders [allowances,] [unit price work] [and] [assignable contracts] so that the breakdown amounts indicated in the schedule of values aggregate to the current total Contract Price. Also provide for indicating the estimated value of Change Directives within the schedule of values, separately from the current total Contract Price.

2.4.6 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:

2.4.6.1 Breakdown Amount: A dollar amount, including an appropriate pro rata portion of Contactor's overhead and profit.

2.4.6.2 Performed to Date: The value of Work performed and Products delivered to Place of the Work up to the date of the application for payment, stated as a percentage of the Contract Price and in dollars.

2.4.6.3 Previously Performed: The value of Work performed and Products delivered to the Place of the Work for which payment has been previously certified, stated in dollars.

2.4.6.4 Current Period: The value of Work performed and Products delivered to Place of the Work for which Contractor is currently applying for payment, stated in dollars.

2.4.6.5 Balance to Complete: The value of Work not yet performed and Products not yet delivered to Place of the Work, stated in dollars.

3. CASH FLOW PROJECTION

3.1 Prior to commence the Work submit, for Consultant's review, a forecast of approximate gross monthly progress payments at the date of each monthly application for payment throughout the duration of the Contract Time based on the schedule for the Work.

3.2 Submit revised cash flow forecasts [when required due to significant changes in rate of progress of the Work or significant changes in the Contract Price] [monthly] [when requested by Consultant].

4. PAYMENT FOR PRODUCTS NOT INCORPORATED INTO THE WORK

4.1 At the time of each application for payment, supply details of those Products which are claimed for payment but not yet incorporated into the Work.

4.2 If requested, provide to the satisfaction of the Owner evidence of unencumbered title to such Products.

5. PAYMENT FOR PRODUCTS STORED OFF SITE

SPEC NOTE: This article does not entitle the Contractor to payment for Products stored off site, only that the Owner may consider such payment in extraordinary circumstances, subject to certain conditions being met by mutual agreement. Extraordinary circumstances may include lack of site space, essential to take delivery of Products well before they are needed, and other factors beyond the Contractor's control. If such circumstances are anticipated, consider specifying the conditions for making such payments, e.g. Consultant/Owner approval of and ready access to a secure storage location, insurance, assurance of legal ownership after payment, etc.

5.1 Owner may, at Owner's sole discretion, make payments for Products delivered to and stored at a location other than Place of the Work, subject to:

5.1.1 Submit reasonable evidence that the title in items stored off site to be included in an application for payment is vested in the Contractor.

5.1.2 Include for products purchased from a supplier

5.1.2.1 A copy of the contract of sale

5.1.2.2 A written statement from the supplier that any conditions of the sale relating to the passing of property have been fulfilled and the products are not subject to any encumbrance or charge.

5.1.3 Include for products purchased from a supplier by a subcontractor or manufactured or assembled by ant subcontractor

5.1.3.1 Copies of the subcontract with the subcontractor and a written statement from the subcontractor that any conditions relating to the passing of property have been fulfilled.

6. RELEASE OF HOLDBACK

SPEC NOTE: Use this article to specify detailed procedures for release of holdback. Depending on the applicable lien legislation, which varies in each province and territory, holdback can potentially be released upon completion of subcontracts, annually, on a phased basis (identify phases here if applicable) or after Substantial Performance of the Work. Where the applicable lien legislation allows options with respect to release of holdback, select and specify the desired option(s) here.

6.1 [ ].

6.2 [ ].

END OF SECTION

1. GENERAL

1.1 Contractor is responsible for shall be responsible for Mechanical and Electrical Coordination by providing a Consultant and Owner approved dedicated person, other than the Contractor's Project Manager, who shall be technically qualified and have extensive experience with coordinating complex hospital type of mechanical and electrical work required for this Project, for duration of construction work.

2. SUBMITTALS

2.1 Submit name, qualifications, and related experience of proposed Mechanical-Electrical Coordinator to the Consultant before any Work starts on site; Consultant reserves the right to reject any candidate that does not appear suitable for this Project.

2.2 Provide required coordination documents before submitting shop drawings, product data and samples in accordance with Section 01 33 00 – Submittal Procedures.

2.3 Preparation of Mechanical and Electrical Coordination Drawings specified in this Section form a part of the Contractor's Scope-of-Work and are specifically excluded from the Mechanical and Electrical Subcontractor's Scope-of-Work as follows:

2.3.1 Mechanical and Electrical Subcontractors shall allow for full assistance and cooperation with the Contractor in the provision of all required information for the assembly of Coordination Drawings.

2.4 Submission Requirements specified in this Section include

2.4.1 field coordination drawings for mechanical and electrical work above ceilings for all floor levels (including interstice, mezzanine, penthouse and mechanical and electrical rooms)

2.4.2 building cross sections indicating mechanical and electrical systems fully coordinated with

2.4.2.1 structural drawings and details

2.4.2.2 architectural finish components (e.g. ceilings, bulkheads, furring, casework and equipment)

2.4.2.3 ductwork, piping, conduit, and equipment in their intended locations

2.4.2.4 all other parts of the Work and highlighting potential interference between systems and building components

3. COORDINATION DOCUMENTS

3.1 Prepare Field Coordination Plan and Section Drawings indicating coordination for the following:

3.1.1 Installation of subgrade plumbing work.

3.1.2 Installation of above ceiling mechanical and electrical work coordinated with the structure and architectural ceiling heights for efficient use of available space, for proper sequence of installation, and to resolve interferences.

3.1.3 Scale for drawings:

3.1.3.1 Plans: Not less than 1:50 metric.

3.1.3.2 Sections: Not less than 1:20 metric.

3.1.3.3 Details: Not less than 1:10 metric.

3.1.4 Clearly indicate changes to the location, direction, route or grade of mechanical and electrical work shown in the Contract Documents that are required or necessary arising from the coordination of the Work.

3.1.5 Reproduce and distribute copies at Coordination Meeting to each concerned party in accordance with Section 01 31 19 – Project Meetings.

3.1.6 Update and revise as necessary after each Coordination Meeting.

3.2 Maintain coordination documents throughout construction period, recording changes arising from modifications and adjustments; submit finalized coordination documents after completion of Project in accordance with Section 01 10 00 – Owners General Requirements.

END OF SECTION

SPEC NOTE: Use this Section to specify requirements for project meeting. If there is a need to expand the content of this section to address other project management and coordination matters, change the section number and name to Section 01 31 00 – Project Management and Coordination.

1. CONSTRUCTION START-UP MEETING

1.1 Promptly after Contract award, [Consultant will] [Contractor shall] establish the time and location of a construction start-up meeting to review and discuss administrative procedures and responsibilities. [Consultant will] [Contractor shall] notify [Contractor] [Consultant] at least [5] [_] Working Days before the meeting.

1.2 Senior representatives of Owner, Consultant, [subconsultants,] and Contractor, including Contractor's project manager and site superintendent, [and major Subcontractors,] shall be in attendance.

1.3 [Consultant's] [Contractor's] representative will chair the meeting and record and distribute the minutes.

SPEC NOTE: Edit the following paragraph to suit project requirements. The recommended agenda items generally follow, in order, the subject matter specified in Div. 01 of the Specifications.

1.4 Agenda will include following:

1.4.1 Appointment of official representatives of Owner, Contractor, Subcontractors, Consultant, and sub-consultants.

1.4.2 Project communications.

1.4.3 Contract Documents for construction purposes.

1.4.4 Documents at the site.

1.4.5 Contractor's use of premises.

1.4.6 Owner-supplied Products.

1.4.7 [Assignable contracts.]

1.4.8 Work restrictions.

1.4.9 [Cash allowances.]

1.4.10 [Substitution procedures.]

1.4.11 Contract modification procedures.

1.4.12 Payment procedures, including monthly progress claim submissions

1.4.13 Construction progress meetings.

1.4.14 Contractor's Progress Reports

1.4.15 Construction progress schedule, including long lead time items.

1.4.16 Submittals schedule and procedures.

1.4.17 [Special procedures.]

1.4.18 Delegated design procedures

1.4.19 Quality requirements, including testing and inspection procedures.

1.4.20 Contractor's mobilization.

1.4.21 Temporary utilities.

1.4.22 Existing utility services.

1.4.23 Construction facilities.

1.4.24 Temporary barriers and enclosures.

1.4.25 Temporary controls.

1.4.26 Field engineering and layout of work.

1.4.27 Site safety.

1.4.28 Site security.

1.4.29 Cleaning and waste management.

1.4.30 Closeout procedures and submittals.

1.4.31 [Commissioning].

1.4.32 Contractor's daily dairy log.

1.4.33 Inclement weather conditions (heavy rain protection of the Site).

1.4.34 Other items.

2. CONSTRUCTION PROGRESS MEETINGS

2.1 Schedule regular [weekly] [bi-weekly] [monthly] construction progress meetings for the duration of the Work. [Contractor shall] [Consultant will] prepare meeting agendas, chair the meetings, and record and distribute the minutes.

2.2 Arrange for and provide physical space for meetings.

2.3 [Contractor shall] [Consultant will] record in the meeting minutes significant decisions and identify action items and action dates by attendees or the parties they represent.

2.4 [Contractor shall] [Consultant will] distribute copies of minutes within [three] [ ] Working Days after each meeting to meeting attendees and any affected parties who may not be in attendance.

2.5 Ensure that Subcontractors attend as and when appropriate to the progress of the Work.

2.6 Agenda for each meeting shall include the following, as a minimum:

2.6.1 [Approval of minutes of previous meeting.]

2.6.2 Contractor's report regarding

2.6.2.1 Work progress since previous meeting.

2.6.2.2 Field observations, including any problems, difficulties, or concerns.

2.6.2.3 Construction progress schedule.

2.6.2.4 Monthly progress claims.

2.6.2.5 Submittals schedule.

2.6.2.6 Proposed changes in the Work.

2.6.2.7 Requests for information.

2.6.2.8 Labour and Equipment Returns reflecting

2.6.2.8.1 Number and description of all tradesmen, labourers and other persons

employed on or in connection with the Works, including those employed by subcontractors

2.6.2.8.2 Number, type and capacity of all mechanical and power-operated equipment employed in constructing the Works

2.6.2.9 Site safety issues.

2.6.2.9.1 If requested, provide copies of site attendance records within 24 hours.

2.6.3 Consultant's Field Reports

2.6.4 Stakeholder issues

2.6.4.1 FMO

2.6.4.2 Clinical

2.6.5 Contractor's daily diary log

2.6.6 [Stat on inclement weather conditions (heavy rain protection of the site)]

2.6.7 Other business.

3. CONTRACTOR'S SITE MEETINGS

3.1 Hold meetings with appropriate subcontractors and suppliers shortly before main progress meetings to facilitate coordination and accurate reporting of progress.

END OF SECTION

SPEC NOTE: This Section assumes use of a CCDC standard form of contract and unmodified Construction Schedule provisions in Part 3 Execution of the Work. The General Conditions of Contract include important provisions related to the construction schedule. This Section provides additional details and requirements specific to the Project and to facilitate administration of this Contract.
Exercise caution when editing this Section to ensure that provisions of the General Conditions of Contract are not duplicated here unnecessarily and that not conflicts are created with the General Conditions.

1. SUMMARY

1.1 This Section specifies Contractor's responsibilities for preparation and submission of schedules and other documentation related to tracking construction progress.

1.2 The purpose of submitting progress schedules is to:

1.2.1 inform Owner and Consultant of actual progress versus planned progress, and

1.2.2 provide assurance that scheduling issues are being proactively identified and addressed in a timely manner, and that planned progress is being maintained as closely as possible.

2. CONSTRUCTION PROGRESS SCHEDULE

2.1 Format and Content:

SPEC NOTE: If the Contractor is required to use particular scheduling software, specify in the following paragraphs.

2.1.1 Prepare schedule in the form of a Critical Path Method (CPM) Gantt chart using software that is approved as compatible with Owner's software.

2.1.2 Provide a work breakdown structure identifying

2.1.2.1 each activity with earliest and latest start and finish dates

2.1.2.2 all critical activities

2.1.2.3 work packages

2.1.2.4 major milestones

2.1.2.5 long delivery Products

2.1.2.6 shop drawings submission dates

2.1.2.7 Details and durations allowing for planning (minimum [ ] weeks) and execution of each shutdown to existing services as required for breaking into or connection to existing services or other closure activities related to the works

2.1.2.8 submission of operations and maintenance manual

2.1.2.9 submission of completed asset management information

2.1.2.10 inspection, commissioning and testing activities

2.1.2.11 demonstration and training activities

2.1.2.12 work resulting from instructions issued in regard to the expenditure of Cash Allowances

2.1.2.13 work related to assigned contracts

2.1.2.14 [preparation and review of mock-ups,]

2.1.2.15 [Owner decisions for cash allowances,]

2.1.2.16 [delivery of Owner supplied Products,]

2.1.2.17 [Owner performed work,]

and similar items, at a sufficient level of detail to effectively manage construction progress.

2.1.3 Where and to the extent that the schedule implications for work which is not so defined are impossible to assess, the Contractor should exclude it and confirm this via an accompanying list when submitting the schedule

2.1.4 Indicate milestone date[s] for [Ready-for-Takeover] [and] [Substantial Performance of the Work].

2.2 Submission:

2.3 Submit initial schedule to Owner and Consultant within 15 Working Days after Contract award.

SPEC NOTE: The storage and retrieval of electronic information is dependent on the availability and sophistications of software. Software platforms, languages, formats, and versions are constantly changing. Determine the Owner's needs and edit the following paragraph accordingly.

2.3.1 Submit schedule via [e-mail] [project web site] [__] as [.pdf] [_____] files.

2.4 Consultant will review format and content of initial schedule and request necessary changes, if any, within [5] [10] [ ] Working Days after receipt.

2.5 If changes are required, resubmit finalized initial schedule within [5] [10] [ ] Working Days after return of review copy.

SPEC NOTE: Edit the following paragraph to specify additional levels of details in the schedule if and as required.

2.6 Submit updated progress schedule [weekly] [bi-weekly] [monthly] [ ] to [Owner and] Consultant, indicating

2.6.1 actual and projected start and finish dates

2.6.2 critical path

2.6.3 report date line

2.6.4 progress on each activity

2.6.5 impact of each approved Change Order

2.6.6 baseline comparison to current progress

2.6.7 [activity relationships]

2.6.8 [float,]

2.6.9 [3D scan before close up].

SPEC NOTE: Consider including the following paragraph where deemed essential for large, complex, projects only, as it could represent a significant additional cost on small projects.

2.7 [Include a written report with each updated progress schedule. Indicate work status to date comparing baseline to actual progress, current forecasts, identifying problem areas, anticipated delays and impact on schedule, and planned corrective actions.]

2.8 Submission of the schedule, either initial or subsequent updates, will not relieve the Contractor of the

responsibility to advice of the need for further drawings or details or instructions in accordance with the Contract.

3. SUBMITTALS SCHEDULE

3.1 Format and Content:

3.1.1 Prepare schedule identifying all required Shop Drawing, Product data, and sample submissions in, [including samples required for testing] [and] [including those for Owner supplied Products].

3.1.2 Prepare schedule in electronic format.

3.1.3 Provide a separate line for each required submittal, organized by Specifications section names and numbers, and further broken down by individual Products and systems as required.

3.1.4 For each required submittal, show planned [earliest date for initial submittal] [earliest date for return of reviewed submittal by Consultant] [and] [latest date for return of reviewed submittal without causing delay].

3.1.5 Allow time in schedule for resubmission of submittals, should resubmission be necessary.

3.2 Submission:

3.2.1 Submit initial schedule to Consultant within 15 Working Days after Contract award.

3.2.2 Submit schedule via [e-mail] [project web site] [ ] as [.pdf] [ ] files.

3.2.3 Consultant will review format and content of initial schedule and request necessary changes, if any, within [5] [10] [ ] Working Days after receipt.

3.2.4 If changes are required, resubmit finalized schedule within [5] [10] [ ] Working Days after return of review copy.

3.2.5 Submit updated submittals schedule [monthly][ ] to [Owner and] Consultant..

4. SCHEDULE MANAGEMENT

4.1 A schedule submitted as specified and accepted by Consultant shall become the baseline schedule and shall be used as the baseline for updates.

4.2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with Consultant [and Owner].

4.3 If any circumstances arise which may affect the progress of the Works, including activities that are behind schedule then submit proposals or take other action as appropriate to minimize any delay and regain schedule slippage (lost time) in key areas on or near the critical path.

4.4 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

5. PROGRESS SCHEDULE AND RECORDS

5.1 Render to the Consultant a weekly report as to the number of workmen in all trades employed on the Works including those of all Subcontractors, Suppliers, etc.

5.2 Any other records the Contractor takes which will be used to aid his submissions under the terms of the Contract shall contain the date and the number of the site instruction, Change Order or Change Directive against which the work is recorded. All such records, of whatever nature, if they are to be accepted as true records for any purposes under the terms of the Contract, shall be issued on a regular basis to the Consultant in accordance with the Contract terms.

5.3 Give adequate notice to the Consultant of intention to take records of anything which will not be permanently exposed in the Works or which can only be checked by attendance at site during the actual work operation. Such notice shall also be given to the Consultant in order that they can carry out their duties in respect of any work which is to be permanently covered up.

5.4 Accept sole responsibility for any losses should failure to give adequate notice preclude the Consultant from taking proper records or checking the Contractor's records.

5.5 The Contractor's site supervisor shall keep a site instruction book on site which contains all sites instructions and all matters raised with the Consultant in anyway vary the works. .

6. RECORDING ACTUAL SITE CONDITIONS ON RECORD DRAWINGS

SPEC NOTE: Specify whether the Contractor is expected to maintain as-build drawings in hard copy or electronic form by selecting one of the first two paragraphs below. Alternatively, revise the text to give the Contractor the option. If the Contractor will also be responsible for preparing the record drawings in electronic form (as specified in Section 01 78 00 – Closeout Submittals) give the Contractor the option of preparing the as-built drawings in electronic form.

6.1 Obtain a hard copy set of construction Drawings for the purpose of creating record drawings. Record information and maintain as-built drawings in clean, dry and legible condition.

[OR]

6.2 Obtain from Consultant an electronic copy of the construction Drawings for the purpose of creating as-built drawings. Record information in electronic form, clearly identifying as-built deviations from the originally obtained construction Drawings.

6.3 Clearly label each drawing as “AS-BUILT DRAWING”. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

6.4 Record actual construction including:

6.4.1 Details of all grid lines, setting-out stations, benchmarks and profiles

6.4.2 Measured depths of elements of foundation in relation to finish first floor datum.

6.4.3 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

6.4.4 Measured locations of pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.

6.4.5 Schedules of plant, equipment, valves, panels etc. in accordance with the Facilities Maintenance Software (otherwise known as [Maximo] [Yardi] [Archibus] [ ]) together with cross referencing to the record drawings, shop drawings and relevant technical submittals.

6.4.6 Changes made by Change Orders and Supplemental Instruction.

6.4.7 References to Shop Drawings, where Shop Drawings show more detail.

6.5 Do not use as-built drawings for construction purposes.

7. PROGRESS PHOTOGRAPHS

SPEC NOTE: Consider Owner’s requirements for progress photographs. The following requirements for digital photos assume that if the Owner requires hard copies, the Owner will arrange and pay for those hard copies to be made from the digital files.

7.1 Arrange for periodic digital photography to document and provide a photographic record of the progress of the Work.

7.2 [Arrange for final photographs to be taken by a professional photographer.]

7.3 Identify each photograph by project name and date taken.

7.4 Submit photographs in [.jpg] [.bmp] [.tif] [] format files in [fine] [standard] resolution [via e-mail] [via project web site] [monthly] [weekly] [at completion of [excavation] [foundation]] [framing and services before concealment] [ ] [building].

7.5 Do not use progress or any other Project photographs for promotional purposes without Owner's written consent.

8. PROGRESS VIDEO

SPEC NOTE: The following may be appropriate for major or special projects. If other forms of progress video are required, e.g. videos of particular installation sequences, specify applicable requirements similar to those for progress photographs.

8.1 Provide internet-capable camera and an active web site, allowing off-site viewing of Place of the Work 24/7. Submit web site address and security access codes to Owner and Consultant.

END OF SECTION

SPEC NOTE: Use this Section to specify general requirements for Contractor submission of Shop Drawings, Product data, and samples, the most commonly required submittals for most Projects. Where necessary, this Section may also be used to specify other types of submittals, but should not be used to specify Closeout Submittals, which are specified in Section 01 78 00 – Closeout Submittals.

SPEC NOTE: This Section assumes use of a CCDC standard form contract and in particular CCDC 2 – 2020. If using a different CCDC contract or a non-CCDC contract, some of the provisions in this Section may be included in the General Conditions of Contract, in which case they should be deleted from this Section. The General Conditions of Contract include important provisions related to Shop Drawings. This Section provides additional details and requirements that are specific to the Project to facilitate administration of the Contract. Exercise caution when editing this Section to ensure that provisions of the General Conditions of Contract are not duplicated here unnecessarily and that no conflicts are created with the General Conditions.

1. ADMINISTRATIVE

1.1 Submit specified submittals to Consultant for review Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time or for Product substitutions or other deviations from the Drawings and Specifications.

1.2 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.

1.3 Do not proceed with Work affected by a submittal until review is complete.

1.4 Present Shop Drawings, Product data, and samples in [SI metric] [imperial] units. Where items or information is not produced in [SI Metric] [imperial] units, converted values are acceptable.

1.5 Review submittals, provide verified field measurements where applicable, and affix Contractor's review stamp prior to submission to Consultant. Contractor's review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and Contract Documents.

1.6 Verify field measurements and that affected adjacent work is coordinated.

1.7 Submittals not meeting specified requirements will be returned with comments.

1.8 Reproduction of construction Drawings to serve as background for Shop Drawings is [not] permitted. [If construction Drawings are used for this purpose, remove references to Consultant.]

1.9 Do not propose Substitutions or deviations from Contract Documents via Shop Drawing, Product data and sample submittals.

2. SHOP DRAWINGS AND PRODUCT DATA

2.1 Indicate Products, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work.

2.2 Where Products attach or connect to other Products, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to Drawings, Specifications and other already reviewed Shop Drawings.

2.3 Accompany submittals with a transmittal information including:

2.3.1 Date.

2.3.2 Project title and number.

2.3.3 Contractor's name and address.

2.3.4 Identification of each submittal item and quantity.

2.3.5 Other pertinent data.

2.4 Shop Drawing submittals shall include:

2.4.1 Date and revision dates.

2.4.2 Project title and specification reference number.

2.4.3 Name and address of:

2.4.3.1 Subcontractor.

2.4.3.2 Supplier.

2.4.3.3 Manufacturer.

2.4.3.4 Contractor's stamp, date, and signature of Contractor's authorized representative responsible for Shop Drawing review, indicating that each Shop Drawing has been reviewed for compliance with Contract Documents and, where applicable, that field measurements have been verified.

2.4.4 Details of appropriate portions of the Work as applicable:

2.4.4.1 Fabrication.

2.4.4.2 Layout, showing dimensions, including identified field dimensions, and clearances.

2.4.4.3 Setting out details

2.4.4.3.1 Details of methods and equipment to be used in setting out the Works

2.4.4.3.2 Check and record the results on a copy of drawings and immediately notify the Consultant of any discrepancies to obtain instructions before proceeding

2.4.4.4 Erection details.

2.4.4.5 Capacities.

2.4.4.6 Performance characteristics.

2.4.4.7 Standards.

2.4.4.8 Operating weight.

2.4.4.9 Wiring diagrams.

2.4.4.10 Single line and schematic diagrams.

2.4.4.11 Relationships to other parts of the Work.

2.4.5 Product data submittals shall include material safety data sheets (MSDS) for all controlled Products.

SPEC NOTE: The following paragraphs offer two forms of Shop Drawing submittal: hard copy or electronic. Multiple hard copies require ‘exact’ duplicate marking of each copy, which is time consuming. Electronic copies require marking only once, with potentially unlimited copies after review.

SPEC NOTE: Electronic information formats are constantly changing. Determine the Owner’s/Consultant’s needs and expand the following paragraphs as required if the Contractor is to provide information using particular formats or methods. PDF is common and appropriate.

2.4.6 Submit [[6] [ ] hard copies] [electronic copy] of Shop Drawings where specified in the technical Specifications.

2.4.7 Submit [[6] [ ] hard copies] [electronic copy] of Product data sheets or brochures where specified in the technical Specifications.

2.4.8 Where a submittal includes information not applicable to the Work, clearly identify applicable information and strike out non-applicable information.

2.4.9 Supplement standard information to include details applicable to Project.

SPEC NOTE: Coordinate the following sentence with Section 01 32 00 – Construction Progress Documentation. Include reference to submittal schedule only if specified in Section 01 32 00.

2.5 Allow [ ] Working Days for Consultant's review of each submittal [and incorporate in submittals schedule specified in Section 01 32 00 – Construction Progress Documentation.] Allow additional [ ] Working Days where sub-Consultant [or commissioning agent] review is required.

2.6 If upon Consultant's review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of Work may proceed.

2.7 If upon Consultant's review significant errors or omissions are discovered, a so noted copy will be returned for correction and resubmission. Do not commence fabrication or installation.

2.8 Consultant's notations on submittals are intended to ensure compliance with Contract Documents and are not intended to constitute a change in the Work requiring change to the Contract Price or Contract Time. If Contractor considers any Consultant's notation to be a change in the Work, promptly notify Consultant in writing before proceeding with the Work.

2.9 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the Work proceeds. When resubmitting, notify Consultant in writing of any revisions other than those requested by Consultant.

3. SAMPLES

3.1 Submit samples for Consultant's review in [duplicate] [triplicate] where specified in the technical Specifications. Label samples as to origin, Project name, and intended use.

3.2 Deliver samples prepaid to Consultant's [business address] [site office].

3.3 Notify Consultant in writing of any deviations in samples from requirements of Contract Documents.

3.4 Where a required colour, pattern or texture has not been specified, submit full range of available Products meeting other specified requirements.

3.5 Consultant selection from samples is not intended to change the Contract Price or Contract Time. If a selection would affect the Contract Price or Contract Time, notify Consultant in writing prior to proceeding with the Work.

3.6 Resubmit samples as required by Consultant to comply with Contract Documents.

3.7 Reviewed and accepted samples will establish the standard against which installed Work will be reviewed.

3.8 Do not confirm orders or use the product until approval of the sample has been obtained

3.9 Retain all approved samples in good, clean condition on site and remove when no longer required.

3.10 Where approval related to the stated characteristics of the sample then do not conceal, or proceed with affected work until compliance with requirements is confirmed.

END OF SECTION

SPEC NOTE: Use this Section to specify, where applicable, "special" procedures that are Owner or Project specific. Since the content of this Section will be completely unique to each individual Project, this Section is included in the CCDC Master Specification as a placeholder only. No standard master specification text is provided. Use this Section to specify applicable administrative and procedural requirements for special or unique project situations including, for example:

- Relocations, renovations, alterations, historic restoration and preservation, etc.
- Environmental requirements for hazardous material abatement, contaminated sites, etc.
- Facility specific requirements for airports, detention centres, healthcare facilities, industrial and process facilities, and other special facility types.
- Owner and regulatory health and safety requirements.
- Owner's requirements for conduct of workers.
- Environmental procedures.
- Indoor air quality procedures.
- Security procedures.
- Sustainability certification program requirements.
- Fair wages and local or aboriginal labour requirements.

SPEC NOTE: Refer to MasterFormat for additional subject matter that belongs in this Section and that should NOT be specified as supplementary or special conditions to the contract in Division 00.

1. [ ]

1.1 [ ].

1.2 [ ].

1.3 [ ].

2. [ ]

2.1 [ ].

2.2 [ ].

2.3 [ ].

END OF SECTION

1. GENERAL

1.1 Delegated design submittals are only required for Work when specifically identified as 'delegated design' in the Specifications.

1.2 Delegated design submittals do not apply to any Temporary Work (e.g. crane hoisting, engineered lifts, false work, shoring, concrete formwork, shielding or other work required for worker safety) performed by the Contractor that would normally form a part of the Contractor's or responsible Subcontractor's, suppliers or manufacturers "means and methods" for completing the Works.

1.2.1 The [Owner][Consultant] may request copies of details associated with temporary Work where this Work may affect permanent Work

1.3 The Contractor shall be deemed to have made due allowances for any Supporting Registered Professional or Supporting Verified/Qualified Practitioner required for compliance with the Delegated Design Submittal requirements.

2. DEFINITIONS

2.1 **Delegated design submittals** are required for the completion of design solutions associated with fabrications, building components, elements or assemblies forming a part of the permanent Work that cannot be fully developed or detailed until completion of the competitive bid process or are identified by the Consultant in the Specifications.

2.1.1 the completion of design solutions requiring engineering analysis using performance requirements and design criteria provided by the Consultant

2.1.1.1 Consultant will provide additional performance requirements or design criteria when requested by the supporting registered professional or supporting certified/qualified practitioner.

2.1.2 contribution by manufacturers, fabricators and suppliers to the final development of design solutions

2.1.3 The requirements of this section apply equally to pre-engineered or custom fabrications

2.2 **Supporting Registered Professional or Supporting Verified/Qualified Practitioner** is a registered professional (engineer, architect or interior designer) or certified/qualified specialist contracted by the Contractor, fabricator or manufacturer to complete design of elements identified in the Specifications and Drawings, and produce delegated design submittals using performance requirements and design criteria contained within the Specifications must

2.2.1 not be the Consultant

2.2.2 be licensed to practice in the province of the Work

2.2.3 have experience directly associated with the work delegated to them

2.2.4 be required to seal and sign submittals associated with delegated design

2.2.5 show proof of qualifications or certifications associated with their specialty to support design solutions required by the Specifications or when requested by Consultant

2.3 **Delegated Design Forms** are documents prepared by the supporting registered professional or supporting certified/qualified practitioner as recommended by and endorsed by EGBC's accepted forms for assurance and due diligence by supporting registered professional

2.4 **Engineering Judgement** is a written proposal submitted by manufacturer to the Authority Having Jurisdiction arising from a variation that modifies the manufacturer's standard listed assemblies and details to account for actual site conditions, refer to Specifications.

3. ADMINISTRATIVE REQUIREMENTS

3.1 Consultant Responsibilities

The requirements of this Section do not diminish responsibilities of Consultant's role as the Coordinating Registered Professional or their sub-consultants roles as Registered Professionals of Record as follows:

3.1.1 Contractor's and Subcontractor's supporting registered professional is responsible for completing the design solution based on performance requirements and design criteria provided by the Consultant.

3.1.2 Consultant will review delegated design submittals to determine whether work is in general conformance with stated performance requirements and design criteria.

3.2 Contractor Responsibilities

The requirements of this Section do not transfer overall Project liability to the supporting registered professional or supporting certified/qualified practitioner and as follows:

3.2.1 Supporting registered professionals and supporting certified/qualified practitioners will be responsible for the documentation produced by them as described by their governing associations and referenced practice guides listed in EGBC's Standards and Practice Notes as issued.

3.2.2 Contractor will schedule ordering of Products associated with delegated design submittals and provide required documents described within this Section and Specifications to allow for review, acceptance and coordination by the Consultant; and resubmission by supporting registered professionals before starting any work associated with this Work.

3.2.3 Contractor is responsible for coordinating site layout and placement of Work, providing mark-ups to delegated design submittals when site measurements are different than those contained in Drawings or Specifications, or when delegated design submittals require site confirmation of dimensions.

4. SUBMITTALS REQUIRED FOR DELEGATED DESIGN SOLUTIONS

4.1 The Submittals required during the course of the Works for compliance with delegated design obligations are

4.1.1 Shop drawings and supporting documents for engineered solutions signed and sealed by a Professional Engineer complying with performance requirements and design criteria when specifically identified in the Specifications and other documentation described in the Specifications,

4.1.1.1 Submit a written request for additional information to Consultant if performance requirements and design criteria indicated within Specifications are not sufficient for the Subcontractor's supporting registered professional to complete the design solution required for the Project.

4.1.2 Signed and sealed delegated design forms include

4.1.2.1 Model Schedule S-B

4.1.2.2 Proof of insurance coverage for

4.1.2.2.1.1 *Professional Errors and Omissions Insurance* from a recognized errors and omissions risk advisor appropriate to their discipline practice and design solution contributions to the Project. The insurance coverage only applies to the design solution prepared by the supporting registered professionals.

4.1.2.2.1.2 *Liability Insurance* from a recognized insurance provider appropriate to the business and design solution contributions to the Project. Insurance coverage only applies to the design solution prepared by the supporting registered professionals.

4.2 The Submittals required before Ready-For-Takeover for compliance with delegated design obligations are

4.2.1 Record drawings and other documentation described in the Specifications

4.2.2 Delegated Design Forms include

4.2.2.1 Model Schedule S-C

4.2.2.2 Engineering Judgement

5. REVIEW PROCESS

5.1 Consultant will implement a two-stage review process of shop drawings and supporting engineering analyses containing seal and signature of supporting registered professionals as follows:

5.1.1 Contractor submission of documents and indication of commitment to delegated design process described above for initial review by Consultant.

5.1.2 Consultant will review initial submission and may apply comments and coordination notes to clarify design criteria.

5.1.3 Contractor submission of sealed and signed documents after incorporation of Consultants comments and coordination notes indicating that they are suitable for intended use.

6. EXECUTION

6.1 Include Summary of Work described in relevant Specification section as a part of the required Model Schedule S-B.

6.2 Prepare required submittals and submit to Consultant allowing time for Consultant's detailed review and acceptance before starting any Work affected by delegated design procedures.

END OF SECTION

SPEC NOTE: Use this Section to specify administrative requirements related to specified reference standards and administrative requirements related to inspection, testing, mock-ups, and similar quality control and quality assurance requirements.

SPEC NOTE: This Section assumes use of a CCDC standard form contract and unmodified Review and Inspection of the Work provisions in Part 2 Administration of the Contract. The General Conditions of Contract include important contractual provisions related to review and inspection of the Work. This Section provides additional details and requirements specific to the Project and to facilitate administration of this Contract. Exercise caution when editing this Section to ensure that provisions of the General Conditions of Contract are not duplicated here unnecessarily and that no conflicts are created with the General Conditions.

1. REFERENCE STANDARDS

1.1 "Reference standards" means consensus standards, trade association standards, guides, and other publications expressly referenced in Contract Documents.

1.2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing. However if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.

1.3 Reference standards establish minimum requirements. If Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.

1.4 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Consultant for clarification.

1.5 The substitution of a standard may be proposed complying with a grade or category within a national standard of an international standard recognized in Canada. Submit notification of all such proposals and provide verification when requested and, where documents are in a foreign language, provide certified translations into both official languages of Canada.

1.6 References to published documents are to the editions, including amendments and revisions, at the time of bid closing.

SPEC NOTE: List all reference standard writing organizations referenced in the Specifications.

1.7 Within the Specifications, reference may be made to the following standards writing, testing, or certification organizations by their acronyms or initialisms:

SPEC NOTE: Edit the following list to add and delete names, so that all reference standard writing organizations referenced in the technical Specifications are listed. The list provided does not necessarily include all industry and trade associations that publish standards or have quality testing or certification programs. In particular, it does not include those operating only at the provincial level.

1.7.1 AA - Aluminum Association

1.7.2 ACI - American Concrete Institute

1.7.3 AISC - American Institute of Steel Construction

1.7.4 ANSI - American National Standards Institute

1.7.5 ASME - American Society of Mechanical Engineers

1.7.6 ASTM - American Society for Testing and Materials

1.7.7 AWMAC - Architectural Woodwork Manufacturers Association of Canada

1.7.8 AWPA - American Wire Producers Association

1.7.9 CaGBC - Canadian Green Building Council

1.7.10 CGSB - Canadian General Standards Board

1.7.11 CISC - Canadian Institute of Steel Construction

1.7.12 CPCI - Canadian Prestressed Concrete Institute

1.7.13 CSA - Canadian Standards Association

1.7.14 CSSBI - Canadian Sheet Steel Building Institute

1.7.15 CWB – Canadian Welding Bureau

1.7.16 EGBC – Engineers and Geoscientists of British Columbia

1.7.17 ICEA - Insulated Cable Engineers Association

1.7.18 IEEE - Institute of Electrical and Electronics Engineers

1.7.19 IGMAC – Insulating Glass Manufacturers Association of Canada

1.7.20 LEED - Leadership in Energy and Environmental Design

1.7.21 MPP – Master Painters Institute

1.7.22 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry

1.7.23 NAAMM - National Association of Architectural Metal Manufacturers

1.7.24 NEMA - National Electrical Manufacturers Association

1.7.25 NFPA - National Fire Protection Association

1.7.26 NHLA - National Hardwood Lumber Association

1.7.27 NLGA - National Lumber Grades Authority

1.7.28 SSPC – The Society for Protective Coatings

1.7.29 TTMAC - Terrazzo, Tile and Marble Association of Canada

1.7.30 ULC - Underwriters' Laboratories of Canada

2. INDEPENDENT INSPECTION AND TESTING AGENCIES

2.1 Except as otherwise specified, Owner will retain and pay for independent inspection and testing agencies to inspect, test, or perform other quality control reviews of parts of the Work.

2.2 Retain and pay for inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.

SPEC NOTE: Delete following clause if not applicable.

2.3 [Section 01 21 00 – Allowances specifies a cash allowance for independent inspection and testing services to be retained and paid for by Contractor. Cash allowance excludes any inspection and testing that is for Contractor's own quality control or is required by regulatory requirements.]

2.4 Employment of inspection and testing agencies by Contractor and/or Owner does not relieve Contractor from responsibility to perform the Work in accordance with Contract Documents.

2.5 Allow and arrange for inspection and testing agencies to have access to the Work, including access to off site manufacturing and fabrication plants.

2.6 For inspection and testing required by Contract Documents or by Authorities Having Jurisdiction, provide Consultant and inspection and testing agencies with timely notification in advance of required inspection and testing.

2.7 Submit test samples required for testing [in accordance with submittals schedule specified in Section 01 32 00 – Construction Progress Documentation].

2.8 Provide labour, Construction Equipment and temporary facilities to obtain and handle test samples on site.

3. INSPECTION AND TESTING AGENCY REPORTS

3.1 For inspection and testing required by Contract Documents or by regulatory requirements, and performed by Contractor retained inspection and testing agencies, submit to Consultant [and Owner] copies of reports. Submit within [ ] Working days after completion of inspection and testing.

3.2 For inspection and testing performed by Owner retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to Contractor.

4. MOCK-UPS

4.1 Prepare mock-ups of Work as specified in the technical Specifications. If a mock-up location is not indicated in the Drawings or Specifications, locate where directed by Consultant.

4.2 Modify mock-up as required until Consultant approval is obtained.

4.3 Approved mock-ups establish an acceptable standard for the Work.

4.4 Protect mock-ups from damage until the Work they represent is complete.

4.5 Unless otherwise specified in the technical Specifications, approved mock-ups forming part of the Work may remain as part of the Work.

4.6 Remove mock-ups only when the Work they represent is complete or when otherwise directed by Consultant.

END OF SECTION

SPEC NOTE: Use this Section to specify temporary utilities necessary to complete the Work but not incorporated into final or permanent Work.

1. TEMPORARY UTILITIES - GENERAL

1.1 Provide temporary utilities as specified and as otherwise necessary to perform the Work expeditiously.

1.2 Remove temporary utilities after use.

2. TEMPORARY WATER SUPPLY

SPEC NOTE: Select one of the following paragraphs.

2.1 Arrange and pay for a temporary supply of clean uncontaminated water required during construction.

2.2 Do not use the supply until evidence of suitability is provided by Contractor's own testing agency in accordance with [ ] standards.

[OR]

2.3 Connect to and use Owner's existing water supply for temporary use during construction, subject to existing available volume and pressure. [Usage at no cost to Contractor.] [Reimburse Owner's utility costs based on metered usage. Install a sub-meter for this purpose at Contractor's cost.]

2.4 Arrange and pay for necessary water supply connections and disconnections.

2.5 The Owner will not be responsible for the consequences of failure or restriction in supply.

3. TEMPORARY HEATING, VENTILATION AND COOLING.

3.1 Arrange and pay for temporary heating, ventilation and cooling required during construction.

3.2 [Contractor may connect to and use Owner's existing supply of [natural gas] [propane] for temporary use during construction, subject to existing available volume and pressure. [Usage at no cost to Contractor.] [Reimburse Owner's utility costs based on metered usage. Install a sub-meter for this purpose at Contractor's cost.]]

3.3 Vent construction heaters in enclosed spaces to the outside or use flameless type of construction heaters.

3.4 Provide temporary heat for the Work as required to:

3.4.1 Facilitate progress of Work.

3.4.2 Protect the Work against dampness, cold and extreme heat.

3.4.3 Prevent moisture condensation on surfaces, freezing, or other damage to finishes or stored Products.

3.4.4 Maintain specified minimum ambient temperatures and humidity levels for storage, installation and curing of Products.

3.4.5 After building is enclosed, maintain interior temperature of minimum [10][ ] degrees C.

3.5 Provide temporary ventilation for the Work as required to:

3.5.1 Prevent accumulations of fumes, exhaust, vapours, gases and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.

3.5.2 [Ensure that hazardous, noxious, or volatile substances do not migrate to Owner occupied spaces.]

3.5.3 Ventilate temporary sanitary facilities.

SPEC NOTE: Select either the following paragraph or the subsequent paragraph and its sub-paragraphs.

3.6 Do not use permanent building heating and ventilation systems during construction.

[OR]

3.7 New permanent building heating and ventilation systems may be used during construction, at Contractor's sole risk option. If used during construction:

3.7.1 [Owner will] [Contractor shall] pay utility costs resulting from the use of permanent systems.

3.7.2 Operate systems in a non-wasteful and energy efficient manner. Be responsible for any system damage.

3.7.3 Just prior to [Ready-for-Takeover] [Substantial Performance of the Work], [replace filters,] [replace [ ],] [clean [ ] and [,] and perform other required maintenance to ensure systems are in as near as new condition as possible.

3.7.4 Ensure that systems manufacturers' warranties do not commence until the date of [Ready-for-Takeover] [Substantial Performance of the Work] or, if manufacturers' warranties do commence earlier when systems are put into use, arrange for necessary extension of manufacturers' warranties or provide equivalent coverage under Contractor's warranty.

4. TEMPORARY ELECTRICAL POWER AND LIGHTING

SPEC NOTE: Select one of the following paragraphs.

4.1 Arrange and pay for temporary power and lighting required during construction.

[OR]

4.2 Connect to and use Owner's existing electrical supply for temporary use during construction. [Usage at no cost to Contractor.] [Reimburse Owner's utility costs based on metered usage. Install a sub-meter for this purpose at Contractor's cost].

SPEC NOTE: When allowing Contractor to use existing power supply, confirm sufficient capacity to accommodate power requirements for anticipated construction work. Give consideration to limiting excessive use of power by Contractor for space heating, etc.

4.3 Existing maximum power supply of [230 V,] [kVA,] [phase,] [Hz,] [amps,] is available for temporary use during construction.

4.4 Arrange and pay for necessary connections and disconnections of temporary power and lighting in accordance with regulatory requirements.

4.5 The Owner will not be responsible for the consequences of failure or restriction in supply.

SPEC NOTE: Select either the following paragraph or the subsequent paragraph and its sub-paragraphs.

4.6 Do not use permanent building [power] [and] [lighting] systems during construction.

[OR]

4.7 New permanent building [power] [and] [lighting] systems may be used during construction, at Contractor's option. If used during construction:

4.7.1 [Owner will] [Contractor shall] pay utility costs resulting from the use of permanent systems.

4.7.2 Operate systems in a non-wasteful and energy efficient manner. Be responsible for any system damage.

4.7.3 [Just prior to [Ready-for-Takeover] [Substantial Performance of the Work], replace lamps which have been used for more than [ ] months.]

4.7.4 Ensure that systems manufacturers' warranties do not commence until the date of Ready-for-Takeover or, if manufacturers' warranties do commence earlier when systems are put into use, arrange for necessary extension of manufacturers' warranties or provide equivalent coverage under Contractor's warranty.

4.8 Provide temporary lighting for finishing work and inspection, the intensity and direction of which closely resembles that delivered by the permanent installation.

5. EXISTING BUILDING HEATING, VENTILATION, POWER, AND LIGHTING

SPEC NOTE: For work in an existing building, edit or delete preceding articles and include this article.

5.1 Existing building heating, ventilation, power, and lighting may be used during construction [except during hours or days when the building is not operational].

5.2 The Owner will not be responsible for the consequences of failure or restriction in supply.

5.3 [Coordinate and make arrangements with the building operator [and pay any costs required] for provision of these services during hours or days when the building is not operational].

6. THERMOMETERS

6.1 Provide onsite and maintain in accurate condition a maximum and minimum thermometer for measuring atmospheric shade temperature, in an approved location.

7. PERSONAL PROTECTIVE EQUIPMENT

7.1 Provide for the sole use of those acting on behalf of the Owner, in sizes to be specified:

- [5] no. Safety helmets that are neither damaged nor time expired and meet CSA Z94.1-15 Type 1 (Class G for electrical hazards and Class C for all others).
- [5] no. High visibility waistcoats to CSA Z96-15 Type 1 Class 1.
- [5] pairs Safety boots with steel insole and toecap to CSA Z195.14 Grade 1.
- [5] no. Disposable respirators to CSA Z94.4-18.
- [5] no. Safety glasses to CSA Z94.3-15 Class 1 (spectacles) or Class 2 (googles).
- [5] no. Hearing protection to Z94.2-14
- [5] no. Hand protection to ANSI/ISEA 105-2106 as appropriate.

8. SURVEYING EQUIPMENT

8.1 Provide surveying equipment on site and maintain in accurate condition.

END OF SECTION

SPEC NOTE: Use this Section to specify temporary construction facilities not incorporated into the final or permanent Work, including subject matter such as construction aids, site offices and sheds, parking, vehicular access, and project identification signage. Add additional articles as required to address any other special requirements for construction facilities.

1. CONSTRUCTION FACILITIES - GENERAL

1.1 Provide temporary construction facilities as necessary for performance of the Work and in compliance with applicable regulatory requirements.

1.2 Site mobilization and staging area shall be confirmed and approved with site FMO/project team.

1.3 [See APPENDIX for available on site area] or [There will no area available for storage]

1.4 Maintain temporary construction facilities in good condition for the duration of the Work.

1.5 Remove temporary construction facilities from Place of the Work when no longer required and make good to existing area.

2. CONSTRUCTION PARKING

SPEC NOTE: Consult with Owner regarding provisions of on-site parking for construction personnel.

2.1 Parking will [NOT] be permitted at Place of the Work [at locations indicated on Drawings] [for up to [ ] vehicles] [provided it does not disrupt continuing operation of the facility].

[OR]

2.2 Areas immediately surrounding the Site should be kept clear of all Contractor's, Sub-contractors' and Suppliers' vehicles at all times unless agreed otherwise with the Owner/ CA.

2.3 The Contractor will be solely responsible for making arrangements with, inter alia, authority having jurisdiction, , adjoining owners and occupiers, etc, for all matters including parking of vehicles and deliveries to the Work outside of regular working hours if necessary, and shall pay all charges in connection therewith.

3. VEHICULAR ACCESS

3.1 The Contractor shall ensure proper safety protocols and flag person(s) for access by Owner's staff and visitors if and when near the Place of the Work.

3.2 Build and maintain temporary access roads as required or where indicated on Drawings.

3.3 Access and egress for executing the Works shall be assessed and determined by the Contractor. Access roads must not be obstructed either in whole or in part at any time. The Contractor shall control traffic to all roads, hard standings and footpaths adjacent to the Site and all are to be kept clean and in good repair at all times. If the Contractor fails to keep the adjoining roads, hard standings and footpaths clean at all times, the Owner may employ others to keep such areas clean, and the cost thereof, including the cost of the Owner's management time will be deducted from any monies due to the Contractor. Contractor shall determine and provide for, at its own cost, access and egress to and from the Place of the Work, having regard to requirements of the Owner and authorities having jurisdiction.

4. [SITE OFFICES]

4.1 Provide a temperature controlled and ventilated office, with suitable lighting, of sufficient size to accommodate site meetings.

4.2 The meeting room must be part of the Contractor's own site offices.

4.3 The meeting room must be furnished with

4.3.1 Table large enough to seat [12] as well as accommodate laying down drawings.

4.3.2 Chairs for a minimum of [12] people

SPEC NOTE: Use the following paragraphs for projects only where a Consultant's site office is required.

4.4 [Consultant's site office]:

4.4.1 Provide and obtain approval for suitable lockable temporary accommodation that can either be separate from or part of the Contractor's site office and provides facilities that have:

4.4.1.1 Minimum floor area of [10] square meters

4.4.1.2 At least [1] [one] operable window and a lockable door.

4.4.1.3 Suitable temperature control, ventilation, power and lighting.

4.4.1.4 Equip office with table and chairs to accommodate at least [12] meeting attendees, [one] [3] drawer filing cabinet, [one] plan rack.]

4.4.1.5 Provide [land line telephone] [internet access] [public access wi-fi] [fax machine and paper] [photocopier] [ ].

4.4.1.6 Provide [weekly] [bi-weekly] [monthly] cleaning service.

5. [SANITARY FACILITIES]

5.1 Provide sanitary facilities for workers.

5.2 [When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building.]

5.3 Do not use permanent washroom facilities during construction.

5.4 Keep sanitary facilities clean and fully stocked with the necessary supplies.

6. [ACCOMMODATION/ LAND NOT INCLUDED IN THE SITE]

6.1 The accommodation/land that may be used for the duration of the Contract is identified as follows: [ ]

6.2 This accommodation/land may be used without charge provided that:

6.2.1 It is used solely for the purposes of carrying out the Works.

6.2.2 The use to which it is put does not involve undue risk of damage.

6.2.3 Any temporary adaptations are approved by or on behalf of the Employer before being carried out.

6.2.4 It is vacated on completion of the Works or determination of the Contract.

6.2.5 When vacated, its condition is at least equivalent to its condition must be equivalent to the original state, prior to use of space by Contractor at start of the Contract.

6.3 The accommodation/land has the services listed below and it remains the contractor's responsibility to assess requirements relative to that offered and to allow for installing services not offered should the contractor elect to use this accommodation/land. The available services are as follows:

6.3.1 Site security is the responsibility of Contractor.

7. FIRE PROTECTION

7.1 Prevent personal injury or death, and damage to the Place of the Work and surrounding/adjacent

areas/property.

7.2 Provide and maintain temporary fire protection systems and equipment during construction.

8. USE OF NEW ELEVATORS

SPEC NOTE: Select either the following paragraph or the subsequent paragraph and its sub-paragraphs.

8.1 Do not use permanent elevators for construction purposes.

[OR]

8.2 Permanent elevators may be used by construction personnel and for transporting Products, at Contractor's option. If used during construction:

8.2.1 Provide protective coverings for finish surfaces of cars and entrances.

8.2.2 Just prior to [Ready-for-Takeover] [Substantial Performance of the Work], perform required maintenance to ensure elevators are in new condition.

8.2.3 Elevators are not to be used in a manner are not per the design intent.

8.3 Ensure that elevator manufacturer's warranty does not commence until the date of [Ready-for-Takeover] [Substantial Performance of the Work] or, if manufacturer's warranty does commence earlier when elevators are put into use, arrange for necessary extension of manufacturer's warranty or provide equivalent coverage under Contractor's warranty.

9. USE OF EXISTING ELEVATORS

SPEC NOTE: Use this article for work in an existing building with elevators. Specify additional usage restrictions as required.

9.1 [No] [Designated] elevators may be used by construction personnel and for transporting Products. Co-ordinate use with [ ].

9.2 Provide protective coverings for finish surfaces of cars and entrances. Assume responsibility for and make good any damage to existing elevators caused by construction personnel.

9.3 Elevators are not to be used in a manner other than as per the design intent.

9.3.1 For purposes of clarity regarding capacity within any elevators design intent means

9.3.1.1 Total loads crossing the building hall sill into the elevator at any one time shall not exceed 25% of the rated elevator capacity

9.3.1.2 Loads shall be centre loaded outward to less than the elevator rated capacity including all persons accompanying the load, except

10. PROJECT IDENTIFICATION SIGNS

SPEC NOTE: If no project identification sign is required, delete this article. If signage is required, a detail drawing may be added to this Section, or on the Drawings, illustrating required graphics and text including logos, fonts, colours, etc.).

10.1 Provide [one] [two] [ ] Project identification sign[s] [with graphics and text as shown on [attached detail drawing] [the Drawings].] [Graphics and text shall indicate name of Project, name [and logo] of Owner, [Consultant], [subconsultants], Contractor, [and major Subcontractors].] [Graphics and text [will be provided by [Consultant] [Owner] promptly after Contract award.]

10.2 Project identification sign[s] shall be [ ] m x [ ] m, of wood frame and plywood construction with graphics produced by a professional sign company.

10.3 Submit Shop Drawing for Project identification sign graphics and text.

10.4 Erect sign[s] within [three] [ ] weeks of Contract award in location[s] directed or approved by [Owner] [Consultant].

10.5 No other signs or advertisements, other than safety, warning, or directional signs, are permitted without Consultant's prior approval.

END OF SECTION

SPEC NOTE: Use this Section to specify requirements for temporary protection of the public and existing building occupants during construction, by means of barriers and enclosures that are not incorporated into the final or permanent work. Edit to delete inapplicable requirements and expand to include additional requirements as necessary to suit the nature of the Work and of the site.

1. BARRIERS AND ENCLOSURES - GENERAL

1.1 Provide temporary barriers and enclosures necessary to protect the public [and building occupants] and to secure Place of the Work during performance of the Work.

1.2 Comply with applicable regulatory requirements.

1.3 Maintain temporary barriers and enclosures in good condition for the duration of the Work.

1.4 Remove temporary barriers and enclosures from Place of the Work when no longer required.

2. FENCING

2.1 Erect temporary security and safety site fencing of type and height determined by Contractor, subject to applicable regulatory requirements.

[OR]

2.2 Erect temporary security and safety site fencing, minimum [m] high, using [chain link fencing] [snow fencing] [self-supporting wire fence sections] enclosing entire site.

2.3 Maintain site fencing in good repair until removed.

2.4 Provide lockable access gates as required to facilitate construction access.

2.5 [Owner reserves the right to install graphic screen signage on Contractor's fencing.]

3. [EXTERIOR HOARDING]

SPEC NOTE: Use this article in lieu of 1.2 Fencing for projects located in dense urban areas or where otherwise required for public safety and security.

3.1 Erect temporary exterior site hoarding to comply with applicable regulatory requirements [and as follows:]

3.1.1 Use lumber framing and, minimum [13] [ ] mm thick exterior grade plywood.

3.1.2 Paint public side of hoarding [in colour selected by Consultant] with one coat primer and one coat exterior paint. Maintain public side of hoarding clean and in good repair until removed.

3.1.3 Provide lockable access gates for Construction Equipment and lockable pedestrian doors as required to facilitate construction access.

3.1.4 Erect and maintain pedestrian walkways including roof and side covers, complete with pedestrian signage and electrical lighting.

4. WEATHER ENCLOSURES

4.1 Provide weather tight enclosures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

4.2 Provide weather enclosures to protect floor areas where walls are not finished and to enclose work areas that require temporary heating.

4.3 Design weather enclosures to withstand wind pressure and snow loading requirements.

5. INFECTION CONTROL / DUST TIGHT [SCREENS] [PARTITIONS]

5.1 Provide dust tight [polyethylene screens] [insulated] [wood stud and plywood] [steel stud and gypsum board] [partitions] to localize interior building areas from dust [and noise] generating activities all in accordance with CSA Z317.13 as outlined in the Infection Control Annex A (ICRA) form included tender documents.

5.2 Erect, maintain, and relocate [screens] [partitions] as required to facilitate construction operations and Owner's operational requirements.

6. FIRE ROUTES

6.1 Maintain fire access routes, including overhead clearances, for use by emergency response vehicles.

7. PROTECTION OF BUILDING FINISHES

7.1 Provide necessary temporary barriers and enclosures to protect [existing and] completed or partially completed finished surfaces from damage during performance of the Work.

END OF SECTION

SPEC NOTE: Use this Section to specify temporary controls required during construction that are not incorporated into the final or permanent work. Edit to delete inapplicable requirements and expand to include additional requirements as necessary to suit the nature of the Work and of the site. For some projects, significant additional environmental controls may be required on account of applicable federal, provincial, or municipal regulatory requirements.

1. TEMPORARY CONTROLS - GENERAL

1.1 Provide temporary controls as necessary for performance of the Work and in compliance with applicable regulatory requirements.

1.2 Maintain temporary controls in good condition for the duration of the Work.

1.3 Remove temporary controls and Construction Equipment used to provide temporary controls from Place of the Work when no longer required.

2. PLANT PROTECTION

2.1 Retained Trees

2.1.1 Protect trees and other plant material designated to remain on site [and on adjacent properties] where indicated on Drawings.

2.1.2 Protect trees and shrubs susceptible to damage during construction by encasing with protective wood framework from grade to height of [one] [two] [metre[s]].

2.1.3 Replace , at Contractor's cost, with trees of similar type and age any and all mature trees uprooted, destroyed or damaged by the Contractor beyond reasonable chance of survival in their original shape .

2.1.4 For trees designated to remain, protect roots inside dripline from disturbance or damage during excavation and grading by not:

2.1.4.1 Dumping spoil or rubbish, excavating or disturbing topsoil, parking vehicles or plant, storing materials or placing temporary accommodation within an area which is the larger of the branch spread of the tree or an area with a radius of half the tree's height, measured from the trunk.

2.1.4.2 Severing roots exceeding 25 mm in diameter. If unintentionally severed give notice and seek advice.

2.1.4.3 Changing the level of ground within an area 3 m beyond branch spread.

2.2 Existing topsoil/subsoil

2.2.1 The Contractor shall prevent over compaction or stripping of existing topsoil, subsoil and vegetation in those areas which may be damaged by construction traffic, parking of vehicles, temporary site accommodation or storage of materials and which will require reinstatement prior to completion of the Works

2.2.2 Before starting work, the contractor shall submit proposals for protective measures

3. DUST AND PARTICULATE CONTROL

3.1 Implement and maintain dust and particulate control measures in accordance with applicable regulatory requirements.

3.2 Execute Work by methods that minimize dust from construction operations and spreading of dust on site or to adjacent properties.

3.3 Provide temporary enclosures to prevent extraneous materials resulting from sandblasting or similar operations from contaminating air beyond immediate work area.

3.4 Where construction work is proximal to fresh air building intake vents, coordinate with owner/team on mitigation measure on noxious odours, dust & fumes arising from the construction site.

3.5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

3.6 Use appropriate covers on trucks hauling fine, dusty, or loose materials.

3.7 Provide dust control for all materials to and from the Work.

3.8 Others

4. DEWATERING

4.1 Provide temporary drainage and pumping as necessary to dewater excavations, trenches, foundations, and other parts of the Work. Maintain such areas free of water arising from groundwater or surface run-off, as required to keep them stable, dry, and protected from damage due to flooding.

4.2 Maintain standby equipment necessary to ensure continuous operation of dewatering system.

4.3 Do not pump water containing suspended materials or other harmful substances into waterways, sewers or surface drainage systems. Treat or dispose of such water in accordance with applicable regulatory requirements

5. SITE DRAINAGE

5.1 Maintain grades to ensure proper site drainage.

5.2 Prevent surface water runoff from leaving the site [except as otherwise provided by waste water management plan].

5.3 Prevent precipitation from infiltrating or from directly running off stockpiled [waste] materials. Cover stockpiled [waste] materials with an impermeable liner during periods of work stoppage including at end of each Working Day.

5.4 Control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas as required to prevent erosion and sedimentation.

5.5 Control surface drainage by ensuring that gutters are kept open and water is not directed across or over pavements or sidewalks, except through pipes or properly constructed troughs. Ensure that runoff from unfinished areas is intercepted and diverted to suitable outlets.

6. EROSION AND SEDIMENT CONTROL

6.1 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and watercourses, and repair damage caused by soil erosion and sedimentation.

6.2 Provide and maintain appropriate temporary measures such as silt fences, straw bales, ditches, geotextiles, drains, berms, terracing, riprap, temporary drainage piping, sedimentation basins, vegetative cover, dikes, and other measures that may be required to prevent erosion and migration of silt, mud, sediment, and other debris.

6.3 Do not disturb existing embankments or embankment protection.

6.4 Periodically inspect erosion and sediment control measures to detect evidence of erosion and sedimentation. Promptly take corrective measures when necessary.

6.5 If soil and debris from site accumulate in ditches or other low areas, remove accumulation and restore area to original condition.

7. POLLUTION CONTROL

7.1 Take measures to prevent contamination of soil, water, atmosphere, and existing infrastructure through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental or infrastructure damage.

7.2 Be prepared, by maintaining appropriate materials, equipment, and trained personnel on site, to intercept, clean up, and dispose of spills or releases that may occur. Promptly report spills and releases that may occur to:

7.2.1 authority having jurisdiction,

7.2.2 person causing or having control of pollution source, if known, and

7.2.3 Owner and Consultant.

7.2.4 Contact manufacturer of pollutant, if known and applicable, to obtain material safety data sheets (MSDS) and ascertain hazards involved and precautions and measures required in cleanup or mitigating actions.

7.3 Take immediate action to contain and mitigate harmful effects of the spill or release.

END OF SECTION

SPEC NOTE: Use this Section to specify requirements that are common to most or all Product requirements specified in technical Specification Sections, thus negating the need to repeat these types of requirements in technical Sections.

1. GENERAL

1.1 Provide Products that are ~~generally~~ new (i.e. not damaged or defective), and suitable for purpose intended, subject to specified requirements. Contractor may propose, and Owner may consider and accept in the Owner's sole discretion, proposals for recycled Products.

1.2 If requested by Consultant, furnish evidence as to type, source and quality of Products provided.

1.3 Unless otherwise specified, maintain uniformity in quality and appearance of manufacture for like items throughout.

1.4 [Permanent manufacturer's markings, labels, trademarks, and nameplates on Products are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.]

2. PRODUCT OPTIONS

2.1 Subject to the provisions of Section 01 25 00 –Substitution Procedures:

2.1.1 Wherever a Product or manufacturer is specified by a single proprietary name, provide the named Product only.

2.1.2 Wherever more than one Product or manufacturer is specified by proprietary name for a single application, provide any one of the named Products.

~~2.1.3 Wherever products are specified by proprietary name for a single application, the phrase 'or equivalent' is to be deemed included.~~

2.2 Wherever a Product is specified by reference to a standard only, provide any Product that meets or exceeds the specified standard. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified standard.

2.3 Wherever a Product is specified by descriptive or performance requirements only, provide any Product that meets or exceeds the specified requirements. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified requirements.

3. PRODUCT AVAILABILITY AND DELIVERY TIMES

3.1 Promptly upon Contract award and periodically during construction, review and confirm Product availability during the Project and delivery times. Order Products in sufficient time and quality to meet the construction progress schedule and the Contract Time.

3.2 If a specified Product is no longer available, promptly notify Consultant. Consultant will take action as required.

3.3 If delivery delays are foreseeable, for any reason, promptly notify Consultant.

3.4 If a delivery delay is beyond *Contractor*'s control, *Consultant* will provide direction.

3.5 If a delivery delay is caused by something that was or is within Contractor's control, Contractor shall propose actions to maintain the construction progress schedule for Consultant's review and acceptance.

4. STORAGE, HANDLING, AND PROTECTION

4.1 Store, handle, and protect Products during transportation to Place of the Work and before, during, and after installation in a manner to prevent damage, adulteration, deterioration and soiling.

4.2 Comply with manufacturer's instructions for storage, handling and protection.

4.3 Store packaged or bundled Products in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in Work.

4.4 Comply with the requirements of the workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, including requirements for labeling and the provision of material safety data sheets (MSDS).

4.5 Store Products subject to damage from weather in weatherproof enclosures.

4.6 Store sheet Products on flat, solid, supports and keep clear of ground. Slope to shed moisture.

4.7 Remove and replace damaged Product.

5. EXECUTION

5.1 Fix, apply, install or lay Products securely, accurately, plumb, neatly and in alignment.

5.2 Do not use different colour batches where they can be seen together.

5.3 Check on-site dimensions [prior to installation of Products].

5.4 Finished work shall not be defective, e.g. not damaged, disfigured, dirty, faulty, or out of tolerance.

5.5 When locating and fixing products, adjust joints open to view so they are even and regular.

6. COMPLIANCE

6.1 Retain on site evidence that the product supplied complies with the proprietary specifications

6.2 Submit evidence of compliance with performance specifications of either the Consultant or manufacturer, including test reports indicating:

6.2.1 Properties tested.

6.2.2 Pass/ fail criteria.

6.2.3 Test methods and procedures.

6.2.4 Test results.

6.2.5 Identity of testing agency.

6.2.6 Test dates and times.

6.2.7 Identities of witnesses.

6.2.8 Analysis of results.

END OF SECTION

SPEC NOTE: Use this Section to specify requirements for survey, utility locate, and other preparatory work before commencement of construction. Also use this Section to specify examination and preparation requirements that are common to most or all technical Specifications Sections, thus negating the need to repeat these types of requirements in technical Sections.

1. SURVEYOR QUALIFICATIONS

1.1 Engage a registered land surveyor, licensed to practice in Place of the Work.

2. SUBMITTALS

2.1 Submit name and address of registered land surveyor performing survey work.

2.2 Submit to [Owner] [and] [Consultant] the survey of the Work prepared and issued by a registered land surveyor [on completion of the building footings and foundations] [as required by Authorities Having Jurisdiction] [ ] and on completion of the Work.

3. SURVEY REFERENCE POINTS

3.1 Locate and confirm permanent reference points prior to starting site work. Preserve and protect permanent reference points on site during construction.

3.2 Do not change or relocate reference points without prior written notice to Consultant.

3.3 Report to Consultant when a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations. Require registered land surveyor to replace reference points in accordance with original survey.

4. SURVEY REQUIREMENTS

4.1 Establish sufficient permanent benchmarks on site, referenced to established benchmarks by survey control points.

4.2 Confirm that existing survey reference points are in accordance with Owner's survey and property limits.

4.3 Establish initial lines and levels for building layout.

4.4 Maintain a complete, accurate log of control and survey work as it progresses. Record locations with horizontal and vertical data in project record documents.

5. EXISTING UTILITIES AND STRUCTURES

5.1 Before commencing excavation other earthwork, drilling, cutting or demolition of existing structures, establish or confirm location and extent of all existing underground, buried or hidden utilities and structures in work area.

5.2 Promptly notify Consultant if underground utilities, structures, or their locations differ from those indicated in Contract Documents or in available project information.

5.3 Consultant will provide appropriate direction.

5.4 Record locations of maintained, re-routed and abandoned utility lines.

6. CONDITIONS SURVEY

6.1 Prior to commencement of the Works the Contractor is to carry out a condition survey in conjunction with the [Owner] [and] [Consultant] of the Site, including, inter alia, footpaths / roads / fences and trees etc. which are to be retained during the Works, and issue a report to the [Owner] [and] [Consultant], 2 hard copies and a further copy on CD Rom format of the report which records the condition of such. The Report is to include record photographs. The Contractor must provide the [Owner] [and] [Consultant] with a

minimum of 5 working days notice of his intention to carry out this survey.

7. VERIFICATION OF EXISTING CONDITIONS

7.1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work. Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.

7.2 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of Products used.

7.3 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.

7.4 Notify Consultant in writing of unacceptable conditions.

END OF SECTION

SPEC NOTE: Use this Section to specify requirements that are common to most or all technical Specifications sections, thus negating the need to repeat these types of requirements in technical Sections.

1. SUMMARY

1.1 Except where otherwise specified in technical Specifications or otherwise indicated on Drawings, comply with requirements of this Section.

2.

3. MANUFACTURER'S INSTRUCTIONS

3.1 Install, erect, or apply Products in strict accordance with manufacturer's instructions.

3.2 Notify Consultant, in writing, of conflicts between Contract Documents and manufacturer's instructions where, in Contractor's opinion, conformance with Contract Documents instead of the manufacturer's instructions may be detrimental to the Work or may jeopardize the manufacturer's warranty.

3.3 Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

3.4 Provide manufacturer's representatives with access to the Work at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

4. CONCEALMENT

4.1 Conceal pipes, ducts, and wiring in floors, walls and ceilings in finished areas:

4.1.1 after review by Consultant and authority having jurisdiction, and

4.1.2 where locations differ from those shown on Drawings, after recording actual locations on Record Drawings.

4.2 Provide incidental furring or other enclosures as required.

4.3 Notify Consultant in writing of interferences before installation.

5. FASTENINGS - GENERAL

5.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials.

5.2 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.

5.3 Use non-corrosive fasteners and anchors for securing exterior work [and in spaces where high humidity levels are anticipated].

5.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage.

5.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

5.6 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.

6. FASTENINGS - EQUIPMENT

6.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

6.2 Bolts shall not project more than one diameter beyond nuts.

7. FIRE RATED ASSEMBLIES

7.1 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

8. LOCATION OF FIXTURES, OUTLETS AND DEVICES

8.1 Consider location of fixtures, outlets, and devices indicated on Drawings as approximate.

8.2 Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.

8.3 Promptly notify Consultant in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.

9. PROTECTION OF COMPLETED WORK AND WORK IN PROGRESS

9.1 Adequately protect parts of the Work completed and in progress from any kind of damage.

9.2 Promptly remove, replace, clean, or repair, as directed by Consultant, work damaged as a result of inadequate protection.

9.3 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the safety or integrity of the Work.

10. METHOD / SEQUENCE OF WORK

10.1 Include the following specific limitations in the schedule

10.1.1 [ ]

10.1.2 [ ]

11. SCAFFOLDING

11.1 Make standing scaffolding available to subcontractors at all times.

12. DEFECTS IN EXISTING WORK

12.1 Immediately give notice when undocumented defects are discovered. Do not proceed with executing the affected related work until a response is received

12.2 Do not execute work which may either hinder access to defective products or work or be rendered abortive by the remedial work

13. REMEDIAL WORK

13.1 Agree the extent and location of all remedial work before commencement

13.2 Notify Consultant of, and perform remedial work required to, repair or replace defective or unacceptable work.

13.3 Carry out remedial work in ways that minimize the extent of the work

13.4 Ensure that properly qualified workers perform remedial work.

13.5 Coordinate adjacent affected work as required.

END OF SECTION

SPEC NOTE: Use this Section to specify requirements for incidental cutting, fitting, and patching required to complete the Work and make its many parts fit together properly.

1. REQUEST FOR CUTTING, PATCHING AND REMEDIAL WORK

1.1 Submit written request in advance of cutting, coring, or alteration which affects or is likely to affect:

1.1.1 Structural integrity of any element of the Work.

1.1.2 Integrity of weather-exposed or moisture-resistant elements.

1.1.3 Efficiency, maintenance, or safety of any operational element.

1.1.4 Visual qualities of sight-exposed elements.

1.1.5 Work of Owner or other contractors.

1.1.6 Warranty of Products affected.

1.1.7 Noise and/or vibration.

1.2 Include in request:

1.2.1 Identification of Project.

1.2.2 Location and description of affected work, including drawings or sketches as required.

1.2.3 Statement on necessity for cutting or alteration.

1.2.4 Description of proposed work, and Products to be used.

1.2.5 Alternatives to cutting and patching.

1.2.6 Effect on work of Owner or other contractors.

1.2.7 Written permission of affected other contractors.

1.2.8 Date and time work will be executed.

2. PRODUCTS

2.1 Unless otherwise specified, when replacing existing or previously installed Products in the course of cutting and patching work, use replacement Products of the same character and quality as those being replaced.

2.2 If an existing or previously installed Product must be replaced with a different Product, submit request for substitution in accordance with Section 01 25 00 - Substitution Procedures.

3. PREPARATION

3.1 Inspect existing conditions in accordance with Section 01 71 00 - Examination and Preparation.

3.2 Provide supports to ensure structural integrity of surroundings; provide devices and methods to protect other portions of the Work from damage.

3.3 Provide protection from elements for areas that may be exposed by uncovering work.

4. EXISTING UTILITIES

4.1 When breaking into or connecting to existing services' utilities, execute the Work at times directed by local governing authorities, with a minimum of disturbance to the Work, pedestrian and vehicular traffic, and ongoing Owner operations.

[OR]

4.2 Where the Work involves breaking into or connecting to existing services, give notice to the [authority having jurisdiction] [Owner] [Consultant] at least [48] [ ] [hours] [days] prior to the necessary interruption of mechanical or electrical services. The notice must be accompanied by Owner approved detailed work plan that addresses the safety of all stakeholders both implementing and affected by the break into or connection to existing services

4.3 Maintain excavations free of water.

4.4 Keep duration of interruptions to a minimum.

4.5 Carry out interruptions after regular working hours of occupants, preferably on weekends, unless Owner's prior written approval is obtained.

4.6 Protect and maintain existing active services. Record location of services, including depth, on as-built drawings.

4.7 Construct or erect barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures as required to protect pedestrian and vehicular traffic.

5. CUTTING, PATCHING, AND REMEDIAL WORK

5.1 Coordinate and perform the Work to ensure that cutting and patching work is kept to a minimum.

5.2 Perform cutting, fitting, patching, and remedial work [including excavation and fill,] to make the affected parts of the Work come together properly and complete the Work.

5.3 Provide openings in non-structural elements of the Work for penetrations of mechanical and electrical work.

5.4 Perform cutting by methods to avoid damage to other work

5.5 Provide proper surfaces to receive patching, remedial work, and finishing.

5.6 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the Products affected, in a manner that neither damages nor endangers the Work.

5.7 Do not use pneumatic or impact tools without Consultant's prior approval.

5.8 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers' warranties.

5.9 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection. For an assembly, refinish entire unit.

5.10 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.

5.11 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices.

END OF SECTION

SPEC NOTE: Use this Section to specify requirements for progressive and final cleaning of the Work and waste management and disposal.

1. REGULATORY REQUIREMENTS

1.1 Comply with applicable regulatory requirements when disposing of waste materials.

1.2 Obtain permits from Authorities Having Jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

2. GENERAL CLEANING REQUIREMENTS

2.1 Provide adequate ventilation during use of volatile or noxious substances. [Do not rely on building ventilation systems for this purpose.]

2.2 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

2.3 Prevent cross-contamination during the cleaning process.

2.4 Notify the Consultant of the need for cleaning caused by Owner or other contractors.

3. PROGRESSIVE CLEANING AND WASTE MANAGEMENT

3.1 Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and construction debris.

3.2 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables. [Locate containers [ ] [where indicated on Drawings].]

3.3 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.

3.4 Remove waste materials and recyclables from Place of the Work [daily] [weekly] [at regular intervals].

3.5 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.

3.6 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly finished surfaces nor contaminate building systems.

SPEC NOTE: Include the following sentence only where the Contractor will have care, custody and control of a site with adjacent public sidewalks.

3.7 [Clear snow and ice from public sidewalks as required to comply with applicable municipal regulatory requirements.]

4. FINAL CLEANING

4.1 Before final cleaning, arrange a meeting at Place of the Work to determine the acceptable standard of cleaning. Ensure that [Owner,] Consultant, Contractor [and cleaning company] are in attendance.

4.2 Remove from Place of the Work surplus Products, waste materials, recyclables, Temporary Work, and Construction Equipment not required to perform any remaining work.

4.3 Provide professional cleaning by a qualified, established cleaning company.

4.4 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.

4.5 Re-clean as necessary areas that have been accessed by Contractor’s workers prior to

4.6 Owner occupancy.

4.7 Remove stains, spots, marks, and dirt from finished surfaces, electrical and mechanical fixtures, furniture fitments, walls, floors [and] [ ].

4.8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, [ ] and all other finished surfaces, including mechanical and electrical fixtures. Replace broken, scratched or otherwise damaged glass.

4.9 Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.

4.10 Vacuum clean and dust exposed wall, floor, and ceiling surfaces, behind grilles, louvres and screens, [above suspended ceiling tiles] [ ].

4.11 Clean mechanical, electrical, and other equipment. Replace filters for mechanical equipment if equipment is used during construction.

4.12 Remove waste material and debris from crawlspaces and other accessible concealed spaces.

4.13 Remove stains, spots, marks, and dirt from exterior facades.

4.14 Clean exterior and interior window glass and frames.

4.15 Clean and sweep roofs, [clear roof drains,] [clean gutters and downspouts,] [sunken wells,] [ ].

4.16 [Sweep clean] [power wash] [remove snow and ice from] exterior [sidewalks,] [steps,] [driveways,] [roads,] [parking lots,] and other paved surfaces.

4.17 Use leaf blowers to clean landscaped surfaces.

5. WASTE MANAGEMENT AND DISPOSAL

SPEC NOTE: If the project involves removal of hazardous materials or designated substances such as asbestos, lead paint, PCBs, etc., this article is inadequate. Specify additional requirements in this section or in other sections.

5.1 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.

5.2 Do not burn or bury waste materials at Place of the Work.

5.3 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.

5.4 Cover or wet down dry waste materials to prevent blowing dust and debris.

END OF SECTION

SPEC NOTE: Use this Section to specify administrative processes associated with the attainment of closeout milestones at the completion of the Work.

SPEC NOTE: This Section assumes use of CCDC 2 – 2020 standard form contract and unmodified closeout related provisions in that contract. This Section provides additional details and requirements that are specific to the Project and to facilitate administration of this Contract. This Section is not intended to be used with CCDC contracts that do not address Ready-for-Takeover and contain General Conditions that address procedures related to Substantial Performance of the Work instead. In order to use this Section with other CCDC contracts and to avoid duplication or conflict with the Conditions of Contract and the applicable lien legislation, either the other CCDC contracts would need to be significantly modified by means of Supplementary Conditions to align with CCDC 2 – 2020 or alternatively this Section would need to be significantly modified.

1. READY-FOR-TAKEOVER

1.1 The prerequisites to attaining Ready-for-Takeover of the Work are described in the General Conditions of the Contract.

2. INSPECTION AND REVIEW BEFORE READY-FOR-TAKEOVER

SPEC NOTE: This article specifies the contractual prerequisites for attaining the Ready-for-Takeover milestone identified in CCDC 2 – 2020.

SPEC NOTE: This article specifies the inspection and review procedure for attaining the Ready-for-Takeover milestone identified in CCDC 2 – 2020.

SPEC NOTE: Exercise caution when editing this Section to ensure that provisions of the General Conditions of Contract are not duplicated here unnecessarily and that no conflicts are created with the General Conditions.

2.1 Contractor's Inspection: Before applying for the Consultant's review to establish Ready- for-Takeover of the Work:

2.1.1 Ensure that the specified prerequisites to Ready-for-Takeover of the Work are completed.

2.1.2 Conduct an inspection of the Work to identify defective, deficient, or incomplete work.

2.1.3 Prepare a comprehensive and detailed list of items to be completed or corrected.

2.1.4 Provide an anticipated schedule and costs for items to be completed or corrected.

SPEC NOTE: Select one of the following two paragraphs depending on whether the Consultant wishes to review the Work independently or jointly with the Contractor. In both cases there should be only one deficiency list and the Contractor should be responsible for maintaining it.

2.2 Consultant's Review: Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected, the Consultant will review the Work. The Consultant will advise the Contractor whether or not the Work is Ready-for-Takeover and will provide the Contractor with a list of items, if any, to be added to the Contractor's list of items to be completed or corrected. Provide the Consultant with a copy of the Contractor's revised list.

[OR]

2.3 Consultant's Review: Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected, the Consultant and the Contractor shall arrange a mutually satisfactory agreed date and time to jointly review the Work. The Consultant will advise the Contractor whether or not the Work is Ready-for- Takeover. Add additional items, if any, to the Contractor's list of items to be completed or corrected. Provide the Consultant with a copy of the revised

list.

2.4 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The Contractor's inspection and Consultant's review procedures specified above shall be repeated until the Work is Ready-for-Takeover and no items remain on the Contractor's list of items to be completed or corrected.

2.5 When the Consultant determines that the Work is Ready-for-Takeover, the Consultant will notify the Contractor and the Owner in writing to that effect.

3. PREREQUISITES TO FINAL PAYMENT

3.1 After Ready-for-Takeover of the Work and before submitting an application for final payment in accordance with the General Conditions of Contract:

3.1.1 Correct or complete all remaining defective, deficient, and incomplete work.

3.1.2 Remove from the Place of the Work all remaining surplus Products, Construction Equipment, and Temporary Work.

3.1.3 Perform final cleaning and waste removal necessitated by the Contractor's work performed after Ready-for-Takeover, as specified in Section 01 74 00 – Cleaning and Waste Management.

4. PARTIAL USER OCCUPANCY

SPEC NOTE: Include this article if partial user occupancy is specified in Section 01 14 00 – Work Restrictions.

4.1 If partial Owner occupancy of a part of the Work is required before the date of Ready-for- Takeover of the entire Work of the Contract, the provisions of this Section shall apply, to the extent applicable, to that part of the Work that the Owner intends to occupy.

5. SUBSTANTIAL PERFORMANCE OF THE WORK

SPEC NOTE: In the past, CCDC contracts have in effect combined the Owner's takeover with substantial performance of the Work, or similar such milestone provided for in the applicable lien legislation. The purpose of this milestone in the lien legislation is primarily to trigger release of the statutory lien holdback. However, lien legislation differs in each province and territory. Hence the prerequisites to, and the procedures for, attaining substantial performance also differ and they cannot be overridden by the contract. CCDC 2 – 2020 therefore no longer defines substantial performance of the Work nor includes any provisions dealing with the process for attaining substantial performance of the Work. It only addresses payment of the lien holdback, which comes after substantial performance of the Work, or similar milestone. CCDC 2 – 2020 assumes that this is an independent milestone that is not necessarily related to the Owner's takeover. Substantial performance of the Work for lien legislation purposes could potentially be certified before, at the same time as, or after, Ready-for-Takeover.

5.1 The prerequisites to, and the procedures for, attaining substantial performance of the Work, or similar

SPEC NOTE: The following paragraph simply refers to the applicable lien legislation for the process of attaining substantial performance of the Work or similar milestone.

such milestone as provided for in the lien legislation applicable to the Place of the Work, shall be:

5.1.1 independent of those for attaining Ready-for-Takeover of the Work, and

5.1.2 in accordance with the lien legislation applicable to the Place of the Work.

6. MAINTENANCE SERVICE

6.1 Provide a comprehensive maintenance service for the following items of plant and equipment including all planned preventative maintenance, as set out within the maintenance schedule and replacement of all

consumable items for review by the Consultant and Owner's FMO team.

6.1.1 [ ].

6.2 The comprehensive maintenance service will take place during the last month of the warranty period.

END OF SECTION

SPEC NOTE: This Section specifies procedures for closeout submittals, including supply of spare parts and maintenance materials at or near completion of construction. Section 01 33 00 - Submittal Procedures specifies submittals during construction.

SPEC NOTE: Additional requirements may be needed if the Owner decides to implement a voluntary sustainability certification program. Such additional submittal requirements should be addressed in a separate Div. 01 section (not included in the CCDC Master Specification for Div. 01).

1. OPERATION AND MAINTENANCE MANUAL

1.1 Prepare a comprehensive operation and maintenance manual, in the language[s] of the Contract, using personnel qualified and experienced for this task.

1.2 Submit an initial draft of the operation and maintenance manual for Consultant's review a minimum of [ ] weeks prior to the date scheduled for [Ready-for-Takeover] [Substantial Performance]. If required by Consultant's review comments, revise manual contents and resubmit for Consultant's review. If required, repeat this process until Consultant accepts the draft manual in writing.

1.3 Submit final version to Owner in [hard copy] [and] [electronic] format. [Provide [ ] [four] hard copies.]

2. OPERATION AND MAINTENANCE MANUAL FORMAT

2.1 Organize data in the form of an instructional manual.

2.2 Binders: vinyl, hard covered, three D-rings, loose leaf, 216 x 279 mm, with spine and face pockets.

2.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

2.4 Cover: Identify each binder with typed or printed title "Operation and Maintenance Manual", name of Project or facility, and subject matter of contents.

2.5 Arrange content [by systems,] [process flow,] under Section numbers and sequence of Table of Contents.

2.6 Provide tabbed fly leaf for each separate Product or system, with typed description of

2.7 Product and major component parts of equipment.

2.8 Text: Manufacturer's printed data, or typewritten data.

2.9 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

SPEC NOTE: The storage and retrieval of electronic information is dependent on the availability and sophistication of software. Software platforms, languages, formats and versions are constantly changing. Determine the Owner's needs and edit the following paragraph when requiring the Contractor to provide the information electronically.

2.10 Provide electronic copy of manual in searchable PDF format.

2.11 Provide electronic copy of Shop Drawings in manual as [1:1] [ ] scaled CAD files in [.dxf] [.dwg] [ ] format on [CD-ROM] [DVD-ROM] [USB flash drive] [electronic media acceptable to Owner].

3. OPERATION AND MAINTENANCE MANUAL – GENERAL CONTENT

3.1 Table of contents for each volume.

3.2 Introductory information including:

3.2.1 Date of manual submission.

3.2.2 Complete contact information for Consultant, subconsultants, other consultants, and

3.2.3 Contractor, with names of responsible parties.

3.2.4 Schedule of Products and systems indexed to content of volume.

3.2.5 For each Product or system, include complete contact information for Subcontractors, Suppliers and manufacturers, including local sources for supplies and replacement parts.

3.2.6 Product Data: mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.

3.2.7 Reviewed Shop Drawings.

SPEC NOTE: Edit the following paragraph to incorporate relevant certificates issued by the authorities having jurisdiction, as required by safety code legislation and occupational health and safety requirements.

3.2.8 Permits, certificates, letters of assurance and other relevant documents issued by or required by Authorities Having Jurisdiction.

3.2.9 Warranties.

3.2.10 Operating and maintenance procedures, incorporating manufacturer's operating and maintenance instructions, in a logical sequence.

3.2.11 [Training materials as specified in Section 01 79 00 - Demonstration and Training].

4. OPERATION AND MAINTENANCE MANUAL - EQUIPMENT AND SYSTEMS CONTENT

SPEC NOTE: Ensure that this article is reviewed by mechanical, electrical, and other specialty equipment and systems specifiers to avoid duplication or conflict with other divisions of the Specifications. If necessary, delete and specify in other technical sections with a reference to this Section.

4.1 Each Item of Equipment and Each System: include description of unit or system and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

4.2 Panel Board Circuit Directories: provide electrical service characteristics, controls, and communications.

4.3 Include installed colour coded wiring diagrams.

4.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

4.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

4.6 Provide servicing and lubrication schedule, and list of lubricants required.

4.7 Include manufacturer's printed operation and maintenance instructions.

4.8 Include sequence of operation by controls manufacturer.

4.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

4.10 Provide installed control diagrams by controls manufacturer.

4.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

4.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control

diagrams.

4.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

4.14 Include testing and balancing reports.

4.15 Include additional content as specified in technical Specifications sections.

5. OPERATION AND MAINTENANCE MANUAL - PRODUCTS AND FINISHES CONTENT

5.1 Include Product data, with catalogue number, options selected, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured Products.

5.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

5.3 Include an outline of requirements for routine and special inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.

5.4 Include additional content as specified in technical Specifications sections.

6. OPERATION AND MAINTENANCE MANUAL - WARRANTIES CONTENT

6.1 Separate each warranty with index tab sheets keyed to Table of Contents listing.

6.2 List each warrantor with complete contact information.

6.3 Obtain or retain copies, register with manufacturer and

6.4 Verify that documents are in proper form and contain full information. Ensure that warranties are for the correct duration and are in Owner’s name.

6.5 Hand over on or before the Ready-for-Takeover Date as stated in the Contract.

6.6 [Include maintenance bond(s)].

7. CONTRACTOR’S RECORD DRAWINGS

SPEC NOTE: If the Contractor is required to maintain as-built drawings as specified in Section 01 32 00, include this article regardless of who is responsible for producing the project record drawings.

7.1 Submit final as-built drawings in the form specified in Section 01 32 00 – Construction Progress Documentation to [Owner] [Consultant].

8. PROJECT RECORD DRAWINGS

SPEC NOTE: Most commonly the Consultant will be responsible for transferring as-built information from the as-built drawings maintained by the Contractor to the permanent project record drawings, in which case this article should be deleted. Include this article only if the Owner had determined that the Contractor, and not the Consultant, will be responsible for creating the project record drawings.

8.1 Transfer all information marked up on the as-built drawings during the progress of the Work (otherwise referred to as “red-line” drawings) to a master set of record drawing files provided by Consultant, in [ ] electronic format.

8.2 Mark revised drawings as "RECORD DRAWINGS".

8.3 Submit completed record drawings in [hard copy] [and] [electronic] form to [Owner] [Consultant]. Provide [four] [ ] hard copy sets.

9. SPARE PARTS, MAINTENANCE MATERIALS, AND SPECIAL TOOLS

9.1 Supply spare parts, maintenance materials, special tools and portable indicating instruments necessary for the operation and maintenance of all services, plant and equipment in quantities specified in technical Specifications sections.

9.2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed Products.

9.3 All spare parts shall be marked and numbered referencing the service, plant and equipment listed in the Operations and Maintenance Manual.

9.4 Provide tags for sets (minimum 2) of special tools and portable indicating instruments identifying their function and associated Product.

9.5 Deliver to and store items at location directed by Owner at Place of the Work. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.

9.6 Provide and inventory listing, organized by Specification section, cataloguing all items with manufacturer's current prices (including packaging and delivery to site) to [Owner] [Consultant]. Include Consultant reviewed inventory listing in operation and maintenance manual.

10. BUILDING INFORMATION MODEL (BIM) AND COMPUTER AIDED FACILITY MANAGEMENT (CAFM)

SPEC NOTE: If BIM is used for the project, and the Owner wishes to utilize the BIM as the basis for CAFM, specify the detailed particulars of the Contractor's submittal obligations at closeout. It may be appropriate to refer to the BIM Contract Appendix published by the Institute for BIM in Canada (IBC) in this regard.

10.1 [ ].

10.2 [ ].

END OF SECTION

SPEC NOTE: Use this Section to specify requirements for systems manufacturers, Suppliers and installers to demonstrate Products, equipment and systems to Owner's personnel.

1. SUMMARY

1.1 Demonstrate and provide training to Owner's personnel on operation and maintenance of [equipment] [building envelope] [and] [systems] prior to the date scheduled for [Ready-for- Takeover of the Work] [Substantial Performance of the Work].

1.2 Training includes explaining and demonstrating to the Owner's maintenance staff the purpose, function and operation of the installations including items and procedures listed in the Operational and Maintenance Manual.

1.3 Owner will provide list of personnel to receive training and will coordinate their attendance at agreed upon times.

1.4 Coordinate and schedule demonstration and training provided by Subcontractors and Suppliers.

2. SUBMITTALS

2.1 Submit proposed dates, times, durations, and locations for demonstration and training of each item of equipment and each system for which demonstration and training is required. Allow sufficient time for training and demonstration for each item of equipment or system, or time as may be specified in technical Specifications.

2.2 Consultant and Owner will review submittal and advise Contractor of any necessary revisions.

2.3 Submit report(s) within [5] [ ] Working Days after completion of demonstration and training:

2.3.1 identifying time and date of each demonstration and training session,

2.3.2 summarizing the demonstration and training performed, and

2.3.3 including a list of attendees

2.3.4 formal acknowledgement from attendees that training is complete

2.4 [Submit video record of demonstration and training together with report.]

3. PREREQUISITES TO DEMONSTRATION AND TRAINING

3.1 Testing, adjusting, and balancing has been performed in accordance with Contract Documents.

3.2 Equipment and systems are fully operational.

3.3 Copy of completed operation and maintenance manual is available for use in demonstration and training.

3.4 Conditions for demonstration and training comply with requirements specified in technical Specifications.

4. DEMONSTRATION AND TRAINING

4.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, [ ] and maintenance of each item of equipment and system.

4.2 Review operation and maintenance manual in detail to explain all aspects of operation and maintenance.

4.3 Prepare and insert additional information in operation and maintenance manual if required.

END OF SECTION

SPEC NOTE: Use this Section to specify Contractor, commissioning agency, Consultant, and Owner responsibilities related to commissioning. This Section assumes that either the Owner or the Contractor will retain and pay for the services of a third party commissioning agency to do the commissioning.
Select either option in article 1.1. In cases where both the Owner and the Contractor may retain separate commissioning agencies for particular types of commissioning, specify their respective responsibilities in more detail. Specify more detailed system or Product specific requirements for Contractor performed testing, adjusting, and balancing and other commissioning related requirements in the applicable technical Specifications Sections.

1. COMMISSIONING AGENCY

1.1 Owner will retain and pay for an independent commissioning agency to provide commissioning services for the Project.

[AND/OR]

1.2 Contractor shall retain and pay for a commissioning agency to provide commissioning services for the Project.

2. CONTRACTOR RESPONSIBILITIES

2.1 Prepare each system ready for commissioning. Verify systems installation is complete and in operation.

2.2 Coordinate commissioning with and/or assist commissioning agency(s).

2.3 Submit relevant drawings and preliminary performance data to enable the building user's staff to familiarize themselves with the installation.

2.4 Perform and document verification, performance testing, adjusting, and balancing operations.

2.5 Cooperate with commissioning agency and provide access to equipment and systems.

2.6 Provide personnel and operate systems at designated times, and under conditions required for proper commissioning.

2.7 Make instruments available to commissioning agency to facilitate spot checks during commissioning.

2.8 Participate in commissioning meetings.

2.9 Complete commissioning forms as requested by commissioning agency.

2.10 Correct deficiencies identified in commissioning process.

2.11 Incorporate commissioning data into operation and maintenance manual.

2.12 Ensure that commissioning agency participates in demonstration and training as specified in Section 01 79 00 – Demonstration and Training.

2.13 [Provide instruments necessary for commissioning.]

3. COMMISSIONING AGENCY RESPONSIBILITIES

3.1 The commissioning agency [will] [shall]:

3.1.1 Prepare a commissioning plan, including systems to be commissioned, forms, checklists and responsibilities of commissioning team members.

3.1.2 Implement the commissioning plan and lead the commissioning team through start-up, verification, performance testing, training, and document preparation.

3.1.3 Convene, chair, prepare and distribute minutes of commissioning meetings.

3.1.4 Supervise commissioning activities and witness inspections and tests.

3.1.5 Make periodic site visits for the purpose of selective checking of accuracy of commissioning form submissions, witness testing, and review of mock-ups.

3.1.6 Review content of operations and maintenance manual.

3.1.7 [Provide instruments necessary for commissioning.]

4. CONSULTANT RESPONSIBILITIES

4.1 Consultant will:

4.1.1 Participate in commissioning meetings.

4.1.2 Review verification and performance test results and direct Contractor to correct defects or deficiencies in the Work.

4.1.3 Initiate Change Orders or Change Directives identified as necessary by the commissioning process.

4.1.4 Review final commissioning report.

5. OWNER RESPONSIBILITIES

5.1 Owner will:

5.1.1 Assign operations and maintenance personnel to participate in meetings, and witnessing of demonstration, and training.

5.1.2 Designate a person to acknowledge receipt of reports.

6. SCHEDULE OF EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

SPEC NOTE: Use this article to provide a comprehensive list of all equipment and systems to be commissioned. Ensure that individual technical Specification Sections include more detailed commissioning related requirements, as necessary.

6.1 Division [ ] – [ ]

6.1.1 [ ]

6.1.2 [ ]

6.1.3 [ ]

6.2 Division [ ] – [ ]

6.2.1 [ ]

6.2.2 [ ]

6.2.3 [ ]

6.3 Division [ ] – [ ]

6.3.1 [ ]

6.3.2 [ ]

6.3.3 [ ]

END OF SECTION

1. GENERAL NOTES

1.1 Refer to Appendix A: Integrated Systems Testing Matrix at the end of this specification section.

1.2 This specification section describes the methodology for verifying and documenting that all interconnections between systems are installed and operating in conformance with their design criteria;

1.3 Contractor will ensure that when the Contractor is connecting or making modifications, or is causing a Subcontractor to connect or make modifications to existing systems, that the Contractor will manage, coordinate and schedule such work with the Owner.

1.4 For integrated systems testing to begin, the Contractor shall ensure that individual systems are functioning and installed in accordance with their design criteria or referenced standards;

1.5 All aspects of power distribution system shall be confirmed on-site including;

1.5.1 load transfer

1.5.2 bypass operation

1.5.3 key interlocks

1.5.4 load shedding

1.5.5 power metering

1.5.6 SCADA systems

1.5.7 BAS interface

1.5.8 energy performance monitoring

1.5.9 This specification defines the following:

1.5.9.1 Integrated Systems Testing Team (ISTT);

1.5.9.2 Integrated Systems Testing Process;

1.5.9.3 Integrated Systems Testing Requirements;

1.5.9.4 Integrated Systems Testing Documentation;

1.5.9.5 Verification (by the CxA) of Integrated Systems Testing;

1.5.9.6 Deferred Integrated Systems Testing.

2. DEFINITIONS

In this Section 01 91 26 the following capitalized terms have the meaning ascribed to them:

2.1 Acceptance Testing: the evaluation of a system to ensure that the installation is in accordance with its design criteria and the relevant Standards;

2.2 Component: individual devices, forming part of equipment, sub-systems, systems or interconnected systems;

2.3 Control Unit: a component that provides the control and logic processing of a fire alarm system;

2.4 Design Criteria: documents prescribed by a design professional for a system to meet the requirements of the Owner and applicable codes and standards;

2.5 Design Professional: a person, firm or corporation, qualified in accordance with federal, provincial, territorial, or other applicable regulations responsible for the design;

2.6 Input/Output Correlation: the relationship between two or more systems which has a defined cause

(input) and a resultant effect (output) as specified in the system's design documentation;

2.7 Inspection: a visual examination to determine that the device or system will apparently perform in accordance with its intended function;

2.8 Interconnection: the link between two or more integrated fire protection and life safety systems which has an associated input/output correlation. The link between two or more integrated fire protection and life safety systems may or may not be a physical connection;

2.9 Integrated System: a combination of two or more systems, which may or may not be physically connected with one another, but that are designed to operate together to achieve an overall functional objective;

2.10 Integrated Systems Testing Team (ISTT): is the designated team that plans, performs and documents the integrated systems testing according to the Integrated Systems Testing Plan.

2.11 Integrated Systems Testing Plan: a written project-specific document prepared by the CxA with input from the ISTT and the design team outlining the required tests and necessary functional results of the integrated systems testing;

2.12 Integrated Systems Testing Report; a written project-specific document prepared by the CxA documenting the results of the testing activities undertaken in accordance with the Integrated Systems Testing Plan;

2.13 Installing Contractor: a person, firm, corporation, or organization responsible for the installation of a system in accordance with the contract documents;

2.14 Supplier: a person, firm, corporation, or organization responsible for the supply of equipment or systems in accordance with the contract documents or similar contract documents (in the case of owner-supplied equipment or systems);

3. REFERENCES

3.1 CSA Z8001-13 - Commissioning of Health Care Facilities

4. RELATED SECTIONS

4.1 Section 00 01 10 Appendix F Commissioning Plan

4.2 Section 01 91 00 – VGH OR Ph1 - Facility Commissioning – General

4.3 Section 01 91 14 – VGH OR Ph1 - Facility Commissioning – Mechanical

4.4 Section 01 91 15 – VGH OR Ph1 - Facility Commissioning – Electrical

4.5 Section 23 08 00 Commissioning of HVAC Systems

4.6 Section 26 05 10 – Electrical Systems Commissioning

5. INTEGRATED SYSTEMS TESTING TEAM (ISTT)

5.1 The Integrated Systems Testing Team (ISTT) is the team who, together, plans and performs and documents the integrated systems testing according to the Integrated Systems Testing Plan. The ISTT members are to be identified in the integrated system testing Plan. These members will include designers, installers and suppliers of each system that interacts with at least one other system.

5.2 The ISTT members shall be knowledgeable and experienced in the design, installation, and operation of the system or systems being integrated for which they are responsible. NOTE: Federal, provincial, territorial or other applicable regulations may exist for the licensing and/or certification of individuals as confirmation of their knowledge and experience.

5.3 Specific-system ISTT members shall have knowledge and understanding of:

5.3.1 The codes and standards that regulate the design of building systems;

5.3.2 How individual and integrated systems are designed to operate during normal operating conditions and emergency conditions; and

5.3.3 Methods for validating the intended functionality of integrated systems.

5.4 Specific-system ISTT members shall have all licenses and certifications if required by:

5.4.1 Federal, provincial, territorial or other applicable regulations; and/or

5.4.2 Contract

5.5 Specific-system ISTT members shall have experience on at least 2 healthcare projects of similar size, scope and nature.

5.6 Key ISTT members are:

5.6.1 Contractor

5.6.1.1 Contractor will assist in coordination of all parties involved with the installation and supply of the individual systems to be commissioned.

5.6.1.2 Contractor is responsible for the on-site coordination of all installation parties (including Subcontractors) and suppliers and is ultimately responsible for the delivery of fully functional and integrated systems (documented as such).

5.6.1.3 Contractor will work together with the Owner's consultants and the Commissioning Authority (CxA) in the development of the integrated testing plan and its execution;

5.6.2 Owner's commissioning representative (aka Commissioning Authority (CxA))

5.6.2.1 As defined in the latest project commissioning plan

5.6.3 Design Professionals

5.6.3.1 As defined in the latest project commissioning plan

6. INTEGRATED SYSTEMS TESTING PROCESS

6.1 General

6.1.1 This section applies to the testing of new installations of integrated systems;

6.1.2 This section shall also be applied, as appropriate to existing integrated systems;

6.1.3 The design criteria for the integration of various systems is the responsibility of the design professional(s). The design professional(s) shall document together with the CxA, the intended integration systems performance for each system for which they hold design responsibility;

6.1.4 Any deficiencies found during integrated systems testing shall be documented and forwarded – via the CxA - to the Contractor or to specific trade contractor or supplier or to the appropriate design professional(s) for resolution.

6.1.5 Once the integrated systems are fully operational and documented as such, the integrated systems shall be demonstration to the design professionals and then to the owner in accordance with appropriate elements of Subsection 1.7 ("Integrated Systems Testing Requirements");

6.2 Integrated Systems Testing Planning Phase

6.2.1 During this planning phase of integrated systems testing, documentation detailing each interconnection between systems is made available to the CxA (sent from appropriate member of the ISTT). This documentation shall be sufficient for the CxA to prepare the Integrated Systems Testing Plan. Such documentation shall include, but not be limited to the following, as applicable:

6.2.1.1 Building floor plan(s);

6.2.1.2 Systems design documentation (drawings and specifications), including:

6.2.1.2.1 Sequencing descriptions (showing coordination between mechanical and electrical systems); and

6.2.1.2.2 Mechanical and electrical riser diagrams.

6.2.1.2.3 Manufacturer's operating and testing instructions, as requested by the CxA; and

6.2.1.2.4 Documentation of any alternative solutions and/or deviations from the requirements of Codes and Standards.

6.2.2 The Integrated Systems Testing Plan shall outline the following:

6.2.2.1 The functional objectives of system integrations;

6.2.2.2 The sequence of operations of integrated systems which:

6.2.2.2.1 Describe operation under normal operating conditions,

6.2.2.2.2 Describe operation under fire conditions and other non-normal conditions.

6.2.2.2.3 Test protocol and procedures for integrated systems;

6.2.2.2.4 A procedure for notifying building occupants of integrated systems testing; and

6.2.2.2.5 Alternate measures, such as notifications and safety protocols, for ensuring occupant safety during integrated systems testing.

6.2.2.3 Test procedures provided in the Integrated Systems Testing Plan shall consider the safety of personnel and the safe operation of the systems;

6.2.2.4 Where a building is intended to be occupied in phases, the Integrated Systems Testing Plan shall:

6.2.2.4.1 Be developed for the entire building, with consideration for the integrated tests which will be required for each occupancy phase identified within the overall Integrated Systems Testing Plan; and

6.2.2.4.2 Ensure that the integrated systems within each area to be occupied are tested for proper integrated operation.

6.2.2.5 Where a building is occupied in phases, and an integrated system is complete and undergoes integrated systems testing, the system integrations are not required to be retested for subsequent integrated systems tests provided ongoing construction does not impact previously tested system integrations;

6.2.2.6 Prior to implementation of the Integrated Systems Testing Plan, the CxA shall provide the Integrated Systems Testing Plan to the design professional(s) and the owner for review and acceptance;

6.2.2.7 Following acceptance of the Integrated Systems Testing Plan by the design professional(s) and the owner and prior to implementation of the Integrated Systems Testing Plan, where required, Contractor shall provide the Integrated Systems Testing Plan to the authority having jurisdiction for review;

6.2.2.8 Where the design professional(s) make changes to integrated systems that impact the

Integrated Systems Testing Plan, revisions to the Integrated Systems Testing Plan shall be submitted to the design professional(s) and the CxA and, where required, the authority having jurisdiction for review.

6.2.3 Integrated Systems Testing Implementation Phase

6.2.3.1 During this phase of a project, and prior to implementing the Integrated Systems Testing Plan, the following documentation shall be provided to the CxA, as required:

6.2.3.1.1 Written confirmation from design professional(s) that they have conducted individual system acceptance testing and that the systems, or parts thereof, have been installed in accordance with the design and are ready for integrated systems testing;

6.2.3.1.2 Written confirmation from the installing contractor(s) that the systems, or parts thereof, have been installed in accordance with the design and are ready for integrated systems testing;

6.2.3.1.3 Documentation from the verifying party(s) confirming that the fire protection and life safety systems have been installed in accordance with the design. Documentation that may be requested from the verifying parties may include, but not be limited to, the following, as applicable:

a. Fire alarm system verification report;

b. Standpipe system contractor's material and test certificate for aboveground piping;

c. Sprinkler system contractor's material and test certificate for aboveground piping;

d. Fixed fire suppression systems approval test report;

e. Emergency pressurization system testing, adjusting, and balancing report;

f. Smoke exhaust system testing, adjusting, and balancing report; and Contractor's material and test certificate for underground piping.

6.2.3.1.4 Confirmation of inspection by the local authority responsible for enforcing CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations;

6.2.3.1.5 Confirmation of inspection by the local authority responsible for enforcing ASME A17.1/CSA B44, Safety Code for Elevators and Escalators;

6.2.3.1.6 Confirmation of implementation of occupant notification procedures; and

6.2.3.1.7 Confirmation of implementation of alternate measures for ensuring occupant safety.

6.2.3.2 Where required, the Contractor shall provide sufficient notification to the Authority Having Jurisdiction of the implementation of the Integrated Systems Testing Plan to allow them to witness the integrated systems testing;

6.2.3.3 The design professional(s), installing contractor(s), and verifying party(s) shall participate in the test protocol and procedures, as required by the Integrated Systems Testing Plan;

6.2.3.4 Failure of any integrated systems tests shall result in the correction and re-testing of the affected integrated systems;

6.2.3.5 System shall be returned to their functional operating condition upon completion of integrated systems testing;

6.2.3.6 Upon successful completion of the integrated systems tests, documentation as required in Section 1.8, Integrated Systems Testing Documentation, shall be:

6.2.3.6.1 Provided to the building owner, design professionals and the CxA;

6.2.3.6.2 Provided to the authority having jurisdiction, where required; and

6.2.3.6.3 Maintained on site as specified in the National Fire Code of Canada.

7. INTEGRATED SYSTEMS TESTING REQUIREMENTS

7.1 General

7.1.1 This section describes the requirements for the testing of integrated systems;

7.1.2 These tests shall be incorporated into the Integrated Systems Testing Plan, based on the specific configuration and condition of the integrated systems;

7.1.3 The tests described in this section, shall be considered the minimum level of required testing. Additional testing may be required by the CxA or the Design Professionals to demonstrate the proper operation of the integrated systems;

7.1.4 The tests described in this section, shall include a functional operation of the device or system, except that testing by simulation shall be permitted where:

7.1.4.1 Non-restorable devices or systems are required to be activated to demonstrate an integrated function; or

7.1.4.2 Tests may result in harm to persons, or damage to a device, system, or building.

7.1.4.3 Where the CxA has been provided with specific documented evidence that an integrated systems test was performed during acceptance testing, such documentation may be considered acceptable to comply with the intent of this specification at the discretion of the CxA, and where required, in consultation with the Design Professionals and/or the authority having jurisdiction;

7.1.4.4 Where test requirements for integrated systems are not detailed in this section, the CxA shall prepare test procedures in consultation with the design professional(s) and members of the ISTT for inclusion in the Integrated Systems Testing Plan.

7.2 Fire Alarm Systems

7.2.1 Fire alarm systems integrated with other fire protection and life safety systems shall be tested to confirm correct operation in accordance with the design sequence of operation;

7.2.2 The test method shall be a functional test and shall be appropriate for the method of integration provided;

7.2.3 Where provided, the following interconnections with a fire signal receiving centre shall be confirmed:

7.2.3.1 Receipt of the fire alarm transmission signal;

7.2.3.2 Receipt of the supervisory transmission signal;

7.2.3.3 Receipt of the trouble transmission signal; and

7.2.3.4 Operation of a fire signal receiving centre disconnect means, such as a control by-pass,

results in a specific trouble indication at the fire alarm system and transmits a trouble transmission signal to the fire signal receiving centre.

7.3 Elevators

7.3.1 Where elevators are integrated with other systems, each system interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation;

7.3.2 2 Elevator integration considered by this specification includes integration to a fire alarm system and integration to standalone fire detectors;

7.3.3 Input/output correlations for elevator recall operation shall be tested to confirm the following:

7.3.3.1 Recall to primary level; or

7.3.3.2 Recall to alternate level.

7.3.4 Each elevator recall operation listed above shall be tested to confirm integration as follows:

7.3.4.1 Initiating devices designed to initiate elevator recall operation to the primary recall level shall, when activated, cause the affected elevators to recall to the primary recall level and the in-car recall indicator to stay constantly illuminated;

7.3.4.2 Initiating devices designed to initiate elevator recall operation to the alternate recall level shall, when activated, cause the affected elevators to recall to the alternate recall level and the in-car recall indicator to stay constantly illuminated; and

7.3.4.3 Initiating devices installed within elevator hoistways, elevator machine rooms, control spaces, or control rooms, designed to initiate elevator recall operation shall, when activated, cause the affected elevators to recall to the appropriate recall level and the in-car recall indicator to stay intermittently illuminated.

NOTE: Confirmation of in-car recall indicator status is intended to ensure correct input/output correlation (i.e. correct relay operation) and is not intended to replace elevator functional testing conducted by the local elevator licensing authority or authorized designate. Where one or more initiating device can cause an output correlation function, only one initiating device is required to be tested to confirm correct operation.

7.4 Audio/Visual and/or Lighting Control Systems

7.4.1 Where audio/visual and/or lighting control systems are integrated with other fire protection and life safety systems, each system interconnection shall be tested to confirm that, upon operation, the audio/visual system or lighting control system functions in accordance with the design sequence of operation. Examples of audio/visual and lighting control systems include, but are not limited to, the following:

7.4.1.1 Building lighting control systems;

7.4.1.2 Audio systems;

7.4.2 Each interconnection shall be tested to confirm integration by activating one initiating device associated with the input/output correlation and confirming correct output operation.

7.5 Notification Systems

7.5.1 Where notification systems are integrated with other fire protection and life safety systems, each system interconnection shall be tested to confirm that, upon operation, the notification system

functions in accordance with the design sequence of operation. Examples of notification systems include, but are not limited to, the following:

7.5.1.1 Fire: Do Not Enter signage;

7.5.1.2 Electronic messaging systems;

7.5.1.3 LED scrolling signs;

7.5.1.4 Emergency wayfinding signage;

7.5.1.5 Computer network messaging;

7.5.1.6 Building television systems;

7.5.1.7 Wide area voice paging systems;

7.5.1.8 Community alerting systems;

7.5.1.9 Building voice paging systems (not part of a fire alarm system);

7.5.1.10 Cellular device alerting systems (e.g. mobile phones, pagers, etc.).

7.5.2 Each interconnection shall be tested to confirm integration by activating one initiating device associated with the input/output correlation and confirming correct output operation.

7.6 Sprinkler Systems

7.6.1 Each interconnection between a sprinkler system and other fire protection and life safety system(s) shall be tested to confirm correct operation of the integration;

7.6.2 The test method shall be appropriate for the method of integration provided;

7.7 Standpipe Systems

7.7.1 Each interconnection between a standpipe system and other fire protection and life safety system(s) shall be tested to confirm correct operation of the integration;

7.7.2 The test method shall be appropriate for the method of integration provided;

7.8 Fire Pump

7.8.1 Where fire pumps are integrated with other fire protection and life safety systems, each fire pump interconnection shall be tested to confirm correct change of status in accordance with the design sequence of operation;

7.8.2 Input/output correlations for fire pump supervision shall include, but not be limited to, the following:

7.8.2.1 Fire pump running;

7.8.2.2 Fire pump trouble (diesel only);

7.8.2.3 Fire pump phase reversal (electric only);

7.8.2.4 Fire pump loss of phase (electric only);

7.8.2.5 Fire pump connected to alternate source (electric only); and

7.8.2.6 Controller main switch to OFF or manual position (diesel only).

7.8.3 Each supervision function for the fire pump, shall be tested to confirm integration as follows, where applicable:

7.8.3.1 Fire pump running (electric and/or diesel) shall be confirmed by manually starting the fire

pump. It is not necessary to flow water for the purpose of this test;

7.8.3.2 Fire pump trouble (diesel only) shall be confirmed by causing a trouble condition required to cause a common trouble signal on the fire pump controller in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection;

7.8.3.3 Fire pump phase reversal (electric only). Some fire pump controllers have a built-in switch that can simulate phase reversal. Where such a switch is provided, it should be used to test phase reversal interconnections. For fire pump controllers without this switch, activation of the phase reversal relay should be electrically simulated on the fire pump controller side of the interconnection;

7.8.3.4 Fire pump loss of phase (electric only) shall be confirmed by disconnecting one phase of the power source supplying the fire pump;

7.8.3.5 Fire pump connected to alternate source (electric only) shall be confirmed by manually switching the fire pump from primary to alternate power; or

7.8.4 Controller main switch to OFF or MANUAL position (diesel only) shall be confirmed by switching the main switch from the AUTO position to either the OFF or MANUAL position.

7.9 Water Supplies

7.9.1 Each interconnection between a water supply and other fire protection and life safety system(s) shall be tested to confirm correct operation of the integration;

7.9.2 The test method shall be appropriate for the method of integration provided;

7.9.3 Water level supervisory devices shall be tested by adjusting the water level sufficiently, or by simulating its mechanical operation;

7.9.4 Pressure supervisory devices shall be tested by adjusting the pressure level sufficiently, or by simulating its mechanical operation;

7.9.5 Temperature supervisory devices shall be tested by simulating the activation temperature of the device. Low temperature conditions may be simulated by using an aerosol based freeze spray suitable for use with energized electrical equipment. High temperature conditions may be simulated by using a controlled flame-less heat source.

7.10 Water Supplies Control Valves

7.10.1 Each interconnection between a private water supply control valve and other fire protection and life safety system(s) shall be tested to confirm correct operation of the integration;

7.10.2 The test method shall be appropriate for the method of integration provided.

7.11 Freeze Protection Systems

7.11.1 Each interconnection between a freeze protection system and other fire protection and life safety system(s) shall be tested to confirm correct operation of the integration;

7.11.2 The test method shall be appropriate for the method of integration provided.

7.12 Fixed Fire Suppression Systems

7.12.1 Where fixed fire suppression systems are integrated with other fire protection and life safety system(s), each fixed fire suppression system interconnection shall be tested to confirm correct change of status in accordance with the design sequence of operation. Examples of fixed fire suppression systems may include, but are not be limited to, the following:

7.12.1.1 Clean agent systems;

7.12.1.2 Carbon dioxide systems;

7.12.1.3 Halon systems;

7.12.1.4 Water mist systems;

7.12.1.5 Foam water systems;

7.12.1.6 Dry chemical systems; and

7.12.1.7 Fixed aerosol fire extinguishing systems.

7.12.2 The test method shall be a functional test and shall be appropriate for the method of integration provided. Release of suppression agent is not required for this test;

7.12.3 Fixed fire suppression systems shall be secured from inadvertent actuation for the duration of the integrated systems testing by:

7.12.3.1 Disconnecting releasing solenoids or electric actuators;

7.12.3.2 Closing of valves, and

7.12.3.3 Other actions, or combinations thereof, in accordance with manufacturer's instructions;

7.12.3.4 Where multiple initiating devices can cause an input/output correlation function as determined by the sequence of operation, the minimum number of initiating devices required to cause the input/output correlation function shall be tested to confirm operation.

7.13 Hold-Open Devices

7.13.1 Where hold-open devices are integrated with other systems, each system interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation;

7.13.2 Testing of correct operation shall include confirmation that each door equipped with a hold-open device has returned to the closed and latched position;

7.13.3 Hold-open device integration considered by this specification includes integration to a fire alarm system and integration to standalone initiating devices;

7.13.4 Where hold-open devices are controlled by a common fire alarm system interconnection, testing of hold-open devices shall include activation of a minimum of one initiating device;

7.13.5 Where hold-open devices are controlled by local initiating device interconnection, testing of hold-open devices shall include testing of all local initiating devices controlling the hold-open device. As the intent of integrated systems testing is to confirm correct operation of interconnections between two or more fire protection and life safety systems, where each hold-open device is individually interconnected to an initiating device, each separate interconnection would be required to be tested.

7.14 Electromagnetic Locks

7.14.1 Where electromagnetic locks are integrated with other systems, each system interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation;

7.14.2 Testing of correct operation shall include confirmation that each electromagnetic lock has de-energized;

7.14.3 Common release integrations for electromagnetic locks shall be tested by activation of a minimum of one initiating device;

7.14.4 Local release integrations for electromagnetic locks shall be tested by activation of all local initiating devices controlling the electromagnetic locks. Depending on the applicable Building Code, local release integrations may be through exit release hardware or local fire alarm manual stations. In addition, common release integrations are required. As the intent of integrated testing is to confirm correct operation of interconnections between two or more fire protection and life safety systems, each individual local and common release integration would be tested as appropriate to the integration provided.

7.15 Smoke Control Systems

7.15.1 For the purpose of this Specification:

7.15.1.1 Emergency Pressurization Systems are smoke control systems which are installed to limit the movement of smoke in a building to maintain a tenable environment. These systems include exit stairwell, elevator hoist way, areas of refuge, contained use areas, and vestibule pressurization; and

7.15.1.2 Smoke Exhaust Systems are systems which are installed to evacuate smoke from a building to maintain a tenable environment and to aid firefighting. These systems may include smoke exhaust fans, smoke exhaust shafts, smoke control dampers, and pressurization fans.

7.15.2 Smoke control systems may include interconnections between fans, closures, dampers, doors, and associated control systems such as fire alarm systems and building management systems. The interconnections should be tested by activating an alarm initiation device and confirming that the interconnected systems operate in accordance with the design sequence of operation. Access into pressurized areas through at least one access door should be confirmed to ensure that the exiting system and the smoke control system are correctly integrated.

7.15.3 Emergency Pressurization Systems

7.15.3.1 Where emergency pressurization systems are integrated with other systems, each system interconnection shall be tested to confirm correct operation in accordance with the design sequence of operation;

7.15.3.2 The test method shall be a functional test and shall be appropriate for the method of integration provided;

7.15.3.3 Input/output correlations for emergency pressurization systems may include, but not be limited to, one or more of the following:

7.15.3.3.1 Automatic pressurization fan control;

7.15.3.3.2 Manual pressurization fan control;

7.15.3.3.3 Automatic pressurization air relief control;

7.15.3.3.4 Manual pressurization air relief control; or

7.15.3.3.5 Door opening forces.

7.15.3.3.6 Where one or more initiating device can cause an output correlation function, only one initiating device is required to be tested to confirm correct operation;

7.15.3.3.7 With respect to door opening forces, a minimum of one door into each pressurized area is required to be tested to ensure the door is openable with the emergency pressurization system and/or smoke control system in operation.

7.15.4 Smoke Exhaust Systems

7.15.4.1 Smoke exhaust systems integrated with other fire protection and life safety systems shall be tested to confirm correct operation in accordance with the design sequence of operation;

7.15.4.2 The test method shall be a functional test and shall be appropriate for the method of integration provided;

7.15.4.3 Input/output correlations for smoke exhaust systems shall include, but not be limited to, one or more of the following:

7.15.4.3.1 Automatic fan control;

7.15.4.3.2 Manual fan control;

7.15.4.3.3 Fan status monitoring;

7.15.4.3.4 Automatic damper control;

7.15.4.3.5 Manual damper control;

7.15.4.3.6 Damper status monitoring;

7.15.4.3.7 Firefighter's smoke control station; or

7.15.4.3.8 Building Automation system interface.

7.15.4.4 Input/output correlations for smoke exhaust systems shall be tested for each smoke exhaust system interconnection;

7.15.4.5 Where one or more inputs can cause an output correlation function, only one input is required to be activated to confirm the correct operation of the interconnection. The correct operation of the interconnection shall also be confirmed to be in accordance with the smoke exhaust system sequence for the activated input;

7.15.4.6 Where interconnections are provided through digital interfaces, each command string (software object) shall be considered as a separate interconnection for the purposes of integrated testing;

7.15.4.7 For the purpose of confirming smoke exhaust system input/output correlation functions, control and monitoring functions provided through centralized displays, such as the firefighter's smoke control station or the building automation system, may be used provided the control and monitoring functions have been confirmed for correct operation and the monitoring functions provide true status.

7.16 Smoke Alarms

7.16.1 Where smoke alarms are interconnected with other systems or systems with fire protection and life safety functions, the interconnections shall be tested to confirm correct operation of the integration;

7.16.2 The test method shall be appropriate for the method of integration provided.

7.17 Building Automation System (BAS)

7.17.1 Where BAS is interconnected with systems or systems with fire protection and life safety functions, the interconnections shall be tested to confirm correct operation of the integration;

7.17.2 Each input/output correlation shall be tested to confirm correct operation in accordance with the design sequence of operation.

8. INTEGRATED SYSTEMS TESTING DOCUMENTATION

8.1 General

8.1.1 The purpose of an integrated systems testing report shall be to provide results of the implementation of the integrated testing plan;

NOTE: The Integrated Systems Testing Plan and the integrated testing report may be combined into a single document.

8.1.2 The integrated systems testing report shall be presented in a form and media in which it can be easily used, maintained and updated over the life cycle of the systems installed in buildings or facilities.

8.2 Integrated Systems Testing Forms

8.2.1 Integrated systems testing forms are to be developed by the CxA with consultation with the appropriate member(s) of the ISTT based on the test protocols and procedures for integrated systems as outlined in the project specifications;

8.2.2 Integrated systems testing forms shall indicate the test protocol and procedures and allow for documenting the resultant conditions observed by the CxA;

8.2.3 Integrated systems testing forms shall be signed upon completion of the test protocol and procedures confirming that the participants in the integrated systems testing concur that the resultant conditions observed are correctly stated in the integrated systems testing report;

8.2.4 Participants in the integrated systems testing shall only be required to sign integrated systems testing forms detailing the test protocol and procedures for their respective systems;

8.2.5 Where test protocols and procedures are required to be re-implemented due to failure of the initial integrated systems tests, the resultant conditions shall be recorded in an integrated systems testing form;

8.2.6 Integrated systems testing forms for re-tests shall clearly indicate the tests as confirmation of integrations after a failed result during initial integrated systems testing.

8.3 Integrated Systems Testing Report

8.3.1 Following the successful completion of integrated systems testing, the CxA shall prepare an Integrated Systems Testing Report;

8.3.2 The integrated systems testing report shall include, but not be limited to the following:

8.3.2.1 The Integrated Systems Testing Plan;

8.3.2.2 initial integrated systems testing forms;

8.3.2.3 Re-test integrated systems testing forms; and

8.3.2.4 Documentation provided as required by Subsection 1.6.3, Integrated Systems Testing Implementation Phase.

8.3.2.5 Examples of procedures which may be included in the integrated testing report include, but are not limited to, the following:

8.3.2.5.1 Notification of integrated systems testing should be given in advance. The parties to be notified who could be affected may include, but are not necessarily limited to, the fire department, supervisory staff in the building and the occupants of the building;

8.3.2.5.2 During implementation of integrated systems testing, the Fire Department and building occupants/owner should be notified. Instructions should be posted as to alternate provisions or actions to be taken in case of an emergency. These provisions and actions should be acceptable to the Chief Fire Official and be in accordance with the accepted Fire Safety Plan, where provided;

8.3.2.5.3 An attempt to minimize the impact of inoperative equipment should be made (i.e. where portions of a sprinkler system, fire alarm system and standpipe system are taken out of service, the remaining portions will be maintained). Assistance and direction for specific situations should be sought from the authority having jurisdiction and be in accordance with the approved Fire Safety Plan, where provided;

8.3.2.5.4 Where procedures to be followed in the event of a shutdown of any part of a fire protection and life safety system are not detailed in an approved Fire Safety Plan, the following procedures are to be implemented, as applicable, based on stage of construction or occupancy of the building:

8.3.2.5.4.1 Notify the Fire Department, the fire signal receiving centre, and the owner or owner's representatives, as applicable. Give your name, address and a description of the work and when you expect it to be completed. The Fire Department should be notified in writing of shutdowns longer than 24 h, as applicable;

8.3.2.5.4.2 Post notices on all floors by elevators and at entrances, stating the work and when it is expected to be completed,

8.3.2.5.4.3 Have staff or other reliable person(s) patrol the affected area(s) at least once every hour;

8.3.2.5.4.4 Notify the Fire Department, the fire signal receiving centre, and building occupants/owner when work has been completed and systems are operational; and

8.3.2.5.4.5 Alternate measures for ensuring building occupant safety during integrated systems testing.

9. VERIFICATION (by the CxA) of INTEGRATED SYSTEMS TESTING

9.1.1 The appropriate party or parties of the ISTT shall demonstrate to the CxA on-site and through documentation, that the various systems have been properly integrated and are functioning as defined in the Integrated Systems Testing Plan and the contract documents;

9.1.2 The CxA will ensure that any integrated systems testing issues or deficiencies found during this verification process are recorded and then ultimately resolved;

9.1.3 The CxA will recommend acceptance of integrated systems testing results, in consultation with design professionals, to the Owner.

10. DEFERRED INTEGRATED SYSTEMS TESTING

10.1.1 All integrated system tests that could not occur for any reason in the period leading up to or immediately following Ready-for-Takeover is to be rescheduled when the conditions that prevented this testing from occurring can be overcome.

Vendor and/or Manufacturer Sign-Off Form

Project: _____ Equipment Schedule Reference: _____

Asset System / Component : _____

(Make / Model / Size): _____

Vendor and/or Manufacturer: _____

Expected Service Life of Asset / System (years): _____

Standard Warranty Period (years): _____

Optional Warranty Extensions (years) _____

Service Contract Options Description including typical service levels agreement, as applicable:

Preventative Maintenance

Option 1: Number of Visits _____ Unit Price _____ Annual Price _____

Option 2: Number of Visits _____ Unit Price _____ Annual Price _____

Option 3: Number of Visits _____ Unit Price _____ Annual Price _____

Demand Maintenance

Description _____ Unit of Measure _____ Unit Price _____

Maintenance Activity	Weekly	Monthly	Quarterly	Annually

Component Repair / Replacement Activity	Frequency (years)

Propose Equipment Install Location	Mark Applicable
Acceptable Clearances	
Non-Hazardous Area	
Requires Safe Work / Confined Space Provisions	
Other:	

Comments: _____

Licensing costs (if applicable)	Frequency (years)

The undersigned vendor and/or manufacturer of the equipment item described above hereby certifies that the above information is accurate under typical operating conditions and with consideration of acceptable maintenance practices.

_____ _____

Date Vendor and/or Manufacturer

_____

Signature of Authorized Representative

_____ _____

Date Contractor

_____

Signature of Authorized Representative

End of Section

May 2, 2024

Appendix B

HVAC System Standardization Documentation for New Construction and Renovation Project

Vancouver General Hospital
899 W 12th Ave, Vancouver, BC V5Z 1M9

FMO – HVAC System Standard Documentation For New Construction and Renovation Project

Flowchart, Test Sheets, Checksheets and Checklists

Prepared by:

Marvin Naval, AScT.
HVAC Chargehand

Submitted to:

Eric Sutton, RSE
Senior Manager
Facilities, Maintenance & Operation

Revision 0

December 3, 2021

Index for

VGH – FMO – HVAC Standard Documentation

Vancouver, BC

Table Index

1.0 NEW PROJECT and RENOVATION DOCUMENTS ENDORSEMENT TO FMO FLOWCHART

NEW **PROJECT and RENOVATION DOCUMENTS** ENDORSEMENT TO **FMO** FLOW CHART

PROJECT TEAM

Construction Period

FMO- Electrical

Training and Demonstration of the Electrical Systems
-Please ensure that all necessary documents are provided five (5) days before the scheduled date of "DEMO to the OWNER" by the General Contractor.

All Construction deficiency findings during walk-through (demo) should be recorded by Project Team (In-charge) and ensure to be included in Electrical Commissioning Agent Status Report.

Provide Training (If necessary)

FMO- HVAC

Project Team to include to mechanical specs the " Final Balancing Report vs. Controls Contractor Program Implementation Flow Chart. ***(See Item 2.0)***

Training and Demonstration of the Mechanical Systems
-Please ensure that all necessary documents are provided five (5) days before the scheduled date of "DEMO to the OWNER" by the General Contractor.
(See Item 8.0)

All Construction deficiency findings during walk-through (*Demo*) should be recorded by Project Team *(In-charge)* and ensure to be included in Mechanical Commissioning Agent Status Report (*by the Comm. Agent*).

Controls Contractor DDC Training
-Separate training sessions with Controls Contractor in FMO-HVAC/Controls team (if necessary).

FMO- Plumbing

Training and Demonstration of the Piping Systems
-Please ensure that all necessary documents are provided five (5) days before the scheduled date of "DEMO to the OWNER" by the General Contractor

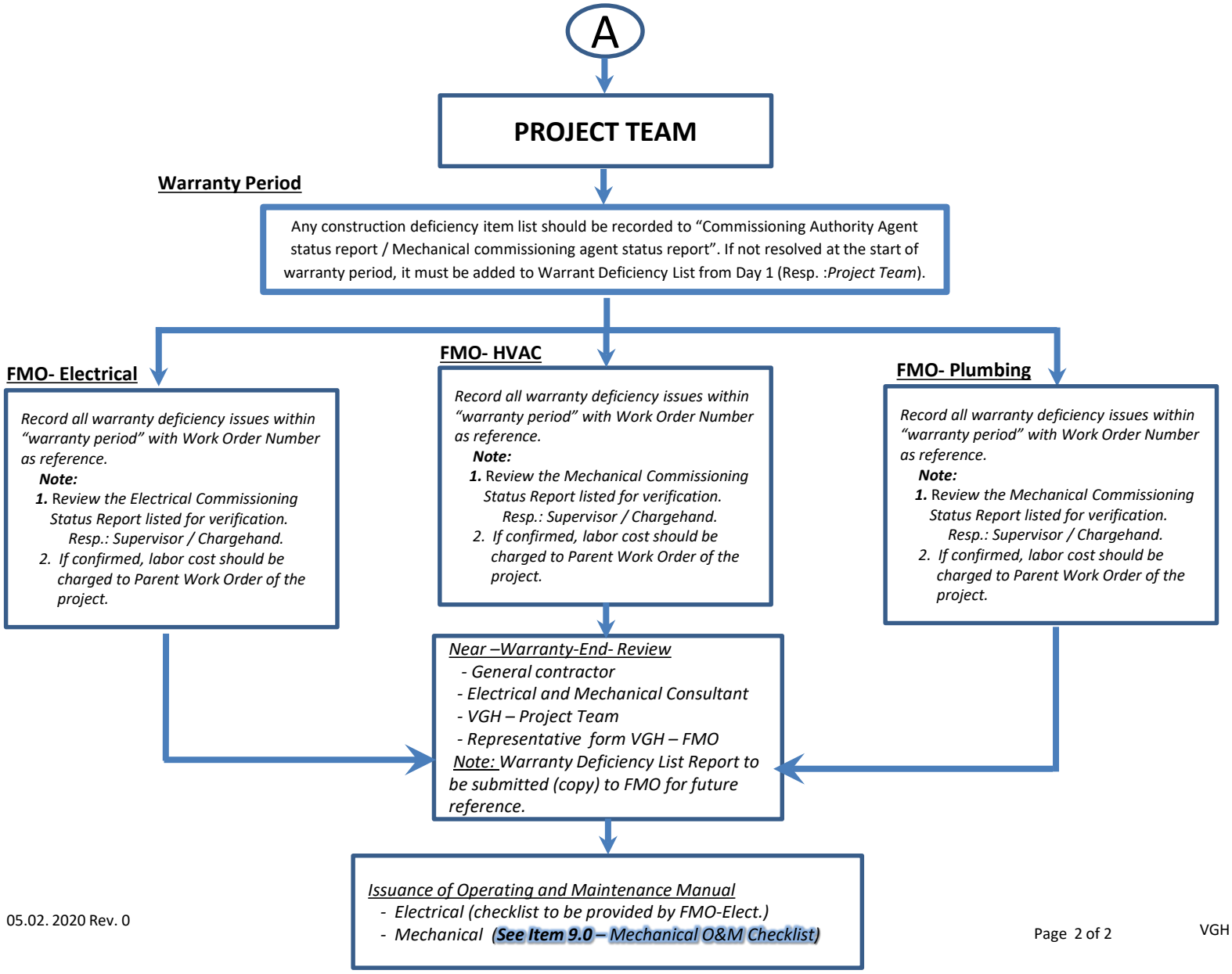
All Construction deficiency findings during walk-through (demo) should be recorded by Project Team (In-charge) and ensure to be included in Mechanical Commissioning Agent Status Report.

Provide Training (If necessary)

"Final Acceptance Letter" sign-off by the Owner.
- Ensure that all deficiency list related during construction are resolved.

A

NEW **PROJECT & RENOVATION DOCUMENTS** ENDORSEMENT TO **FMO** FLOW CHART



2.0 FINAL BALANCING REPORT VS. CONTROLS CONTRACTOR PROGRAM IMPLEMENTATION FLOWCHART

Vancouver CoastalHealth

Vancouver General Hospital

899 W 12th Ave, Vancouver, BC V5Z 1M9

FINAL BALANCING REPORT VS. CONTROLS CONTRACTOR PROGRAM IMPLEMENTATION FLOW CHART

Controls Contractor to perform end-to-end checks and commissioned the HVAC Systems.

HVAC System for Final Balancing by Balancing Contractor.
- determined the controls system setpoints/values and entered into controls program in a permanent state at the time of balancing (indicates testing mode during balancing - if applicable).

Final Balancing Report to be submitted by Balancing Contractor to their client (*Sheet Metal or Mechanical Contractor*).
Note: all controls system setpoints / values are recorded on the balancing report.

Sheet Metal or Mechanical Contractor to be submitted the Final Balancing report to Controls Contractor to encode the final variables of points *(if applicable*).

Note:
See Item 4.1 to 4.6 suggested "Balancing Test Sheets Format.

A

A

Controls system setpoints/values are doubled checked by the Controls Contractor (*comparing the final balancing report to the control system with assurance that setpoints/values are permanent) .*(**Note: All software variables to be in AUTO STATE**)

For VAV's :
- Duct Sizes
- Calibration Factor
- Maximum / Minimum Air Flow (*Cooling and Heating*)

For Equipment with VFD:
- Final fan speed / frequency setting (*air and water system*).

For Main HVAC System Pressure:
- Final Duct Pressure sensor setpoint from air balancing report.
- Final Differential Pressure sensor setpoint from water balancing report.

Note:
Controls Contractor to include to BAS the location of pressure sensor both air and water of HVAC system. (for future VGH-HVAC reference).

Controls Contractor to be stamped "Reviewed" the final balancing report and return to Controls Contractor client. (*Sheet Metal or Mechanical Contractor*).

B

B

Mechanical Commissioning Agent to include the final balancing report with Controls Contractor "Reviewed" stamp to their report.
Note: Mechanical Commissioning Agent manage and confirm the above process.

BAS Graphics should be available 5 working days prior to Demonstrations to the Owner for HVAC Controls to review and comment.

Demonstration to the Owner.
(*See Item 8.0)*

Final " Owner Acceptance" Letter to be signed by the Owner when BAS graphics is complete and reviewed by Mechanical Agent and VGH – HVAC staff.

VGH – FMO – HVAC
/mrn

12.11.2019 Rev. 0

3.0 PRE-DEMO BALANCING TEST SHEETS FORMAT
(System Survey)
(Air and Water)
for Renovation Project

Note: Submit this report to Mechanical Consultant and FMO-HVAC.

PRE-DEMO AIR BALANCING FORMAT (for Supply VAV's)
System Survey

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of survey);

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____

List of VAV's connected to this system

No.	VAV Drawing No.	DDC Tag No.	Control ID	Duct Size	Calibration Factor	Airflow						Comment/s
						Maximum (L/s)			Minimum (L/s)			
						Setpoint	Actual	%	Setpoint	Actual	%	

NOTE: This is summary of total airflow of individual VAV's only.

PRE-DEMO AIR BALANCING FORMAT (for Return_Exhaust VAV's)
System Survey

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of survey);

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____

List of VAV's connected to this system

No.	VAV Drawing No.	DDC Tag No.	Control ID	Duct Size	Calibration Factor	Airflow						Comment/s
						Maximum (L/s)			Minimum (L/s)			
						Setpoint	Actual	%	Setpoint	Actual	%	

NOTE: This is summary of total airflow of individual VAV's only.

PRE-DEMO AIR BALANCING FORMAT (for Supply Constant Volume)
System Survey

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of survey);

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____ (*if applicable*)

List of VAV's connected to this system

No.	Outlet No.	Room serves	Duct Size	Duct Size	Air flow			Comment/s
					Design	Actual	%	

PRE-DEMO AIR BALANCING FORMAT (for Return_Exhaust Constant Volume) System Survey

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of survey);

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____ (*if applicable*)

List of VAV's connected to this system

No.	Outlet No.	Room serves	Duct Size	Duct Size	Air flow			Comment/s
					Design	Actual	%	

PRE-DEMO WATER BALANCING FORMAT
(Chilled Water System)
System Survey

Project Name: _____ Date: _____

TOTAL SYSTEM ON FULL COOLING

Main Pump System

Tag Number: _____

Water System Condition (at the time of survey);

Differential Pressure Setpoint : _____
Actual Differential Pressure : _____
Pumps setting : _____
No. of Pump/s running : _____

List of Balancing Circuit Valve (CBV) or Autoflow valve connected to this system

No.	Valve Tag	Serves	CBV Make / Size (")	Position	Specified	Operating		%	Comment/s
					Flowrate (L/s)	PD (ft)	Flowrate (L/s)		

PRE-DEMO WATER BALANCING FORMAT
(Heating Water System)
System Survey

Project Name: _____ Date: _____

TOTAL SYSTEM ON FULL HEATING

Main Pump System

Tag Number: _____

Water System Condition (at the time of survey);

Differential Pressure Setpoint : _____
Actual Differential Pressure : _____
Pumps setting : _____
No. of Pump/s running : _____

List of Balancing Circuit Valve (CBV) or Autoflow valve connected to this system

No.	Valve Tag	Serves	CBV Make / Size (")	Position	Specified	Operating		%	Comment/s
					Flowrate (L/s)	PD (ft)	Flowrate (L/s)		

4.0 FINAL BALANCING TEST SHEETS FORMAT (Air and Water)

FINAL AIR BALANCING FORMAT (for Supply VAV's)

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of balancing):

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____

List of VAV's connected to this system

No.	VAV Drawing No.	DDC Tag No.	Control ID	Duct Size	Calibration Factor	Airflow						Comment/s
						Maximum (L/s)			Minimum (L/s)			
						Setpoint	Actual	%	Setpoint	Actual	%	

NOTE: This is summary of total airflow of individual VAV's only.

FINAL AIR BALANCING FORMAT (for Return_Exhaust VAV's)

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of balancing):

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____

List of VAV's connected to this system

No.	VAV Drawing No.	DDC Tag No.	Control ID	Duct Size	Calibration Factor	Airflow						Comment/s
						Maximum (L/s)			Minimum (L/s)			
						Setpoint	Actual	%	Setpoint	Actual	%	

NOTE: This is summary of total airflow of individual VAV's only.

FINAL AIR BALANCING FORMAT (for Supply Constant Volume)

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of balancing);

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____ (*if applicable*)

List of VAV's connected to this system

No.	Outlet No.	Room serves	Duct Size	Duct Size	Air flow			Comment/s
					Design	Actual	%	

FINAL AIR BALANCING FORMAT (for Return_Exhaust Constant Volume)

Project Name: _____ Date: _____

Main Air Handling Unit System

Tag Number: _____

Air System Condition (at the time of balancing);

Duct Static Pressure Setpoint : _____
Actual Duct Static Pressure : _____
AHU's settings (VFD) : _____ (*if applicable*)

List of VAV's connected to this system

No.	Outlet No.	Room serves	Duct Size	Duct Size	Air flow			Comment/s
					Design	Actual	%	

FINAL WATER BALANCING FORMAT
(Chilled Water System)

Project Name: _____ Date: _____

TOTAL SYSTEM ON FULL COOLING

Main Pump System

Tag Number: _____

Water System Condition (at the time of balancing);

Differential Pressure Setpoint : _____
Actual Differential Pressure : _____
Pumps setting : _____
No. of Pump/s running : _____

List of Balancing Circuit Valve (CBV) or Autoflow valve connected to this system

No.	Valve Tag	Serves	CBV Make / Size (")	Position	Specified	Operating		%	Comment/s
					Flowrate (L/s)	PD (ft)	Flowrate (L/s)		

FINAL WATER BALANCING FORMAT
(Heating Water System)

Project Name: _____ Date: _____

TOTAL SYSTEM ON FULL HEATING

Main Pump System

Tag Number: _____

Water System Condition (at the time of balancing);

Differential Pressure Setpoint : _____
Actual Differential Pressure : _____
Pumps setting : _____
No. of Pump/s running : _____

List of Balancing Circuit Valve (CBV) or Autoflow valve connected to this system

No.	Valve Tag	Serves	CBV Make / Size (")	Position	Specified	Operating		%	Comment/s
					Flowrate (L/s)	PD (ft)	Flowrate (L/s)		

5.0 MECHANICAL COMMISSIONING AGENT "PROJECT PROGRESS TRACKER" CHECKLIST AND CHECKOUT SHEETS (*Individual*) FORMAT

Note: *Mechanical Commissioning Agent Checklist serves as "PROJECT PROGRESS TRACKER" to be discussed the latest updates during Mechanical Commissioning Agent meeting and submit the updated list to the COMMISSIONING TEAM.*

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY EQUIPMENT COMMISSIONING AGENT CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	Installed	Piping Complete	Duct/Vent complete	Unit is accessible	Electrical Rough-In	Electrical Terminated (OLs set)	Fire Interlock	Controls complete	Controls E-to-E Checks	Pre-start Checks	Area / System Clean	Equipment Start-ups/ Fans running	Balancing Complete	Functional Checks	Remarks
		In-Charge (Contractor)	Sheet Metal Contractor	Mechanical Contractor	Sheet Metal Contractor	General Contractor & Mechanical Contracotr	Electrical Contractor	Electrical Contractor	Electrical Contractor	Controls Contractor	Controls Contractor	Mechanical Commissioning Agent /& General Contractor	General Contractor & Mechanical Contracotr	Mechanical Commissioning Agent, Controls Contractor and Mechanical Contractor	Balancing Contractor	Mechanical Commissioning Agent / Controls Contractor	
AIR HANDLING UNITS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
HEATING / COOLING COILS SYSTEM																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
RETURN / RELIEF FANS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY EQUIPMENT COMMISSIONING AGENT CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	Installed	Piping Complete	Duct/Vent complete	Unit is accessible	Electrical Rough-In	Electrical Terminated (OLs set)	Fire Interlock	Controls complete	Controls E-to-E Checks	Pre-start Checks	Area / System Clean	Equipment Start-ups/ Fans running	Balancing Complete	Functional Checks	Remarks
		In-Charge (Contractor)	Sheet Metal Contractor	Mechanical Contractor	Sheet Metal Contractor	General Contractor & Mechanical Contracotr	Electrical Contractor	Electrical Contractor	Electrical Contractor	Controls Contractor	Controls Contractor	Mechanical Commissioning Agent /& General Contractor	General Contractor & Mechanical Contracotr	Mechanical Commissioning Agent, Controls Contractor and Mechanical Contractor	Balancing Contractor	Mechanical Commissioning Agent / Controls Contractor	
PRESSURIZATION / VESTIBULE FANS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
SUPPLY / EXHAUST FANS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
SPLIT DX / CHILLED WATER SYSTEM																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															

VGH - FMO - HVAC
\mrn

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY EQUIPMENT COMMISSIONING AGENT CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	Installed	Piping Complete	Duct/Vent complete	Unit is accessible	Electrical Rough-In	Electrical Terminated (OLs set)	Fire Interlock	Controls complete	Controls E-to-E Checks	Pre-start Checks	Area / System Clean	Equipment Start-ups/ Fans running	Balancing Complete	Functional Checks	Remarks
		In-Charge (Contractor)	Sheet Metal Contractor	Mechanical Contractor	Sheet Metal Contractor	General Contractor & Mechanical Contracotr	Electrical Contractor	Electrical Contractor	Electrical Contractor	Controls Contractor	Controls Contractor	Mechanical Commissioning Agent /& General Contractor	General Contractor & Mechanical Contracotr	Mechanical Commissioning Agent, Controls Contractor and Mechanical Contractor	Balancing Contractor	Mechanical Commissioning Agent / Controls Contractor	
HEAT PUMPS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
COOLING TOWER																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
FAN COILS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															

VGH - FMO - HVAC
\mrn

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY EQUIPMENT COMMISSIONING AGENT CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	Installed	Piping Complete	Duct/Vent complete	Unit is accessible	Electrical Rough-In	Electrical Terminated (OLs set)	Fire Interlock	Controls complete	Controls E-to-E Checks	Pre-start Checks	Area / System Clean	Equipment Start-ups/ Fans running	Balancing Complete	Functional Checks	Remarks
		In-Charge (Contractor)	Sheet Metal Contractor	Mechanical Contractor	Sheet Metal Contractor	General Contractor & Mechanical Contracotr	Electrical Contractor	Electrical Contractor	Electrical Contractor	Controls Contractor	Controls Contractor	Mechanical Commissioning Agent /& General Contractor	General Contractor & Mechanical Contracotr	Mechanical Commissioning Agent, Controls Contractor and Mechanical Contractor	Balancing Contractor	Mechanical Commissioning Agent / Controls Contractor	
PUMPS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
BOILERS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
DOMESTIC HOT WATER TANK																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															

VGH - FMO - HVAC
\mrn

PROJECT ID : _____ **PROJECT ID : _____**

PROJECT NAME: _____ **Updated as of : _____**

SUMMARY EQUIPMENT COMMISSIONING AGENT CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	Installed	Piping Complete	Duct/Vent complete	Unit is accessible	Electrical Rough-In	Electrical Terminated (OLs set)	Fire Interlock	Controls complete	Controls E-to-E Checks	Pre-start Checks	Area / System Clean	Equipment Start-ups/ Fans running	Balancing Complete	Functional Checks	Remarks
		In-Charge (Contractor)	Sheet Metal Contractor	Mechanical Contractor	Sheet Metal Contractor	General Contractor & Mechanical Contracotr	Electrical Contractor	Electrical Contractor	Electrical Contractor	Controls Contractor	Controls Contractor	Mechanical Commissioning Agent /& General Contractor	General Contractor & Mechanical Contracotr	Mechanical Commissioning Agent, Controls Contractor and Mechanical Contractor	Balancing Contractor	Mechanical Commissioning Agent / Controls Contractor	
HOT WATER TANK																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
COMPRESSOR																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
UNIT HEATERS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY EQUIPMENT COMMISSIONING AGENT CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	Installed	Piping Complete	Duct/Vent complete	Unit is accessible	Electrical Rough-In	Electrical Terminated (OLs set)	Fire Interlock	Controls complete	Controls E-to-E Checks	Pre-start Checks	Area / System Clean	Equipment Start-ups/ Fans running	Balancing Complete	Functional Checks	Remarks
		In-Charge (Contractor)	Sheet Metal Contractor	Mechanical Contractor	Sheet Metal Contractor	General Contractor & Mechanical Contracotr	Electrical Contractor	Electrical Contractor	Electrical Contractor	Controls Contractor	Controls Contractor	Mechanical Commissioning Agent /& General Contractor	General Contractor & Mechanical Contracotr	Mechanical Commissioning Agent, Controls Contractor and Mechanical Contractor	Balancing Contractor	Mechanical Commissioning Agent / Controls Contractor	
RADIANT PANELS																	
1		Tag No. _____ Location: _____ Serves: _____															
2		Tag No. _____ Location: _____ Serves: _____															
3		Tag No. _____ Location: _____ Serves: _____															
4		Tag No. _____ Location: _____ Serves: _____															
5		Tag No. _____ Location: _____ Serves: _____															

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY VARIABLE AIR VALVE (VAV) COMMISSIONING CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	VAV Size	Size Correction (installed)	Piping Complete	Coil & access complete & correct	Unit is accessible	Ducting completed & correct	Install. complete & Correct	Controls completed & correct	Controls End-to-End	Damper strokes fully	Area or System Clean	Max/Min Programmed Box controlling (Calibration)	Balancing complete data recorded	No unusual sounds or leakage observed	Space temp. controlled Unit functions correctly	Remarks
		In-Charge (Contractor)	from shop Drawigs	Sheet Metal Contractor	Mechanical Contractor	Mechanical Contractor	General Contractor & Mechanical Contracotr	Sheet Metal Contractor	Mechanical Contractor	Controls Contractor	Controls Contractor	Controls Contractor	General Contractor & Mechanical Contracotr	Controls Contractor	Balancing Contractor	Balancing Contractor / Controls Contractor / Mechanical Contractor	Mechanical Commissioning Agent / Controls Contractor	
SUPPLY VARIABLE AIR VALVE																		
1		Tag No. _____ Location: _____ Serves: _____																
2		Tag No. _____ Location: _____ Serves: _____																
3		Tag No. _____ Location: _____ Serves: _____																
4		Tag No. _____ Location: _____ Serves: _____																
5		Tag No. _____ Location: _____ Serves: _____																
6		Tag No. _____ Location: _____ Serves: _____																
7		Tag No. _____ Location: _____ Serves: _____																
8		Tag No. _____ Location: _____ Serves: _____																
9		Tag No. _____ Location: _____ Serves: _____																
10		Tag No. _____ Location: _____ Serves: _____																
11		Tag No. _____ Location: _____ Serves: _____																
12		Tag No. _____ Location: _____ Serves: _____																
13		Tag No. _____ Location: _____ Serves: _____																
14		Tag No. _____ Location: _____ Serves: _____																
15		Tag No. _____ Location: _____ Serves: _____																

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY VARIABLE AIR VALVE (VAV) COMMISSIONING CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	VAV Size	Size Correction (installed)	Piping Complete	Coil & access complete & correct	Unit is accessible	Ducting completed & correct	Install. complete & Correct	Controls completed & correct	Controls End-to-End	Damper strokes fully	Area or System Clean	Max/Min Programmed Box controlling (Calibration)	Balancing complete data recorded	No unusual sounds or leakage observed	Space temp. controlled Unit functions correctly	Remarks
		In-Charge (Contractor)	from shop Drawigs	Sheet Metal Contractor	Mechanical Contractor	Mechanical Contractor	General Contractor & Mechanical Contracotr	Sheet Metal Contractor	Mechanical Contractor	Controls Contractor	Controls Contractor	Controls Contractor	General Contractor & Mechanical Contracotr	Controls Contractor	Balancing Contractor	Balancing Contractor / Controls Contractor / Mechanical Contractor	Mechanical Commissioning Agent / Controls Contractor	
RETURN VARIABLE AIR VALVE																		
1		Tag No. _____ Location: _____ Serves: _____																
2		Tag No. _____ Location: _____ Serves: _____																
3		Tag No. _____ Location: _____ Serves: _____																
4		Tag No. _____ Location: _____ Serves: _____																
5		Tag No. _____ Location: _____ Serves: _____																
6		Tag No. _____ Location: _____ Serves: _____																
7		Tag No. _____ Location: _____ Serves: _____																
8		Tag No. _____ Location: _____ Serves: _____																
9		Tag No. _____ Location: _____ Serves: _____																
10		Tag No. _____ Location: _____ Serves: _____																
11		Tag No. _____ Location: _____ Serves: _____																
12		Tag No. _____ Location: _____ Serves: _____																
13		Tag No. _____ Location: _____ Serves: _____																
14		Tag No. _____ Location: _____ Serves: _____																
15		Tag No. _____ Location: _____ Serves: _____																

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

SUMMARY VARIABLE AIR VALVE (VAV) COMMISSIONING CHECKLIST

"PROJECT PROGRESS TRACKER"

No.	Maximo ID No.	Equipment	VAV Size	Size Correction (installed)	Piping Complete	Coil & access complete & correct	Unit is accessible	Ducting completed & correct	Install. complete & Correct	Controls completed & correct	Controls End-to-End	Damper strokes fully	Area or System Clean	Max/Min Programmed Box controlling (Calibration)	Balancing complete data recorded	No unusual sounds or leakage observed	Space temp. controlled Unit functions correctly	Remarks
		In-Charge (Contractor)	from shop Drawigs	Sheet Metal Contractor	Mechanical Contractor	Mechanical Contractor	General Contractor & Mechanical Contracotr	Sheet Metal Contractor	Mechanical Contractor	Controls Contractor	Controls Contractor	Controls Contractor	General Contractor & Mechanical Contracotr	Controls Contractor	Balancing Contractor	Balancing Contractor / Controls Contractor / Mechanical Contractor	Mechanical Commissioning Agent / Controls Contractor	
1		Tag No. _____ Location: _____ Serves: _____																
2		Tag No. _____ Location: _____ Serves: _____																
3		Tag No. _____ Location: _____ Serves: _____																
4		Tag No. _____ Location: _____ Serves: _____																
5		Tag No. _____ Location: _____ Serves: _____																
6		Tag No. _____ Location: _____ Serves: _____																
7		Tag No. _____ Location: _____ Serves: _____																
8		Tag No. _____ Location: _____ Serves: _____																
9		Tag No. _____ Location: _____ Serves: _____																
10		Tag No. _____ Location: _____ Serves: _____																
11		Tag No. _____ Location: _____ Serves: _____																
12		Tag No. _____ Location: _____ Serves: _____																
13		Tag No. _____ Location: _____ Serves: _____																
14		Tag No. _____ Location: _____ Serves: _____																
15		Tag No. _____ Location: _____ Serves: _____																

Maximo ID No.

Vancouver General Hospital

899 W 12th Ave, Vancouver, BC V5Z 1M9

MECHANICAL

EQUIPMENT COMMISSIONING CHECKOUT SHEET VERIFICATION

PROJECT NAME:

PUMP

Unit Tag No.: _____ Motor Make: _____ Motor HP: _____
Location: _____ Motor Amp. Rating: _____
Manufacturer: _____ Motor Volts/Phase/Freq.: _____
Model: _____ Motor RPM: _____
Service: _____ Moto Frame: _____

Impeller Size: _____

Prestart Checks		**Date**	✓ or NA	Remarks
1.	Make, model, capacity & accessories/options as per shop drawings.			
2.	Unit O&M manual data available.			
3.	Unit installation complete (*as per manufacturers installation instructions.)*			
4.	Unit complete & no mfg. defects observed.			
5.	Unit system cleaned, flushed, vented & chemical treatment installed.			
6.	Setscrews & fasteners tightened.			
7.	Unit has been properly lubricated.			
8.	Prestart & start up approval / certificate by applicable agencies received.			
9.	Pump strainers & cleaned & replaced			
10.	Pump rotates freely.			
11.	Piping & fittings installed & complete.			
12.	Vibration isolation / seismic restraints installed and functional.			
13.	Controls & wiring complete & correct.			
14.	Manual valves positioned (open or closed) correctly.			
15.	Electrical complete & correct.			
16.	Electrical protection sized and adjusted correctly.			
17.	OK by electrical contractor to start unit.			
18.	Access to unit & components accessible.			
Operational Checks		**Date**	✓ or NA	Remarks
19.	Pump rotation direction correct.			
20.	No unusual sounds, temp., or odors observed.			
21.	No visible system leakage (*water leakage*).			
22.	Pump running amperage draw ≤ motor nameplate FLA rating. (*Please record the actual reading*)			
23.	Gauges & thermometers installed correctly & functioning.			
24.	VFD Start-up report submitted (*if applicable*).			
25.	Testing & balancing (TAB) complete,			

Maximo ID No.

Vancouver General Hospital

899 W 12th Ave, Vancouver, BC V5Z 1M9

MECHANICAL

EQUIPMENT COMMISSIONING CHECKOUT SHEET VERIFICATION

PROJECT NAME:

FANS

Unit Tag No.: _____ Motor Make: _____ Motor HP: _____

Location: _____ Motor Amp. Rating: _____

Manufacturer: _____ Motor Volts/Phase/Freq.: _____

Model: _____ Motor RPM: _____ ☐ Direct Drive ☐ Belt Drive

Service: _____ Moto Frame: _____

☐ Supply ☐ Exhaust ☐ Pressurization ☐ Vestibule

Prestart Checks		**Date**	✓ or NA	Remarks
1.	Make, model, capacity & accessories/options as per shop drawings.			
2.	Unit O&M manual data available.			
3.	Unit installation complete (as per manufacturers installation instructions.)			
4.	Unit complete & no mfg. defects observed.			
5.	Unit / Area clean, no debris or damage observed.			
6.	Setscrews & fasteners tightened.			
7.	Unit has been properly lubricated.			
8.	Filters in place & clean (*hand over filters available*)			
9.	Unit / Fans rotates freely.			
10.	Piping & fittings installed & complete.			
11.	Ductwork complete.			
12.	Vibration isolation / seismic restraints installed and functional.			
13.	Controls & wiring complete & correct.			
14.	Manual valves positioned (open ~~or closed~~) correctly.			
15.	Electrical complete & correct.			
16.	Electrical protection sized and adjusted correctly.			
17.	OK by electrical contractor to start unit.			
18.	Coil fins clean.			
19.	Unit correctly leveled, condensate drain installed & drains properly.			
20.	Access to unit & components accessible.			
Operational Checks		**Date**	✓ or NA	Remarks
21.	Fan(s) rotation direction correct.			
22.	Unit control dampers (& backdraft) stroke freely & completely			
23.	No unusual sounds, temp., or odors observed.			
24.	No visible air by-pass or leakage.			
25.	Fan(s) running amperage draw ≤ motor nameplate FLA rating. (*Please record the actual reading*)			
26.	VFD Start-up report submitted (*if applicable*).			
27.	Testing & balancing (TAB) complete. (& post TAB adjustments performed)			

Maximo ID No.

Vancouver General Hospital

899 W 12th Ave, Vancouver, BC V5Z 1M9

MECHANICAL

EQUIPMENT COMMISSIONING CHECKOUT SHEET VERIFICATION

PROJECT NAME:

FAN COIL

Unit Tag No.: _____ Motor Make: _____ Motor HP: _____

Location: _____ Motor Amp. Rating: _____

Manufacturer: _____ Motor Volts/Phase/Freq.: _____

Model: _____ Motor RPM: _____ ☐ Direct Drive ☐ Belt Drive

Service: _____ Moto Frame: _____

Prestart Checks		**Date**	✓ or NA	Remarks
1.	Make, model, capacity & accessories/options as per shop drawings.			
2.	Unit O&M manual data available.			
3.	Unit installation complete (as per manufacturers installation instructions.)			
4.	Unit complete & no mfg. defects observed.			
5.	Unit / Area clean, no debris or damage observed.			
6.	Setscrews & fasteners tightened.			
7.	Unit has been properly lubricated.			
8.	Filters in place & clean (*hand over filters available*)			
9.	Unit / Fans rotates freely.			
10.	Piping & fittings installed & complete.			
11.	Ductwork complete.			
12.	Vibration isolation / seismic restraints installed and functional.			
13.	Controls & wiring complete & correct.			
14.	Manual valves positioned (*open or closed*) correctly.			
15.	Electrical complete & correct.			
16.	Electrical protection sized and adjusted correctly.			
17.	OK by electrical contractor to start unit.			
18.	Coil fins clean.			
19.	Unit correctly leveled, condensate drain installed & drains properly.			
20.	Access to unit & components accessible.			
Operational Checks		**Date**	✓ or NA	Remarks
21.	Fan(s) rotation direction correct.			
22.	Unit control dampers (& backdraft) stroke freely & completely			
23.	No unusual sounds, temp., or odors observed.			
24.	No visible air by-pass or leakage.			
25.	Fan(s) running amperage draw ≤ motor nameplate FLA rating. (*Please record the actual reading*)			
26.	VFD Start-up report submitted (*if applicable*).			
27.	Testing & balancing (TAB) complete. (& post TAB adjustments performed)			

Maximo ID No.

Vancouver General Hospital

899 W 12th Ave, Vancouver, BC V5Z 1M9

MECHANICAL

EQUIPMENT COMMISSIONING CHECKOUT SHEET VERIFICATION

PROJECT NAME:

AIR HANDLING UNIT C/W RETURN FAN

Unit Tag No.: _____ Manufacturer: _____
Location: _____ Model No.: _____
Service: _____ Serial Number:_____

SUPPLY FAN

☐ **Direct Drive** ☐ **Belt Driven**
Data From : ☐ *unit nameplate* ☐ *motor nameplate*
Make: _____ HP.: _____
Amp. Rating:_____ No. of Motors: _____
Volts/Phase/Freq.: _____
RPM: _____
Frame: _____

RETURN FAN

☐ **Direct Drive** ☐ **Belt Driven**
Data From : ☐ *unit nameplate* ☐ *motor nameplate*
Make:_____ HP.: _____
Amp. Rating:_____ No. of Motors: _____
Volts/Phase/Freq.:_____
RPM: _____
Frame: _____

Prestart Checks		**Date**	✓ or NA	Remarks
1.	Make, model, capacity & accessories/options as per shop drawings.			
2.	Unit O&M manual data available.			
3.	Unit installation complete (as per manufacturers installation instructions.)			
4.	Unit complete & no mfg. defects observed.			
5.	Unit / Area clean, no debris or damage observed.			
6.	Setscrews & fasteners tightened.			
7.	Unit has been properly lubricated.			
8.	Filters in place & clean (*hand over filters available*)			
9.	Unit / Fans rotates freely.			
10.	Piping & fittings installed & complete.			
11.	Ductwork complete.			
12.	Vibration isolation / seismic restraints installed and functional.			
13.	Controls & wiring complete & correct.			
14.	Manual valves positioned (*open or closed*) correctly. (*for supply*)			
15.	Electrical complete & correct.			
16.	Electrical protection sized and adjusted correctly.			
17.	OK by electrical contractor to start unit.			
18.	Coil fins clean (*for supply*)			
19.	Unit correctly leveled, condensate drain installed & drains properly.			
20.	Access to unit & components accessible.			
21.	Make, model, capacity & accessories/options as per shop drawings.			

Vancouver General Hospital
899 W 12th Ave, Vancouver, BC V5Z 1M9

MECHANICAL
EQUIPMENT COMMISSIONING CHECKOUT SHEET VERIFICATION

PROJECT NAME:

AIR HANDLING UNIT C/W RETURN FAN

Unit Tag No.: _____ Manufacturer: _____
Location: _____ Model No.: _____
Service: _____ Serial Number:_____

Operational Checks		**Date**	✓ or NA	Remarks
	Check Out Items – Operational Checks			
22.	Supply Fan(s) rotation direction correct.			
23.	Return Fan(s) rotation direction correct.			
24.	Unit control dampers (& backdraft) stroke freely & completely			
25.	No unusual sounds, temp., or odors observed.			
26.	No visible air by-pass or leakage.			
27.	Supply Fan(s) running amperage draw ≤ motor nameplate FLA rating.. (*Please record the actual reading*)			
28.	Return Fan(s) running amperage draw ≤ motor nameplate FLA rating. (*Please record the actual reading*)			
29.	Gauges & thermometers installed correctly & functioning.			
30.	VFD Start-up report submitted (*if applicable*).			
31.	Testing & balancing (TAB) complete. (& post TAB adjustments performed)			

Maximo ID No.

Vancouver General Hospital

899 W 12th Ave, Vancouver, BC V5Z 1M9

MECHANICAL

EQUIPMENT COMMISSIONING CHECKOUT SHEET VERIFICATION

PROJECT NAME:

AIR HANDLING UNIT

Unit Tag No.: _____ Motor Make: _____ Motor HP: _____

Location: _____ Motor Amp. Rating: _____

Manufacturer: _____ Motor Volts/Phase/Freq.: _____

Model: _____ Motor RPM: _____ ☐ Direct Drive ☐ Belt Drive

Service: _____ Moto Frame: _____

Prestart Checks		**Date**	✓ or NA	Remarks
1.	Make, model, capacity & accessories/options as per shop drawings.			
2.	Unit O&M manual data available.			
3.	Unit installation complete (as per manufacturers installation instructions.)			
4.	Unit complete & no mfg. defects observed.			
5.	Unit / Area clean, no debris or damage observed.			
6.	Setscrews & fasteners tightened.			
7.	Unit has been properly lubricated.			
8.	Filters in place & clean (*hand over filters available*)			
9.	Unit / Fans rotates freely.			
10.	Piping & fittings installed & complete.			
11.	Ductwork complete.			
12.	Vibration isolation / seismic restraints installed and functional.			
13.	Controls & wiring complete & correct.			
14.	Manual valves positioned (*open or closed*) correctly.			
15.	Electrical complete & correct.			
16.	Electrical protection sized and adjusted correctly.			
17.	OK by electrical contractor to start unit.			
18.	Coil fins clean.			
19.	Unit correctly leveled, condensate drain installed & drains properly.			
20.	Access to unit & components accessible.			
Operational Checks		**Date**	✓ or NA	Remarks
21.	Fan(s) rotation direction correct.			
22.	Unit control dampers (& backdraft) stroke freely & completely			
23.	No unusual sounds, temp., or odors observed.			
24.	No visible air by-pass or leakage.			
25.	Fan(s) running amperage draw ≤ motor nameplate FLA rating. (*Please record the actual reading*)			
26.	Gauges & thermometers installed correctly & functioning.			
27.	VFD Start-up report submitted (*if applicable*).			
28.	Testing & balancing (TAB) complete. (& post TAB adjustments performed)			

6.0 MECHANICAL COMMISSIONING AGENT FUNCTIONAL VERIFICATION TEST SHEETS FORMAT (CONTROLLED PRESSURE ROOM - *OPERATING ROOM, ISOLATION ROOM, PHARMACY ROOM*, GENERIC ROOM - *CT SCAN / X-RAY / EP LAB. / CATH. LAB /CT – ANGIO PROCEDURE ROOM*)

and

AIR CHANGES PER HOUR

VGH JPN – Operating Room (Controlled Pressure) and Air Changes per Hour Test Sheet

(for Mechanical Commissioning Agent)

Date: _____ (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

Room No.: _____ Building: _____ Floor: _____

CONTROLLED PRESSURE TEST

System Conditions:

	Supply	Exhaust
Static Press Setpoint:	_____ (avg)	_____ (avg)
Static Press Actual. :	_____ (avg)	_____ (avg)

No. of AHU's Running: _____

Supply VFD Speed (%): _____

No. of Exhaust Fan Running: _____

Exhaust VFD Speed (%) : _____

Room Conditions:

Door Seal good .....: Yes ☐ No ☐

Exhaust grille clean .....: Yes ☐ No ☐

Test Data:

Room No.	Required Mode	Smoke Pencil Result	Supply VAV Tag No.	Supply Air VAV Boxes Volume (L/s)		Exhaust VAV Tag No.	Exhaust Air VAV Boxes Volume (L/s)		Differential Pressure (*As per CSAZ317.2:19*) (Pascal)		Notes
				Set point	Actual		Set point	Actual	Required	Actual	
OR's to Clean Corridor									+5.5 Pa		
OR's to Sterile Corridor									+2.5 Pa		

Remarks: * *= readings were taken when sterile east and west door at closed position.*

Note:

A. *For differential pressure measurement, please indicate the type of Display instrument used for readings.*
Manufacturer: _____ *Model No* _____ *Calibration Date:* _____

B. *Ensure that DDC graphics, Room DP (differential pressure) Display and Instrument used for readings are correlated.*
Correlated: Yes ☐ *No* ☐

Is Room meeting the RT (*Room Temperature*) Setpoint: Yes ☐ No ☐ Setpoint: _____ Actual: _____

Note: As per CSA Temp range is 18 deg. C – 23 deg. C.

Is Room meeting the Humid (Humidity) Setpoint: Yes ☐ No ☐ Setpoint: _____ Actual: _____

Note: As per CSA Relative Humidity (RH) range is 40% - 60%.

Local Audible Alarm operational : Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Door Command Functional: Yes ☐ No ☐ N/A ☐

BAS / OR Desk / Energy Centre Received the Alarm: Yes ☐ No ☐ N/A

BAS / DDC Graphics Completed: Yes ☐ No ☐ (*Please attached, graphics screen shot of room and system condition at the time of commissioning*).

VGH JPN – Operating Room (Controlled Pressure) and Air Changes per Hour Test Sheet

(for Mechanical Commissioning Agent)

Date: _____ (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

Room No.: _____ Building: _____ Floor: _____

OPERATING ROOM DOOR POSITION:-

1. Yellow (warning) on the HMI Panel (OR Door Open):
   For Clean Corridor Door: Yes ☐ No ☐ N/A ☐ with audible alarm? Yes ☐ No ☐ N/A ☐
   For Sterile Corridor Door: Yes ☐ No ☐ N/A ☐ with audible alarm? Yes ☐ No ☐ N/A ☐

   Comments:

2. Red (Alarm) on the HMI Panel (OR Door Open):
   For Clean Corridor Door: Yes ☐ No ☐ N/A ☐ with audible alarm Yes ☐ No ☐N/A ☐
   For Sterile Corridor Door: Yes ☐ No ☐ N/A ☐ with audible alarm Yes ☐ No ☐ N/A ☐

   Comments:

3. Is the "Audible Alarm OFF" after 20 minutes since Red alarm mode?
   For Clean Corridor Door: Yes ☐ No ☐ N/A ☐
   For Sterile Corridor Door: Yes ☐ No ☐ N/A ☐

   Comments:

4. Is the "Energy Centre" notified after 10 minutes since the initial Red alarm mode (audible alarm)?
   For Clean Corridor Door: Yes ☐ No ☐ N/A ☐
   For Sterile Corridor Door: Yes ☐ No ☐ N/A ☐

   Comments:

VGH JPN – Operating Room (Controlled Pressure) and Air Changes per Hour Test Sheet (for Mechanical Commissioning Agent)

Date: _____ (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

Room No.: _____ Building: _____ Floor: _____

AIR CHANGES PER HOUR

No.	Room Name	VAV No.	Control ID No.	Supply Air Volume (L/s)		Room Dimension (in.)			Required ACH (min. 20 ACH	Actual ACH	Notes
				Design (CFM)	Actual (CFM)	Area (sq. ft.)	Height (ft.)	Volume (cu. ft.)			

Additional Information:

VGH JPN – Operating Room (Controlled Pressure) and Air Changes per Hour Test Sheet

(for Mechanical Commissioning Agent)

Date: _____ (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

Room No.: _____ Building: _____ Floor: _____

ATTACHED HERE THE SCREENSHOTS OF ROOM CONDITION FROM DDC GRAPHICS

A. System Condition (Supply Duct Static Pressure):

B. System Condition (Exhaust Duct Static Pressure):

C. OR # Room Graphics

D. BAS Alarm

E. OR Desk Panel

VGH – Isolation Room and Air Changes per Hour Test Sheet

(for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

CONTROLLED PRESSURE TEST

System Conditions:

	Supply	Exhaust
Static Press Setpoint:	_____ (avg)	_____ (avg)
Static Press Actual. :	_____ (avg)	_____ (avg)

No. of AHU's Running: _____

Supply VFD Speed (%): _____

No. of Exhaust Fan Running: _____

Exhaust VFD Speed (%) : _____

Room Conditions:

Door Seal good .....: Yes ☐ No ☐

Return grille clean .....: Yes ☐ No ☐

Room Type:

Type I - ☐ Type II - ☐ Type III - ☐

Test Data:

Room No.	Required Mode	Smoke Pencil Result	Supply VAV Tag No.	Supply Air VAV Boxes Volume (L/s)		Exhaust VAV Tag No.	Exhaust Air VAV Boxes Volume (L/s)		Differential Pressure (*As per CSAZ317.2:19*) (Pascal)		Notes
				Set point	Actual		Set point	Actual	Required	Actual	
Corridor to Anteroom											
Anteroom to Isolation Rm.											
Corridor to Isolation Rm.											

Note:

A. *For differential pressure measurement, please indicate the type of instrument used for readings.*
Manufacturer: _____ *Model No.:* _____ *Calibration Date:* _____

B. *Ensure that DDC graphics, Room DP (differential pressure) Display and Instrument used for readings are correlated.*
Correlated: Yes ☐ *No* ☐

Is Room meeting the RT (*Room Temperature*) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Temp range.

Is Room meeting the Humid (Humidity) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Relative Humidity (RH) range.

Local Audible Alarm operational : Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Door Command Functional: Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Completed : Yes ☐ No ☐ (*Please attached, graphics screen shot of room and system condition at the time of commissioning*).

VGH – Isolation Room and Air Changes per Hour Test Sheet

(for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

AIR CHANGES PER HOUR

No.	Room Name	VAV No.	Control ID No.	Supply Air Volume (L/s)		Room Dimension (in.)			Required ACH (as per ISO 7) 30 – 60 ACH	Actual ACH	Notes
				Design (CFM)	Actual (CFM)	Area (sq. ft.)	Height (ft.)	Volume (cu. ft.)			

Additional Information:

VGH – Isolation Room and Air Changes per Hour Test Sheet

(for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

ATTACHED HERE THE SCREENSHOTS OF ROOM CONDITION FROM DDC GRAPHICS

VGH – Pharmacy Controlled Pressure Room and Air Changes per Hour Test Sheet (for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

CONTROLLED PRESSURE TEST

System Conditions:

	Supply	Exhaust
Static Press Setpoint:	_____ (avg)	_____ (avg)
Static Press Actual. :	_____ (avg)	_____ (avg)

No. of AHU's Running: _____

Supply VFD Speed (%): _____

No. of Exhaust Fan Running: _____

Exhaust VFD Speed (%) : _____

Room Conditions:

Door Seal good .....: Yes ☐ No ☐

Return grille clean .....: Yes ☐ No ☐

Room Type:

Type I - ☐ Type II - ☐ Type III - ☐

Test Data:

Room No.	Required Mode	Smoke Pencil Result	Supply VAV Tag No.	Supply Air VAV Boxes Volume (CFM)		Exhaust VAV Tag No.	Exhaust Air VAV Boxes Volume (CFM)		Differential Pressure (*As per CSAZ317.2:19*) (Pascal)		Notes
				Set point	Actual		Set point	Actual	Required	Actual	

Note:

A. *For differential pressure measurement, please indicate the type of instrument used for readings.*
Manufacturer: _____ *Model No.:* _____ *Calibration Date:* _____

B. *Ensure that DDC graphics, Room DP (differential pressure) Display and Instrument used for readings are correlated.*
Correlated: Yes ☐ *No* ☐

Is Room meeting the RT (*Room Temperature*) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Temp range.

Is Room meeting the Humid (Humidity) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Relative Humidity (RH) range.

Local Audible Alarm operational : Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Door Command Functional: Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Completed : Yes ☐ No ☐ (*Please attached, graphics screen shot of room and system condition at the time of commissioning*).

VGH – Pharmacy Controlled Pressure Room and Air Changes per Hour Test Sheet (for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

AIR CHANGES PER HOUR

No.	Room Name	VAV No.	Control ID No.	Supply Air Volume (L/s)		Room Dimension (in.)			Required ACH (as per ISO 7) 30 – 60 ACH	Actual ACH	Notes
				Design (CFM)	Actual (CFM)	Area (sq. ft.)	Height (ft.)	Volume (cu. ft.)			

Note: Ensure to include the ISO 7 certification report by the certified agency for clean room testing.

Additional Information:

VGH – Pharmacy Controlled Pressure Room and Air Changes per Hour Test Sheet

(for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

ATTACHED HERE THE SCREENSHOTS OF ROOM CONDITION FROM DDC GRAPHICS

VGH – Generic Controlled Pressure and Air Changes per Hour Test Sheet

(for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

CONTROLLED PRESSURE TEST

System Conditions:

	Supply	Exhaust
Static Press Setpoint:	_____ (avg)	_____ (avg)
Static Press Actual. :	_____ (avg)	_____ (avg)

No. of AHU's Running: _____

Supply VFD Speed (%): _____

No. of Exhaust Fan Running: _____

Exhaust VFD Speed (%) : _____

Room Serves:

CT Scan : ☐ CT / Angio : ☐

X-Ray : ☐ Procedure Rm.: ☐

Cath Lab. : ☐ EP Lab. : ☐

Room Conditions:

Door Seal good .....: Yes ☐ No ☐

Return grille clean .....: Yes ☐ No ☐

Room Type:

Type I - ☐ Type II - ☐ Type III - ☐

Test Data:

Room No.	Required Mode	Smoke Pencil Result	Supply VAV Tag No.	Supply Air VAV Boxes Volume (L/s)		Exhaust VAV Tag No.	Exhaust Air VAV Boxes Volume (L/s)		Differential Pressure (*As per CSAZ317.2:19*) (Pascal)		Notes
				Set point	Actual		Set point	Actual	Required	Actual	

Note:

A. *For differential pressure measurement, please indicate the type of instrument used for readings.*
Manufacturer: _____ *Model No.:* _____ *Calibration Date:* _____

B. *Ensure that DDC graphics, Room DP (differential pressure) Display and Instrument used for readings are correlated.*
Correlated: Yes ☐ *No* ☐

Is Room meeting the RT (*Room Temperature*) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Temp range.

Is Room meeting the Humid (Humidity) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Relative Humidity (RH) range.

Local Audible Alarm operational : Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Door Command Functional: Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Completed : Yes ☐ No ☐ (*Please attached, graphics screen shot of room and system condition at the time of commissioning*).

VGH – Generic Controlled Pressure and Air Changes per Hour Test Sheet

(for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

AIR CHANGES PER HOUR

No.	Room Name	VAV No.	Control ID No.	Supply Air Volume (L/s)		Room Dimension (in.)			Required ACH (as per ISO 7) 30 – 60 ACH	Actual ACH	Notes
				Design (CFM)	Actual (CFM)	Area (sq. ft.)	Height (ft.)	Volume (cu. ft.)			

Additional Information:

VGH – Generic Controlled Pressure and Air Changes per Hour Test Sheet

(for Commissioning)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

ATTACHED HERE THE SCREENSHOTS OF ROOM CONDITION FROM DDC GRAPHICS

7.0 MECHANICAL COMMISIONING AGENT FUNCTIONAL VERIFICATION TEST SHEETS FORMAT

for

VAV's, Radiant Panels, Unit Heaters and Baseboard Functional Verification Sheet (Summary)

PROJECT ID : _____ **PROJECT ID** : _____

PROJECT NAME: _____ **Updated as of** : _____

VAV'S, RADIANT PANELS, UNIT HEATERS AND BASEBOARD FUNCTIONAL VERIFICATION SHEET

(by the Mechanical Commissioing Agent)

No.	Tag Number	Level	Location	Serves	Contorl ID#	Installation Complete	Piping Complete & Correct (with coil only)	Controls Complete	Reheat / Radiant Control Valve Functioning	SAT Sensor Functioning	T-Stat / Zone Temperature Sensor Functioning	Control ID# Label Installed	Verification Completed as per S.O.O. (yy.mm.dd)	Remarks
Supply Variable Air Valve with Reheat Coil														
1														
2														
3														
4														
Supply Variable Air Valve without Reheat Coil														
1														
2														
3														
4														
Return Variable Air Valve														
1														
2														
3														
4														
Exhaust Variable Air Valve														
1														
2														
3														
4														
Radiant Panels														
1														
2														
3														
4														
Unit Heater / Baseboard Heater														
1														
2														
3														
4														

Note : S.O.O. = Sequence of Operation

8.0 DEMO TO THE OWNER (FMO – HVAC Document Requirements)

DEMONSTRATION to the OWNER
(by the Mechanical Agent)

FMO – HVAC Documents Requirements:

Please ensure that below documents are provided five (5) days before the scheduled date of "DEMO to the OWNER".

- Equipment Checklist and Checkout Sheets "Project Progress Tracker" (*by the Mechanical Commissioning Agent Agent*) – (*See Item 5.0*)

  A.1 Mechanical Equipment Checkout Sheets (*Individual Equipment*)
  A.2 Summary of Equipment Commissioning Checklist
  A.3 Summary of Variable Air Valve Commissioning Checklist
- FINAL / PRELIM Balancing Report (*by the Balancing Contractor*)
- FINAL / PRELIM Functional Verification Test Sheet (*by the Mechanical Agent / Controls Contractor*).
- Latest Status Report of Mechanical Commissioning Agent (*by the Mechanical Commissioning Agent*)
  Note: *Status Report is a summary of deficiency item list during construction.*
- Controlled Pressured and Air Changes per Hours Test Sheet (for commissioning)
  Note: Room Verification Test Sheets provided by FMO-HVAC (*if applicable - for Mechanical Commissioning Agent to be filled-out*) – (*See Item 5.0*)
- FINAL / DRAFT DDC Graphics (*by the Controls Contractor*).

After Demonstration to the Owner:

- Mechanical Agent / Controls Contractor to schedule the training of facility and controls system to the FMO – HVAC Staff.
- During warranty review prior the expiration date, ensure that construction deficiency item list related to construction period were resolved.

9.0 MECHANICAL OPERATING & MANUAL CHECKLIST

MECHANICAL OPERATING & MAINTENACE MANUAL Checkllist
(by the Mechanical Contractor)

TABLE OF CONTENTS

	Yes	No	N/A
1.0 LIST OF MECHANICAL DRAWINGS (As-Built)	☐	☐	☐
2.0 DESCRIPTION OF SYSTEMS – By Design Builder	☐	☐	☐
3.0 OPERATING DIVISION (DDC Control As-Built)	☐	☐	☐
4.0 MAINTENANCE AND LUBRICATION DIVISION, BELT SCHEDULE	☐	☐	☐
5.0 LIST OF EQUIPMENT SUPPLIERS AND SUB CONTRACTORS	☐	☐	☐
6.0 VALVE TAG SCHEDULE, PIPE COLOUR CODE, EQUIPMENT FILTER SCHEDULE	☐	☐	☐
7.0 BALANCING REPORT :			
7.2 PRE-DEMOLITION BALANCING BALANCING REPORT (*If applicable*)	☐	☐	☐
7.2 FINAL BALANCING BALANCING REPORT	☐	☐	☐
8.0 COMMISSIONING REPORT	☐	☐	☐
8.1 INCLUDES "COMMISSIONING PLAN".			
9.0 MISCELLANEOUS GUARANTEES, CERTIFICATES, PERMITS, START-UP	☐	☐	☐
10.0 AND SPECIFIC EQUIPMENT TEST REPORTS	☐	☐	☐
11.0 CHEMICAL WATER TREATMENT	☐	☐	☐
12.0 PIPE WELDING QUALIFICATIONS AND CERTIFICATIONS	☐	☐	☐
13.0 MAXIMO SCHEDULES (by Owner)	☐	☐	☐

MANUFACTURERS' EQUIPMENT DATA

14.0 AIR HANDLING UNITS	☐	☐	☐
15.0 ACTIVE CHILLER BEAMS	☐	☐	☐
16.0 FAN COIL UNITS	☐	☐	☐
17.0 FANS, LINT TRAPS	☐	☐	☐
18.0 GRILLES, REGISTER, DIFFUSERS, LOUVERS, SMOKE, FIRE & BACKDRAFT DAMPERS,	☐	☐	☐
19.0 ACCESS DOORS, SHEET METAL VENTING	☐	☐	☐
20. 0 HEAT RECOVERY CHILLERS	☐	☐	☐
21.0 HYDRONIC SYSTEMS	☐	☐	☐
22.0 HUMIDIFIERS	☐	☐	☐
23.0 HEAT EXCHANGERS	☐	☐	☐
24.0 HEATING BOILERS & CONDENSATE NEUTRALIZER	☐	☐	☐
25.0 HYDRONIC PUMPS, SUCTION DIFFUSERS, MULTI-FUNCTIONAL VALVES, PUMP VFD'S	☐	☐	☐
26.0 HYDRONIC SPECIALTIES (Expansion Tanks, Low Loss Headers Buffer Tanks)	☐	☐	☐
27.0 FIRE STOPPING, INSULATION AND HEAT TRACING	☐	☐	☐
28.0 RADIANT PANELS	☐	☐	☐
29.0 REHEAT COILS	☐	☐	☐
30.0 SILENCERS	☐	☐	☐
31.0 STEAM SYSTEM AND EQUIPMENT	☐	☐	☐
32.0 UNIT & FORCE FLOW HEATERS	☐	☐	☐
33.0 VARIABLE AIR VOLUME (VAV) BOXES	☐	☐	☐
34.0 VIBRATION ISOLATION	☐	☐	☐
35.0 VALVES, EARTHQUAKE SHUT-OFF VALVES	☐	☐	☐
36.0 Others _____	☐	☐	☐

Appendix C

HVAC BAS Standards

Rev30

Vancouver General Hospital
899 West 12th Avenue
Vancouver, B.C. V5Z 1M9

HVAC Standards for Building Automation, Instrumentation & Controls

Prepared by:

Frank Jay, AScT.
HVAC - Electronic Instrument Controls

Submitted to:

Eric Sutton, RSE
FMO - Senior Manager

Revision 3.0

April 22, 2024

Contents

1 General Overview

.1 This document serves as a supplement to the contract documents. It is to be used as a guideline to standardize the hardware and software installation for the Building Automation System (BAS).

.2 The contract documents (drawings and specifications) will govern the scope and details of the work.

2 General Requirements

.1 All work shall conform to the requirements of the local codes, regulations, and standards.

.2 In addition, all work shall be done according to VGH standards to achieve a uniform framework.

.3 Deviations from this standard shall seek the approval of VGH (VGH/FMO/HVAC Dept).

3 General Wiring Installation

.1 All controls and network wiring to comply with the following:

.1 All wiring installation to be in emt conduit.

.2 All wires to be continuous runs. No splices are allowed.

.3 All wiring subjected to outdoor environment to be in liquid tight flexible metallic conduit with liquid tight fittings.

.4 All control devices and sensors subjected to outdoor environment to be enclosed in NEMA-4 enclosures.

.5 Fiber cables, if installed alongside with (Information Management/Information Technology Services' (IMITS) fiber infrastructure shall be installed in compliance to IMITS' installation standards, otherwise fiber runs must be installed in its own emt conduit.

.2 See Section-11 for additional Network Wiring requirements.

4 Commencement of New and Existing Work

.1 Inform VGH on commencement of work and the areas affected.

.2 Co-ordinate with VGH on any modifications to the existing equipment.

.3 Request for equipment shutdowns to comply with VGH Shutdown Policy.

5 Demolition Work on Obsolete Equipment

.1 Inform and co-ordinate with VGH on any demolition work.

.2 All field devices to be completely removed.

.3 All wires from the field devices to the terminals of the DDC (direct digital controllers) shall be completely removed.

.4 All unnecessary conduits, cable carriers, and electrical boxes shall be completely removed.

.5 All interfacing devices such as transducers, relays, power supplies and wires to be removed from the local panel and the field.

.6 All software related points shall be removed and programs updated.

.7 All DDC controllers to be returned to VGH.

.8 Panel points listing shall be updated accordingly to reflect removed devices.

6 Shop Drawings Submittal

.1 Submit shop drawings to VGH/HVAC/Controls Department for approval.

.2 Shop drawings to include the following:

- Sequence of Operation
- Network schematic
- System schematic of equipment
- DDC Controller types
- Input and Output list
- Sensors, transducers,
- Actuator types
- Valve types
- Specification sheets

7 Hardware Requirements and Installation

.1 General requirements for installation.

1. All devices installed to be easily accessible for replacement or maintenance work.
2. Devices with built-in display shall be mounted for clear visibility and free from obstructions.
3. Where hardware/devices deviate from vendor specific, alternatives must be approved by VGH.

.2 Valves – Hot Water, Chilled Water and Steam.

1. Valves to be ball type by Belimo.
2. Valve actuators to be Belimo.

.3 Pneumatic Air Valves

1. Electro-Pneumatic Transducers (EPT) to be Johnson Controls EP-8000-2 high volume type.
2. All air valves (Electro-Pneumatic Transducers and Electric-Pneumatic Solenoids) to be fitted with pressure gauges on the supply and output lines.

.4 Damper Actuators

1. Damper actuators to be Belimo.
2. Damper actuators to have end switches (tilt type) independently mounted on the damper actuator shaft or on the damper blade of each damper section.

.5 Current Transformers

1. All amperage reading used for controlling purposes shall be sensed by external current transformers. Amperage readings from VFD or BACnet controllers shall not be used.

2. Current Transformer to be split core type.

3. Current Transformers to be accurate down to one-tenth of an ampere. Do not use multiple wraps around the current transformer.

.6 Safety Devices

1. Freeze protection devices may be auto or manual reset. If auto reset is used, then a manual reset of device via software is required for each tripped incident.

2. High- or low-pressure limit devices may be auto or manual reset. If auto reset is used, then a manual reset of device via software is required for each tripped incident.

3. High humidity limit devices may be auto or manual reset. If auto reset is used, then a manual reset of device via software is required for each tripped incident.

.7 Pressure Transducers

1. Differential air pressure transducers to have locally built-in display. Pressure tubing to have T-fittings installed for verification or calibration purposes.

2. Static pressure tips (air) to be used for sensing static pressure readings. Transducers to have locally built-in display. Pressure tubing to have T-fittings installed for verification or calibration purposes.

3. Liquid Pressure Sensors to have locally built-in display. Liquid sensing lines to be copper and fitted with isolation and bleed valves for maintenance. Liquid sensing lines to also have T-fitting with pressure gauges installed on both high and low sides.

.8 Thermostats and Space Sensors

1. Thermostats in main public corridors (outside department boundaries) to be sensor type only, otherwise thermostats must be in clear lockable box.

2. All space sensors (example: temperature, humidity, CO2, motion detectors) shall be installed at locations free from external interferences and barriers.

3. Room thermostats and temperature sensors to be installed at 5ft (1500mm) above finished floor.

.9 Refrigeration Temperature Sensors – Freezers and Fridges.

1. BAS temperature alarm monitoring can be interfaced to refrigeration unit internal alarm module with provided relay contacts. Do not use BACnet data for alarm monitoring.

2. Where actual temperature sensing is required, the temperature sensor is to be used with plastic thermal buffering bottle filled with food grade glycol solution with MSDS labelling. Bottle to be secured to prevent spilling.

8 Primary DDC Controllers

.1 All DDC controllers shall be in hinged enclosures and be accessible. Aluminum electrical boxes are not acceptable.

.2 DDC controllers shall not be located in ceiling space except for dedicated controllers attached directly to damper shaft of VAV boxes.

.3 DDC controllers shall not be subjected to outdoor environment unless they are in a weather proof enclosure with tempered air.

.4 All equipment shall be controlled by external relays/transducers/sensors.

.5 All devices associated to a control loop shall be terminated within the same control panel. (Example – Feedback and Output devices to be terminated and controlled within the same controller)

.6 All new DDC panels shall include minimum 20% spare input and output points.

.7 Acquire control panel addresses from VGH. Do not randomly assign addresses to DDC controllers.

.8 All DDC controllers to be connected to VGH Central UPS power source. Standalone UPS appliances are prohibited.

9 BACnet Controllers from Equipment Vendors

.1 All BACnet controllers shall be BTL (BACnet Testing Laboratories) certified for compatibility.

.2 All BACnet controllers shall be installed and located in the same manner as DDC Controllers - Section-8

.3 BACnet devices are prohibited as a controlling source.

1. DDC Controller must use its own interfacing relay to start/stop the equipment. The DDC Controller shall not WRITE to the BACnet controller to start/stop the equipment.

2. DDC controller must use its own sensing element as feedback for the control loop. The DDC controller shall not retrieve the BACnet data to use it as feedback for the control loop.

.4 BACnet devices may be used for non-critical monitoring purposes only. Examples are:

1. Non-controlling data points for information only.

2. Non critical alarms generated by the BACnet devices.

.5 Acquire BACnet controller addresses from VGH. Do not randomly assign addresses to BACnet controllers.

.6 All BACnet controllers to be connected to VGH Central UPS power source. Standalone UPS appliances are prohibited.

10 BAS Network Integration

.1 For the duration of the project, all new BAS network to be standalone and isolated from the existing BAS network infrastructure.

.2 The new BAS network shall be tested and be free of network errors before integrating into the main BAS infrastructure.

.3 Provide a Network Performance Report (Network Traffic Analysis) that is acceptable to Delta Controls Standard.

.4 Acquire approval from VGH before integrating new networks or new controllers onto existing BAS infrastructure.

11 BAS Network Structured Cabling

.1 Network structured cabling installation to conform to industry standards.

.2 Network cables to be minimum Cat-6.

.3 Network cabling termination:

1. Network Switches - terminate network cables to a patch panel and use patch cords for final termination

2. DDC Control Panels Within Enclosure - terminate network cable to a patch block and use patch cord for final termination.

.4 Allow one spare Ethernet port at each enclosure panel for laptop plugin.

.5 Network cabling shall be labeled at both ends for identification.

12 Network Switches

.1 Network switches to be Allied Telesis. Acquire VGH's approval if others are to be used.

.2 Allow 20% spare capacity for each network switch.

.3 Network switches are prohibited in ceiling spaces.

.4 Network switches to be installed in a hinged enclosure. Aluminum electrical boxes are not acceptable.

.5 All network switches to be connected to VGH Central UPS power source. Standalone UPS appliances are prohibited.

.6 Acquire Network IP addresses from VGH. Do not randomly assign addresses to network appliances.

13 Equipment Interfacing Minimum I/O Points to BAS

.1 Motors:
- Hardware relay to start/stop
- Current transducer to monitor amperage

.2 Variable Speed Drives:
- Drive enable/disable using external relay
- Drive speed output
- Drive speed feedback
- Drive alarm feedback
- Drive motor amperage using external current transducer

.3 AHU - Valve Actuators:
- Analog output signal (0-10vdc) for variable position
- Valve position feedback

.4 AHU – 100% Fresh Air Systems:
- Outdoor air damper to be electrically hardwire interlocked to the SF motor.
- Exhaust air damper to be electrically hardwire interlocked to the EF motor.
- Interlocking end switches for each damper set to be monitored at DDC controller.

.5 AHU - Damper Actuators:

.1 Variable Position:
- Analog signal (0-10vdc) for variable position
- Damper position feedback

.2 Two Position:
- Analog signal (0-10vdc) for 2-position
- Independent Open and Close end switches mounted on damper blade or shaft.
- Where there is more than one bank of dampers, each bank shall have its own damper actuator and its own end switches.

.6 AHU - Isolation Damper Actuators:
- Install actuator for each bank of damper.
- Install independent Open and Close end switches for each bank of damper.

.7 VAV - Damper Actuators:
- Analog signal (0-10vdc) for variable position preferred.
- damper position feedback

.8 VAV - Misc:
- VAV supply air temperature sensor required.
- VAV supply air volumetric sensor required (crossflow type).

.9 Mechanical System Equipment (boilers, chillers, heat pumps, heat exchangers, etc.):
- Controlling of the equipment's components via its BACnet interface is prohibited.
- BACnet data is used only for monitoring.
- Independent sensors to be used for critical monitoring and control loops.
- Independent relays or transducers for controlling.
- All valves to have position indication for physical viewing.
- All valves to have true position feedback to BAS

.10 Critical Alarm Monitoring:
- This includes but not limited to fridges, freezers, oxygen level, water leak detection, sump pit water level, gas detection.
- All alarm wiring to be terminated at main DDC control panels. Do not terminate at subnet control panels.
- All alarm points to be configured as Normally Closed contacts such that when an alarm is generated the relay contact is released Open.

14 Hardware Identification

.1 DDC control panel:

.1 Lamacoids on DDC control panel enclosures. Printed labels are not acceptable. Follow the format as shown.

.2 Printed Label with BACnet address on DDC controllers is acceptable.

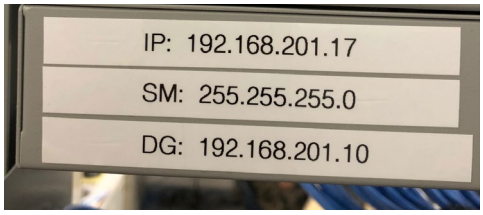
.3 Where new and existing DDC controllers are located in ceiling spaces (example - VAV controllers), labels shall be placed at ceiling. Labels shall indicate controller number.

.2 Thermostats: Affix sticker on the base enclosure, not on the cover plate.

.3 Sensors, transducers, instruments: Use waterproof device tags.

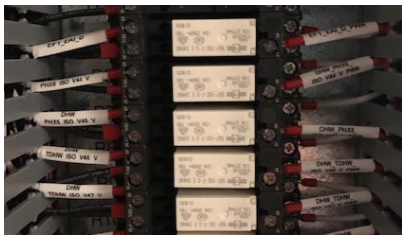
.4 Network Switches: Affixed with labels with the following information

- IP Address
- Submask
- Default Gateway

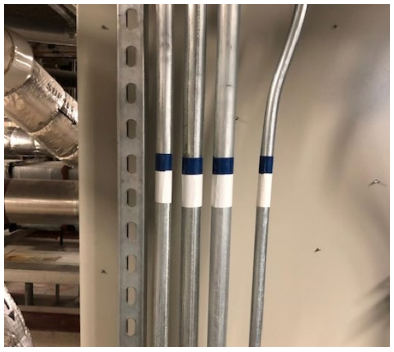


.5 Wiring: Affixed with labels on both ends of wire (including network cables).

- Use machine printed labels.
- Hand written labels are not acceptable

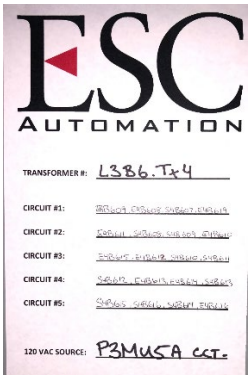


.6 EMT Conduit: Color coding required.



.7 Electrical Boxes: Color coded or company identification.

.8 Power Transformers: Label identifying power source and circuit breaker numbers.



.9 Devices that are installed in non-obvious locations (Example: Outside the boundaries of an AHU) shall be noted in its software object description field.

15 Software Programs

.1 All control loops to be tuned for all conditions.

.2 All software inputs, outputs, and variables to be in the AUTO mode

.3 All inputs to have alarms programmed for device failure or control failure.

.4 All controlling setpoints to have alarms programmed for out-of-setpoint range.

.5 All trend logs to have the following sample rate: 5min interval, 600 samples

.6 All measurements to be in Metric

16 Software Naming Conventions

Descriptors to be in Upper Case and in the following order:

.1 Ahu components: Building_Ahu_Equipment_Point Description

Example: JPS_AH5_SF5_SA_T

.2 Space Sensors: Building_Ahu_VAV_Floor Level_Rm Number_Point

Example: JPS_AH2_VAV114_LEV2 _RM2014_RT_SENS (room sensor)
JPS_AH2_VAV114_LEV2_RM2014_RT_TSTAT (bacstat)

.3 Mechanical components: Building_Primary Equipment_Secondary Equipment_Point

Example: JPS_CH1_PMP1_VFD_C
JPS_HP1_SUP_T
JPS_HEX2_HWS_T

See Appendix for list of typical acronyms. Consult with VGH for additional acronyms.

17 Graphical Representation

.1 Consult with VGH at the design stage of the graphics.

.2 All graphics design must be approved by VGH.

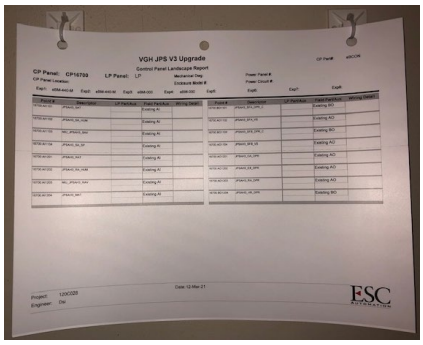
.3 All graphics must match VGH current standard Orcaview graphics or Eviz graphics.

.4 Obtain sample graphics from VGH.

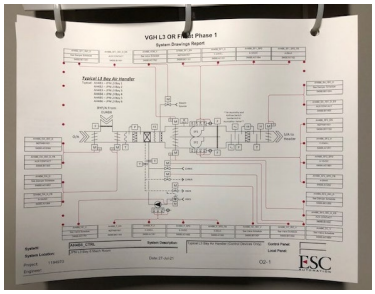
.5 All hardware inputs and outputs on DDC panel must be graphically referenced.

18 Field Equipment Documentation

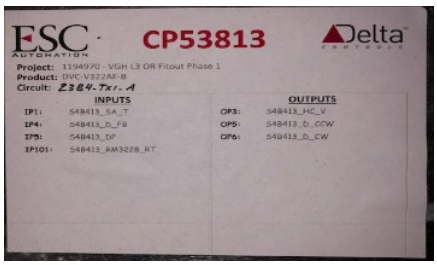
.1 Control Panel Input/Output (I/O's) listings (laminated) to be displayed and mounted on the inside door of the enclosure.



.2 As built drawings and schematics (laminated) for the associated DDC panel to be displayed and mounted on the inside door of the enclosure.



.4 VAV Controllers – I/O listing affixed to vav box.



19 Controls and Instruments Verifications

.1 All inputs to be checked end to end – from panel input terminal to sensor.

.2 All outputs be checked end to end – from panel output terminal to end device.

20 System Commissioning and Calibration

.1 Setup and calibrate all control loops and sensors

.2 Perform all control sequence testing for all modes of operation.

.3 All flow volumes to be calibrated using pitot tube flow traversing or electronic flow-hoods.

21 Pre-Job Completion Requirements

.1 All spare DDC controllers, instrumentation, and control devices to be returned to VGH.

.2 All existing DDC controllers, and thermostats to be returned to VGH.

.3 All graphics should be commissioned and thoroughly checked for accuracy and correct links.

.4 Submit final software graphics for review 10 days in advance before completion of project.

.5 Provide check sheets for the following: See Appendix B for samples.
Controls contractor can make their own check sheets with the following minimum requirements:

.1	Inputs:	- End to end checks (from field device to BAS readings) - Visual confirmation - Calibration as required
.2	Outputs:	- End to end checks (from BAS command to field device) - Visual confirmation - Calibration or adjustment as required.
.3	Volumes:	- Calibration data/factors set/coded into program.

22 Project Completion Requirements

.1 Turnover of equipment shall be fully operational and functional as a complete system.

.2 All DDC points (I/O's) to be commissioned and in the AUTO mode.

.3 All graphics should be commissioned and fully functional.

.4 Provide training as required.

Appendix-A Acronyms

.1 Building Names

BP	Banfield Pavilion
BSSC	Blusson Spinal Cord Centre
CCC	Child Care Centre
NRG	Energy Centre
ECC	Eye Care Centre
PP	Physical Plant (FMO + Power Plant)
HP	Heather Pavilion
JBN	Jack Bell Research Centre – North Bldg
JBS	Jack Bell Research Centre – South Bldg
JPS	Jim Pattison Pavilion - South
JPN	Jim Pattison Pavilion – North
LAU	Laundry Bldg
LBP	Leon Judah Blackmore Pavilion
RP	Research Pavilion
RHRC	Robert Ho Research Centre
SCC	Skin Care Centre
JRSFHC	Joseph & Rosalie Segal & Family Health Centre
SPP	Standby Power Plant
TZU	Tzu Chi Institute
WP	Willow Pavilion

.2 Mechanical Equipment

SF	Supply fan
RF	Return fan
EF	Exhaust fan
BLR	Boiler
HEX	Heat exchanger
HP	Heat pump
PMP	Pump
RAD	Radiation
RHC	Reheat coil
STM	Steam
CH	Chiller
VFD	Variable frequency drive

.3	Outputs:	Relays, transducers, valves,
	C	Control
	EN	Enable
	SPD	Speed
	OA_D	Outdoor air damper
	RA_D	Return air damper
	EA_D	Exhaust air damper
	RLF_D	Relief air damper
	HC_V	Heating coil valve
	HC_P	Heating coil pump
	CC_V	Cooling coil valve
	CC_P	Cooling coil pump
	HUM_V	Humidity valve
	ISO_D	Isolation damper
	ISO_V	Isolation valve
	OVRD	Override
	RESET	Reset

.4	Inputs:	Sensors, devices
	A	Amperage
	OA_T	Outdoor air temperature
	SA_T	Supply air temperature
	MA_T	Mixed air temperature
	PH_T	Pre-heat temperature
	RA_T	Return air temperature
	EA_T	Exhaust air temperature
	HC_T	Heating coil temperature
	HC_SUP_T	Heating coil supply temperature
	HC_RET_T	Heating coil return temperature
	CC_T	Cooling coil temperature
	CC_SUP_T	Cooling coil supply temperature
	CC_RET_T	Cooling coil return temperature
	SA_H	Supply air humidity

RA_H	Return air humidity
EA_H	Exhaust air humidity
HD_T	Hot deck temperature
CD_T	Cold deck temperature
RT_SENS	Room temperature
RT_TSTAT	Room thermostat temperature
DP	Differential pressure
VP	Velocity pressure
PRES	Static Pressure
VOL	Volume
FB	Feedback
ES	End switch
CO2	Carbon dioxide reading
FIL	Filter
OP	Open
CL	Close
HWS_T	Hot water supply temperature
HWR_T	Hot water return temperature
RAD_SUP_T	Radiation water supply temperature
RAD_RET_T	Radiation water return temperature
CHWS_T	Chilled water supply temperature
CHWR_T	Chilled water return temperature
CWS_T	Condenser water supply temperature
CWR_T	Condenser water return temperature
SUP_T	Supply water
RET_T	Return water

Appendix-B Check Sheets

Controller: ***CP-15000*** ***Inputs***

Date: ***Dec 1, 2021***

Input #	*Description*	*BAS Reading*	*Test Instrument*	*Visual Inspection*	*Calibrated or Adjusted*	*End to End Check*	*Remarks*
AI-1	SF Amps	15.5 A	15.0 A	---	---	✓	
AI-2	SAT	15.0°C	---	---	---	✓	
BI-2	OAD ENDSW	OPN	---	OPN	✓		

Controller: ***CP-15000*** ***Outputs***

Date: ***Dec 1, 2021***

Output#	*Description*	*BAS*	*Visual Inspection*	*Calibrated or Adjusted*	*End to End Check*	*Remarks*
BO-1	SF_C	ON/OFF	✓	---	✓	
BO-2	SF_ISO_DPR	OPN/CLO	✓	✓	✓	
AO-1	SF_CCV	0/50/100%	✓	---	✓	

Controller: ***CP-15000*** ***Volumes***

Date: ***Dec 1, 2021***

AV#	*Description*	*BAS*	*Test Instrument*	*Correction Factor*	*Entered into PGM*	*Remarks*
AV-10	VAV2_VOL	300 CFM	275 CFM	0.92	✓	

May 2, 2024

Appendix D

BIM Requirements Specifications V3.0.0

Vancouver CoastalHealth

Version 2022| V:3.0.0

BIM Specifications

BIM REQUIREMENTS SPECIFICATION

SUMMIT BIM

PREPARED BY:
Summit BIM Consulting
1111 West Georgia St., 16th Floor
Vancouver, BC V6E 4G2

Contact us at:
604 568 8325
summitbim.com

#

1 OVERVIEW STATEMENT

Please Note: This document is aligned with the ISO 19650 Framework and the relevant ISO section is provided at the following sections within this document: Overview, Introduction, Design, Construction and Closeout, as shown indicated below:

- ISO 19650 5.1 ASSESMENT & NEED.
- ISO 19650 DOCS: OIR, PIR, AIR, EIR.

Vancouver Coastal Health Authority (the Health Authority) is implementing a Building Information Management (BIM) process, based around the ISO 19650 framework, Sections 5.1 Assement & Need, to support the generation of accurate 3D models containing structured and consistent digital data for their Capital Projects. Their vision for this process and overall goal is to generate data and information that supports Facilities Management throughout the entire life cycle of their facilities, can be defined as:

- "To utilize a BIM process to derive consistent digital data that can be used to drive downstream uses throughout the entire life cycle of the facility, from Design, through Construction and on ito Facilities Management".

In addition to the overall goal stated above, the Health Authority is keen to mitigate risks and benefit from the advantages inherent in following an integrated digital (BIM) process throughout the Design, Construction and Handover Phases of projects.

All participants responding to an RFP from Vancouver Coastal Health Authority, with a BIM deliverable, are required to document in their RFQ / RFP response, the strategies that they have used on previous project to address the following:

- Managing duplication across models
- Managing phasing/existing conditions
- Tagging tracked assets across models
- Managing parent/child relationships
- Managing required clearances for maintenance and replacement

Please Note: Those proponents without experience should document in their response their proposed strategy to support their participation within this BIM process.

Any conflicts between the BIM Specification Requirements document and the RFP should be brought to the immediate attention of the Health Authority.

1.1 BIM Requirements Specification Overview

These Requirements have been prepared to describe to the Teams, the goals and uses that the Health Authority has for the inherent data generated through using BIM enabled software. It is the responsibility of the Teams to define, within the Project Execution Plan (PEP), the responsible parties, workflows, processes and protocols they intend to utilize to achieve the stated goals and uses.

The Health Authority will be using the data extracted from the Design models:

- To support the validation of the 'Owner Project Requirements' (OPR's)
- To derive a project Asset Registry, to which additional data and documents will be appended, in an external database, during the construction phase.
- To reduce risk through utilization of virtual coordination to mitigate change orders and ensure access for maintenance and replacement during Facilities Management phase of the project.

To support these goals, the Health Authority has defined specific requirements relative to Tracked Assets, that must be met by specific project submittals. These requirements are defined in the Data Geometry Specification (DGS) attached in the Appendix F.

Please Note: To facilitate these goals, it is required that, excluding details, single line diagrams and schematics, all other drawing views, and schedules **must** be derived from the model dataset.

The Health Authority will retain an independent BIM Consultant, to ensure compliance with these requirements and that the underlying data is capable of supporting the proposed goals and uses. Issues flagged by this Consultant are required to be resolved prior to the next BIM Compliance audit.

The Owner's BIM Consultant will be responsible for providing the external database for the data and document collection.

The Health Authority is also keen to take advantage of the following benefits which become available when an integrated BIM process is followed:

- Validation: One version of the truth
  - Higher quality project management through improved coordination and communication during design, construction, and facility operations.
  - Improved design quality and accuracy with frequent QA/QC and program compliance checks.
  - Improved risk assessment and mitigation when working with existing facilities.

- Visualization: Clear understanding for all
  - Improved understanding of the facility, supporting spatial comprehension and, user group meetings
  - Reduced change orders through management of virtual coordination process
  - Preservation of required egress pathways, widths and heights and equipment clearances for maintenance and operations and asset replacement.
  - Generation of accurate record models and drawings (as constructed).

- Data access: Point and Click
  - Early identification of asset parent/child relationships and system.
  - Access to current data
  - Collection and early access to asset information for maintenance and operations.
  - Reduced handover timeline and improved data transfer / exchange for CMMS/CAFM and BAS.

2 INTRODUCTION

The relevant ISO sections are as follows:

- ISO 19650 5.1 ASSESMENT & NEED.
- ISO 19650 DOCS: OIR, PIR, AIR, EIR.

2.1 Definitions

A list of acronyms and a glossary with the definitions of the main BIM terms mentioned in the BIM Specification can be found in **Appendix A** and **Appendix B**.

The following colour scheme is utilized in the BIM Specification to help identify work effort required during the design phase, construction phase and by substantial completion.

DESIGN	CONSTRUCTION	SUBSTANTIAL COMPLETION

The following highlighted box is used to indicate critical information:

Please note: Important information is within yellow text boxes.

2.2 BIM Specification

The BIM Specification establishes the requirements that must be achieved for BIM projects. It defines what, and when, critical required information must be available within the model data set, by each participant team/firm from design to handover. The participating team/firm must define within the Project Execution Plan how these requirements will be met. The BIM Specification Document Set is comprised of two (2) interrelated documents as noted below:

- BIM Specification – this document sets technical requirements and workflows that support the generation of design models that can be used as containers for data and document collection during construction and as record models during the operation of the facilities. It includes, in **Appendix E**, topics that must be addressed in the Project Execution Plan (PEP). This living document is required to capture project information, modeling strategies, workflows, and any amendments or exclusions to the BIM Specification.

- BIM DGS/DCS/Rooms – An Excel file, (provided as a PDF in **Appendix F**), that details in different tabs, the following:
  - Notes Tab: Terms and definitins along with guidance on how to use the excel file
  - Data and Geometry Specification (DGS) and the Data Collection Specification (DCS) Tab, defining the scopes for both Design and Construction as follows:
    - Design Phase: Data and Geometry Specification (DGS) – A master list of all asset types, 'tracked assets', that must be modeled by the Design Team if they are part of the design. Each asset type has a classification, a minimum geometric level and a list of parameters that must be included in the design models to facilitate the Health Authority's compliance checks, design analysis and facilities, maintenance, and operations.
  - Construction Phase: Data Collection Specification (DCS) – A spreadsheet that shows what information must be collected against different asset types, 'tracked assets', during construction and later transferred to a FMO CMMS/CAFM/IWMS solution. The DGS/DCS will be provided during the RFP process to support definition of requirements for document upload.
  - Room Specification: A spreadsheet that defines, relative to different room types, the classification system and data fields required along the project timeline to support facilities.

Please Note: The above spreadsheets are combined onto a single Excel file to facilitate management. The editable version of this file will be shared with the Team after project award.

The Data and Geometry Specification and the Data Collection Specification are identified on the same tab, utilizing the specified colours.

2.3 BIM Project Participant Roles

Appendix H contains a summary of BIM scopes of work and deliverables by Team and project phase.

2.3.1 Team

This document uses the term Team to refer to work effort required, relative to BIM processes, during Design and during Construction, irrespective of the contract type being used.

- Design Team
  Work effort required in relation to Design as defined in the Project Agreement, Construction Management Agreement, Design Build Agreement, etc., as applicable. The Construction Manager/Design Builder, as applicable, will determine which firms or individuals form part of the Design Team.
  The Design Team is responsible for the overall development and delivery of the Design Building Information Models, including the Record Model at handover and all processes and deliverables as defined in this document as Design Team scope.
- Construction Team
  Work effort required in relation to Construction as defined in the Project Agreement, Construction Management Agreement, Design Build Agreement, etc., as applicable. This role is defined as the 'Construction Team'. The Construction Manager/Design Builder, as applicable will determine which Trades (firms) or individuals form part of the Construction Team for each project and will be responsible for ensuring their compliance with these requirements.
  The Construction Team is responsible for development of trade models, upload of required information and all processes and deliverables as defined in this document as Construction Team scope.

2.3.2 Participation

For the purposes of The Health Authority's BIM process, all participants involved in 'Design' and 'Construction' are required to conform to the BIM requirements set out in this document.

Please Note: This includes any specialist consultants, whose work includes any tracked asset, included in the Data and Geometry Specification (DGS).

It is the responsibility of the Design Team and Construction Team project participants to define within the BIM Project Execution Plan (PEP) the responsible parties, workflows, processes, and protocols they intend to utilize to address specific issues and achieve the stated goals.

The PEP is a living document that will be used by all parties and where the responsibility for the evolution and development will be transferred from the Design Team to the Construction Team. The timeline for this transfer of responsibility to be recorded in the PEP.

Please Note: Any proposed amendments to these Requirements must be recorded in the PEP for approval and sign-off. Any amendment that impacts the quality of the underlying data or compromises the achievement of the Health Authority's stated goals will not be accepted.

Appendix E: BIM Project Execution Plan (PEP) – Outline Requirements – Design Team and Construction Team outlines the specific criteria that must be addressed.

2.3.3 Vancouver Coastal Health Authority (the Health Authority)

This document uses the term Vancouver Coastal Health Authority (The Authority) to define and encompass all of the Health Authority's various stakeholder groups who will undertake the following:

- Distribute the BIM Specification, standards, and information to support the established BIM goals.
- Approve the PEP, including any requested exemptions.
- Review and comment on submitted deliverables, i.e. design models, asset information and data upload.
- Sign off on the Asset Registry.
- Sign off on construction data and documents uploaded by trades.

2.3.4 Vancouver Coastal Health Authority's BIM Consultant (The Health Authority BIM Consultant)

The Health Authority will retain an independent BIM consultant to undertake BIM Compliance Audits, to ensure compliance with these requirements and check that the data generated can support the proposed goals and uses and mitigate the defined risks.

The Health Authority or the Health Authority's BIM Consultant will be responsible for providing the external database environment, or alternate solution, for the collection and collation of required data and documents for Facilities Management (FM)

Other responsibilities include the following:

- Provide advice and recommendations to the Design Team and Construction Team.
- Audit the PEP to ensure strategies and workflows defined in the PEP are aligned with the BIM requirements and being adhered to within the model dataset.
- Audit the design model data to ensure BIM requirements are being met.
- Monitor BIM process and protocols to ensure agreed processes are being followed.
- Generate the design model Asset Registry.
- Support the work effort of other project consultants and all parties approved by the Health Authority, in accessing the cloud based external data base.
- Prepare, host, and monitor the cloud-based environment for asset information upload.
- Generate progress reports on the data and document upload progress.
- Compile the data for transfer to Computer Maintenance Management System (CMMS), Computer Aided Facility Management (CAFM) and Work Information Management System (WIMS) as required.

2.4 Ownership

The ownership and responsibility for each individual digital model resides with the party that generated it. Only the responsible Design / Trade Team shall enter information into their model. However, The Health Authority must be granted full access to, and use of, all models generated during the project for the lifecycle of the facility.

Models are to be shared with all parties as required by the Health Authority, and as agreed and defined in the PEP, however the Health Authority reserves the right to request additional model submissions.

Models must be uploaded to a common data environment (CDE) on a regular basis, to be agreed and defined in the PEP. The frequency of model upload may vary depending on the project phase, however teams should assume a frequency of between two to four weeks.

Please note: Models must be provided in their native state, retaining all links, attachments, and sheets applicable for all submission and required model exchanges. Models should be purged of unnecessary families and extraneous objects.

The printed and digital 2D paper (PDF/DWF) drawings derived from the models, not the models themselves, will still constitute the legal contract documents.

The use of the models and the inherent data will be entirely at the risk of the user. Models will be provided for information, to help reduce risk, support a better understanding of the project and to support further development of fabrication models.

3 DESIGN PHASE REQUIREMENTS

The relevant ISO sections are as follows:

- ISO 19650 5.4 APPOINTMENT PROCESS, 5.6 COLLABORATIVE INFORMATION PRODUCTION.
- ISO 19650 DOCS: BEP DESIGN, RESPONSABILITY MATRIX, TIDP, RACI.

3.1 General Information:

The Team should consider and record in the PEP their strategy for managing the following:

3.1.1 Risk Mitigation

The relevant ISO sections are as follows:

- Risk Assessment (ISO 19650 5.3.6 Risk Register) – Identify hazards and risk factors that have the potential to cause harm within the process.

The Design Team must generate a Risk Assessment matrics, to identify and manage issues and risks that they feel might impact their ability to meet the requirements of the BIM Specification as detailed within this document. An outline matrix is provided in **Appendix P**.

3.1.2 File Sharing Platform

An accessible file sharing platform, for common access of all BIM Models should be established. Project teams should update the BIM Models on the file sharing platform on a regular basis as specified by the Health Authority. Versioning of models is required and must be detailed in the PEP.

The Design Team is to include in the PEP the workflows they propose to follow. Example workflows are included in **Appendix Q.**

3.2 Design Authoring Software

Autodesk Revit will be the Health Authority's BIM authoring software. Exceptions will be accepted for Civil Engineering and Landscape consultants upon request.

- Civil Engineering must use a 3-Dimensional (3D) Computer Aided Design (CAD) platform such as Autodesk Civil 3D
- A strategy must be included for integration with the Landscape consultant's software, including management of tracked assets, included within the landscape scope of services.
- A strategy must be included in the PEP to establish a process for coordination with the Civil and Landscape consultants.

Additional consultants (e.g. kitchen, elevator, specialist equipment) must generate models capable of exporting Industry Foundation Classes (.ifc) format to support coordination and data collection/extraction.

3.2.1 Software Versioning

Versioning of software shall be managed by the BIM teams throughout the project lifecycle. The version number of any software to be used including collaboration software (e.g., Revit, Navisworks, etc.) must be announced at the start of the project and must be maintained throughout the project close-out, unless the team as a whole agrees to upgrade to a newer version. The versioning of software must be identified in the PEP.

A strategy to manage potential upgrade issues is to be included in the PEP.

Please Note: Depending upon the duration of the project, Revit version updates may be required. The model provided at handover, is to be no older than one version back from current.

3.2.2 Geo-Reference, Levels, Grids and Units

The Design Consultants must establish a strategy for management of the following:

- Spatial coordinates, which must be accurately geo-reference in all models, including Civil, and agreed with the Health Authority.
- Levels and Grids to be used across the entire Team, including fabrication models.

The Health Authority requires all projects units to be metric.

The proposed strategies for managing these are to be clearly defined in the PEP, at the beginning of the project.

Please Note: All objects in models are to be modeled at true scale and at true elevation above sea level in accordance with the established project datuum.

3.3 BIM Design Kick-off

The BIM 'Design' Kick-off meeting should occur soon after project award, so that modeling strategies can be agreed before modeling efforts are too far advanced.

Please Note: The first submission of the Design PEP is to be provided 10 days before the BIM Design Kick-off meeting.

This meeting should include a representative from the Health Authority, the Health Authority BIM Consultant, and the appropriate BIM and leadership representation from the entire Design team, including but not limited to, Architectural, Mechanical, Electrical, Plumbing, Civil and Structural.

At the BIM Design Kick-off Meeting:

- The Health Authority's BIM Consultant will respond to workflow strategies, information exchanges, etc. as documented in the PEP.
- The Health Authority's BIM Consultant will clarify questions raised, explain the compliance review process and be available to respond, as required, to issues and propose acceptable solutions for agreement.

3.4 Project Execution Plan (Design PEP)

A BIM project inherently requires a collaborative approach from all participants. The Design PEP is a document developed and managed by the Design Team, to record the agreement between all the parties involved in the project: who is responsible for doing what, in which model and at what point in time. It provides an opportunity to document model practices that are to be used, strategies, processes and protocols to be

followed and must define any areas of agreed non-compliance with these requirements. **Appendix E** identifies issues that must be addressed in the PEP by the Design Team, if applicable to the project.

In addition, the Design PEP provides clarity to those outside the project team as to the specifics of how the models have been assembled and what strategy is being utilized to cope with the various known challenges associated with working collaboratively in teams, with multiple models.

The PEP is a critical living document that must be maintained and kept current throughout the duration of the project. It will be used by The Health Authority to provide understanding as to how to maintain and update the models after project handover. An updated PEP must be included, along with all Design models, as part of each audit submission.

3.5 Modeling and Data Requirements

One of the main risks targeted by this process is to reduce overall project risk along with the the data loss, delay and quality of handover documentation.

As such BIM Compliance audits will target the data and document collection, focusing on whether the models are sufficiently robust to support the collection and collation of additional information against those assets that are tracked by the Health Authority, and which will be transferred into their Computer Maintenance Management Software (CMMS) / other software systems.

The design models shall be created to include all geometry, physical characteristics, and product data needed to describe the required scope of the project. All drawings and schedules required for assessment, review, bidding, and construction shall be derived directly from the models.

Please note: The Design team must ensure that all model elements, required to define the design intent and are present on the drawing views, have descriptive Family Name and Type Names to support downstream goals and uses.

Appendix D establishes the modeling and data requirements against which models and documents will be audited. For ease of use, the model and document requirements are broken into the following groupings:

- **Document Deliverables:** Updated PEP, risk assessment matrix, virtual coordination matrix
- **Model Consistency -** Alignment between the BIM requirements and the PEP, PEP readability/clarity, alignment with models, phasing consistency, cleanup, duplications/placeholder objects.
- **Model Coordination -** Modeling precision, clearances, virtual coordination.
- **Assets Extraction -** Modeled objects, geometry level, scope clarification, in-place families, asset granularity.
- **Assets Location -** Model alignment, room bounding, existing rooms, associated room, level, room type and multiple repetitive rooms/floors.
- **Assets Classification –** OmniClass (2012) classification, consistent category, descriptive names, system naming.
- **Data Clarity -** Built-in parameters, object relationship, views and schedule data usage.

Please Note: Assets Location is a critical piece of information for the Health Authority and the Design Team must provide their strategy for managing multiple repetitive rooms / floors. The Health Authority requires all tracked assets and associated systems to be present on all floors and in all rooms at issuance of Issued for Construction (IFC) documents.

The Design Team is required to provide in the PEP, for approval by the BIM Consultant, the strategies, workflows, process, and protocols that they are proposing to use to meet these requirements. BIM compliance reviews will be conducted relative to these agreed requirements.

3.6 Tracked Assets Requirements

The Data and Geometry Specification (DGS) in **Appendix F**, identifies assets that must be modeled when part of the design. These assets, defined as 'Tracked Assets', are of critical importance for Facilities Management (FM) and will serve as containers for additional data and documents to be collected, on the external data base during the construction phase of the project.

Please Note: Tracked assets that will not be incorporated as part of the final design, i.e. required only for the duration of the construction phase, are excluded from these requirements, however, if these assets are to be relocated and will be included in the final design, even if in a different phase then they must adhere to these requirements.

Each responsible party is required to validate and ensure that all the data fields as defined are provided with the appropriate and correct information for each asset listed in the DGS prior to IFC submission.

Please Note: The Design Team is required to review and refine the DGS by identifying which asset types they anticipate will be part of the project, assign responsibility to a consultant team, and indicate any variations they would like to submit for approval. The goal of this process is to align expectations and accommodate any reasonable adjustments to the BIM Specification on a project-by-project basis.

3.6.1 Minimum Geometric Level

The DGS defines the minimum Geometric Level (G0, G1, G2, G3) required at different stages of the design phase for each tracked asset type when part of the design. Tracked assets must be modeled as Revit Families and associated with a consistent category. 2D symbols or 2D lines as the only form of representation will not be accepted.

The following table provided for general guidance sets out the expectation for each level. Full details defining all geometry expectations is defined in the Notes, tab on the Data and Geometry Specification (DGS) and the Data Collection Specification (DCS) spreadsheet.

Classification	Description	Requirements
G0	Conceptual Elements	Approximate Geometry (LOD 200)
G1	Accurate Elements	Accurate Geometry (LOD 300)
G2	Data Rich Elements	Plus accurate Family, Type, System, Mark, and Type Mark data if applicable**
G3	Data Rich Elements +	G2 requirements plus Parent-Child relationship data if applicable**

3.6.2 Asset Type Classification System

To remove the requirement for a stringent naming schema, the Health Authority has selected OmniClass 2012 as the classification management system for organization, sorting, and retrieval of asset information for all tracked assets.

In the DGS, each asset type is associated with a corresponding OmniClass number and title. This classification must be used by the Design Team to identify tracked asset types in the models. The Design Team must describe in the PEP the process they will use to assign this information to model elements and their proposed QC process to check for accuracy.

3.6.3 Required Parameters

Specific required parameters relative to tracked assets are defined in the DGS along with the project phase by which the information should be present in the data set. As the inherent data within the Design models is going to be used to drive downstream processes, it is required that critical information be provided consistently in 'built-in' parameters. It is of critical importance that design teams adhere to the parameters identified in the DGS, in order to successfully extract the specified data for each tracked asset required for the Health Authority's CMMS system. If there are requested deviations from the identified parameters, they should be consistent across the models, require approval and noted in the PEP.

Please Note: If the team selects to use 'shared parameters' rather than built in parameters to capture required data, they must be consistently used across the project and a table included in the PEP which identifies each 'shared parameter' and the 'built-in' parameter that is not going to be used.

A typical workflow involves extraction of the data from the model elements into an external database. To be of value for onward migration to the Health Authority's CMMS system, and to mitigate the risk of disconnected, incomplete information for Facilities Management, the accuracy and consistency of the data is critical. A workflow describing the importance of data rich model elements during data extraction is described in **Appendix M**.

3.6.3.1 Tags

'Mark' and 'Type Mark', when applicable, must be used when placing tags on sheets and generating the various schedules. The DGS, **Appendix F**, identifies assets that must be tagged at the type level (the ones that require 'Type Mark') and at the instance level (the ones that require 'Mark') at each milestone.

Please Note: Text tags are not permitted.
If the team is planning to use different parameters to capture Mark and Type Mark information, they must be recorded in the PEP and used consistently used across the entire project.

3.6.3.2 Asset Hierarchies, Classifications and Parent/Child Relationship

Please Note: It is critical for the Health Authority that all tracked assets can be transformed into an asset hierarchy with the required system and parent. The following sets out the naming requirements for all tracked assets that the Authority requires The Design team to use.

- **Parameter Naming Stategy for all Tracked Assets**

To ensure the generation of an Asset Label that meets The Health Authority's requirements the design team must adhere to the following structure:

- Discipline – top parent (e.g. Mechanical or Electrical)
- System – (e.g. Chilled Water or Vital Electrical Distribution)
- Specific Asset Relationship – (e.g. VFD's related to associated pumps or electrical equipment related to assets that they are fed from)

In addition, the Health Authority will require System / Asset Type Classifications (DGS Column B) for each Tracked Asset. This is to improve searching and maintenance cost reporting the following table provides a sample of these classifications.

In order to facilitate the data transformation process, the Design Team is required to utilize consistent parameters / naming strategies to allow for identification of the parent / child relationships and

appropriate classifications. Specifically, the Mark field must follow the specified Mark / Asset Name structure and System name / System abbreviation fields. These must be used consistently and align with the Asset Category Acronyms and System Acronyms provided in Appendix C.

The Mark schema for these 'Tracked Assets' is critical and must follow the Health Authority's structure to ensure that parent / child relationships, along with the following relevant information, is captured.

The following table explains the required Mechanical Asset Hierarchy Schema:

System / Asset Type Classification			
Design Team	**Parameter**	**Example**	**Notes**
	Mark (or other approved parameter i.e. ABC-Mark) (Instance Parameter in Revit)	CHW-P-06-VFD-06 (Asset Label)	Comprised of Parent: CHW-P-06 and Child: VFD-06. See Mark / Asset Name, Naming Structure examples below
	Asset Description (Shared Parameter in Revit)	VFD, Chilled Water Pump #6	Clear accurate name complied as follows: Asset Type (DGS column B), System Name, other critical information for identification of the asset
	Type Mark (or other approved parameter i.e. ABC-Type Mark) (Type Parameter in Revit)	VFD	See Appendix C for Asset Category Acronyms
	OmniClass #2012 – Table 23 (Revit Built-In / Classification Manager Parameter)	23 35 17 15 Variable Frequency Drives	OminClass # and Title
	System Name (Revit Built-In Parameter)	Chiled Water	See Appendix C for System Names
	System Abbreviation (Revit Built-In Parameter)	CHW	See Appendix C for System Abbreviations
	Location – Building (Project Information in Revit)	VH Operating Theatre	As defined in the PEP
	Location – Floor (Revit Level)	01 Floor	As defined in the PEP
	Location – Room Number (Revit Room Number Parameter)	Rm 101	As defined by the Health Authority for the project
	Location – Room Type (OmniClass # - Table 13 Shared Parameter in Revit)	13 23 23 21	As placed in Architectural Models

System / Asset Type Classification Examples			
Design Team	Asset Name	Mark / Asset Name	Mark / Asset Name, Naming Structure Breakdown
	Pump, Chilled Water (P-6)	CHW-P-06	System Abbreviation (CHW) – Asset Category Abbreviation (P) – Asset Number Identifier (06)
	VFD, Chilled Water, Pump 6 (VFD-06)	CHW-P-06-VFD-06	System Abbreviation (CHW) – Parent Asset Category Abbreviation (P) – Parent Asset Number Identifier (06) – Asset Category Abbreviation (VFD) – Asset Number Identifier (06)

	Transformer, Vital, 600V ~ 120/208V (T-2)	V-6T04	Electrical Brach – voltage – Asset Category Abbreviation – Asset Number Identifier
	Bed 53	BED-53	Asset Category abbreviation – Asset Number Identifier

3.6.3.3 System

The DGS also defines which asset types require System information. The Design Team must use the prefix and nomenclature defined in **Appendix C** for systems.

Please Note: if a tracked asset is part of a system then a parent/child asset hierarchy relationship will be required.

3.7 Room Requirements

The Room Specifications, **Appendix F**, defines the data that must be present in the models for different room types along the project timeline. It also defines the classification system to be used by the Design Team to tag architectural rooms, including shafts and interstitial floors, as a way to facilitate compliance checks.

Rooms must be placed to capture assets outside the building, ie, room equipment, tracked assets on external walls, assets within landscaping, (i.e. parking ticket machies, charge stations, emergency call points)

3.8 Areas and Finshes

The Health Authority will use the inherent area information to support Facility Management and as such the Design team is required to define the strategy on how they will provide the following information:

- Gross area of the building by level which is to include the overall building total gross area.
- Area of all rooms on all levels.
- Areas of finishes by type and level.

3.9 Fixtures Finishes & Equipment (FFE)

The Health Authority will be collecting information relative to fixed furniture, finishes, and equipment. The Design Team must record in the PEP the method they plan to use to capture and identify:

- Floor and ceiling finish, material and colour.
- Fixtures / Equipment, i.e. where the design team has made allowance for or included allowance for, space, power, water, connections etc. and the fixture / equipment is included on the design drawings, irrespective of who will be responsible for the purchase and install.

Note: Where the equipment is purchased and installed by the Health Authority the upload of data and documents will be undertaken by the Health Authority.

3.10 Estimating

The Health Authority will be using the models to help support Class D, C + B estimating. The goal to undertake more frequent estimates to help ensure the design stays in alignment with project funding.

As such the Health Authority requires design teams to follow the DGS in order to support the generation of high quality data during design. It is of critical importance for all elements in the model to be representative of the design intent in terms of type and size even when not listed in the DGS as a tracked asset (i.e., pipes, ducts, cable tray, windows, walls, doors, etc.).

The Design Team must record in the PEP any elements that will not be modeled and which they would like to have excluded from supporting this goal.

3.11 Energy Analysis / Sustainability

The models, irrespective of software, will be used to help support the Health Authority's energy analysis / environmental and sustainability goals and as such the following should be considered.

- Site and building location, with a focus on ensuring the correct orientation to true north along with the site / building elevation relative to a reference datum.
- Building storey's, usage and if requested 3D geometry of adjacent buildings that would impact the site.
- Classification, construction type and the material of building elements needs to be provided for:
- Walls (interior / exterior), curtain walls, roof, floors/slabs, ceilings, windows/skylights, doors, and shading devices.

3.12 Existing Facilities: Renovations/Extensions

3.12.1 Relocated/Modified Elements

The expectation is that, where feasible, all work shall be undertaken using a BIM process. The Design Team is required to detail in the PEP any areas where a CAD workflow is proposed and their anticipated process for the capture of new tracked asset information located within this area.

All existing elements that are modeled must reflect their real geometry and location. Should a new MEP tracked asset be added to an existing room, the Architect must place a room object to capture this information. The room may be generated using room separation lines but must contain an accurate room name and number.

If an existing element needs to be relocated or modified due to the proposed design, then it should be treated as a design model element and must comply with all the requirements set out in the BIM Specification and include a unique ID from the existing Asset Label, preferably the Maximo #.

The PEP should be used to record any requested exceptions.

Note: New and relocated tracked asssets must be modeled. There is no requirement to model tracked existing assets.

3.12.2 Risk Mitigation

Working with existing facilities, with historic drawing records adds an additional risk to the process and as such the Design Team must develop a strategy and workflow to mitigate this risk. An example workflow is included in **Appendix P.**

The goal is to provide the Health Authority, along with the project team, an opportunity to assess the risk by considering factors that might help reduce the risk against the cost of additional investigation to ensure that the design model reflects the actual facility.

The risk assessment should consider:

- Perceived reliability of the existing 'record drawings'.
- Conventional or laser scan survey to be undertaken or a combination of both.
- Degree of accuracy required from the laser scan
- Degree of modeling required.

- Verification of loads and capacity of existing systems, asset association to electrical panel relationship etc.

These factors are considered against:

- Facilities age.
- Extent of renovation.
- Degree of required interference checking, back into the existing facility.
- Project schedules.
- Accessibility of systems, structure for validation i.e. is destructive investigation required.

This is not an exhaustive list; it is indicative of those issues that should be considered prior to commencing any modeling effort.

Please note: Existing record drawings alone should not be relied on as accurate information. They may be a starting point for the generation of a model that is subsequently refined when verification activities take place. A verification strategy and risk assessment must be documented in the PEP. If, at any time in the project, a record drawing is found to be incorrect or inaccurate, the responsible party must record the inconsistency in a redline markup, and formally notify the Health Authority.

3.13 Virtual Coordination

Virtual Coordination is a key process in helping to mitigate risk for the project. The Design Team must use the Geometric Level (G1, G2, G3) defined in the DGS (**Appendix F**) for all tracked assets and ensure the assets are accurately created and placed in the models. The Design Team is responsible for determining and modeling all other elements required to define the facility and support virtual coordination. Without relevant representative 3D models, the risk of downstream coordination issues and delays during the construction phase increases, often generating long-term issues for effective maintenance of the facility.

The aim of virtual coordination during the design stage is to mitigate major design issues before the construction phase.

The Design Team must document in the PEP how they propose to conduct virtual coordination throughout the design phase, using **Appendix K** as a reference. The following items must be addressed:

- Coordination Software - Which virtual coordination software will be used. This software must have the ability to automate the clash review process based on customizable settings using the model geometry and underlying component information. It must also have the ability to uniquely track issues, assign responsibility, save views of issues and maintain a record of the eventual resolution of coordination issues.
- Schedule - What is the proposed frequency of reviews/meetings.
- Digital Building Review - How visual checks will be done to resolve potential constructability or design issues not highlighted by either a soft or hard clash.
- Clash Coordination - How hard and soft clash checks will be done and who will be responsible for creating the federated model, running clash tests, reviewing, and grouping the results.
- Hard clashes - physical conflicts between two objects
- Soft clashes - objects impinging on required clearances for code, maintenance or replacement needs. Clearances for maintenance must include the required access column to reach equipment
- Colour Coding - Which colours will be used to distinguish model elements/systems/disciplines.
- Sequence Strategy – which disciplines, objects, systems, assets, etc. will take prescedence over others.

- Issue Tracking Strategy - How issues will be tracked, prioritized, assigned, and shared across the Team and with the Health Authority. Virtual coordination reports should include a unique identifier of the issue, date, location, level, disciplines involved, graphical representation of the issue, status field, severity/risk, assignment of responsibility and timeline for resolution.

Please Note: Access to a free 3D viewer along with access to the selected virtual coordination and issue tracking software must be provided to the Health Authority and their BIM Consultant.

3.14 BIM Compliance Reviews

The Health Authority's BIM Consultant will conduct BIM compliance reviews focused on ensuring compliance with the BIM Specifications as described in **Appendix I**. Model and data requirements will be reviewed for each design model using the PEP as reference for any agreed exclusion. A report will be generated and shared with the Health Authority and the Design Team, indicating the modeling, data and workflow issues that must be addressed prior to the next review.

Please Note: The BIM compliance reviews, conducted by The Health Authority's BIM Consultant are focused on issues and requirements defined in this document, they do not address any design compliance issues with the facility program, codes or constructability. That is the sole responsibility of the Design Team.

The following image, shown on the next page for clarity, provides a diagram of the issues that the BIM Consultant will focus on during an audit. The Design Team must ensure that all the required information is accessible and available in the models by IFC submission and is in full compliance with the BIM requirements.

BIM compliance review workflow

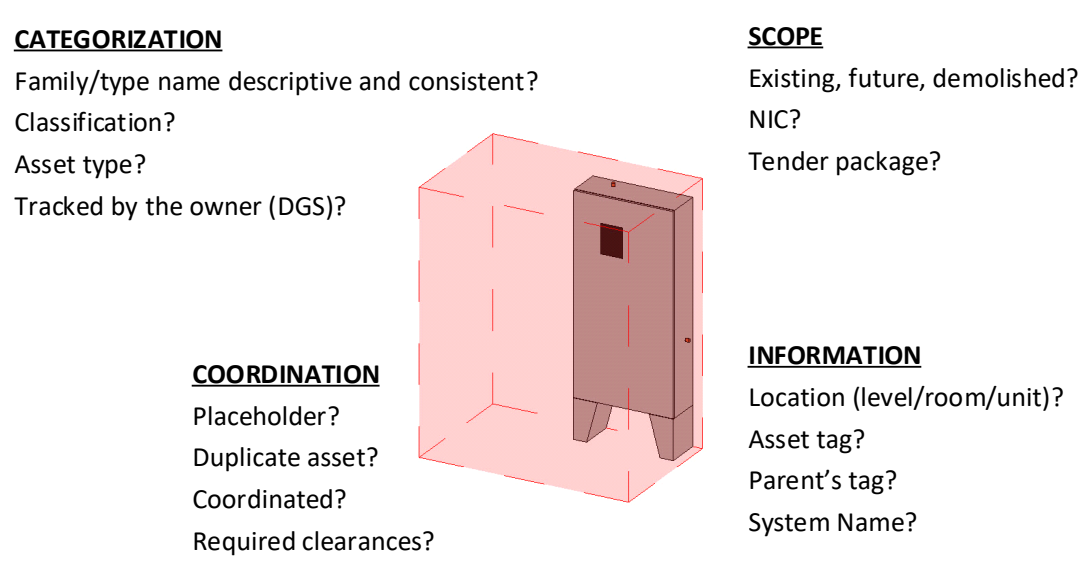


Image: Main compliance issues focused on during a compliance audit

Please Note: BIM Compliance Reviews will align with the project Milestone Submissions and should not be more than three months apart.

3.15 Record Model Update

It is of critical importance to the Health Authority that the design models provided at substantial completion be an accurate geometric representation inclusive of the design rationale, and all sheet views, including the single line diagrams, schematics, schedules and drawings of what has been constructed.

To achieve this, the Team must record in the Design BIM PEP the process they propose to capture, within the design models, the geometry and design rationale changes that have occurred during construction. **Appendix L** has a recommended workflow and should be used as reference. The proposed process should define the timeline, milestone checks for update, along with the accuracy that is to be applied to the design rationale, systems, and assets etc.

Please Note: There is **no** requirement to replace original design rationale data with installed asset information.

The Design team must liaise with the Construction Team who's responsibility it is to ensure that changes are conveyed to them. This update must occur during and not after construction. The BIM Consultants will be checking to ensure that this process is occurring.

Pease Note: Fabrication models are not acceptable as an alternative to updated Design Models.

Appendix G contains a recommended Accuracy Table for model updates. The Team is expected to review and provide and updated version of this table.

Please Note: Extracted design model data is the foundation for the Asset Registry and the subsequent data transfer carried out by the Health Authority's BIM Consultant and as such any update of tracked assets must be undertaken by switching out assets and not deleting and replacing. If switching out is not possible, the Design Team must immediately advise the Health Authority's BIM Consultant so that a strategy can be developed to ensure that information is not orphaned.

3.16 Design BIM Deliverables

BIM deliverables	Design Team	BIM Consultant	Health Authority
Deliverables: BIM Compliance Review			
Updated PEP and DGS (including any additional assests not identified)	x		
Design models – All disciplines	x		
Source software files – Civil, landscape, specialist sub-consultants	x		
Consolidated PDF sheets – By discipline, including civil, landscape and specialty consultants	x		
Federated model NWC and NWF – All disciplines including civil and landscape	x		
Risk Assessment Matrix	x		
Risk Analysis Plan – For Existing Facilities (where applicable)	x		
Virtual coordination report – For all CD submissions	x		
BIM compliance review report		x	
Reviewed PEP		x	
Deliverables: Sequential Tendering / Tender Package			
Sheet sets per tender package	x		
Asset Registry per tender package		x	
Access to Data Collection Environment		x	
Deliverables: End of Design Phase			
Updated PEP and DGS	x		

Sheet sets (all disciplines)	x		
Source software files – Civil, landscape, specialist sub-consultants	x		
Access to Data Collection Environment		x	
Design models – All disciplines	x		
Source software files – Civil, landscape, specialist sub-consultants, single line diagrams, existing facilities and other approved exceptions.	x		
Design specifications (.pdf)	x		
Asset Registries		x	
Asset Registry sign off			x

Please Note: In a tender package submission, design models provided by the Design Team are not going to be audited. The BIM Consultant will only use those models to create an Asset Registry.

4 CONSTRUCTION PHASE REQUIREMENTS

The relevant ISO 19650 sections are as follows:

- ISO 19650 5.7 INFORMATION DELIVERY MODEL.
- ISO 19650 DOCS: BEP CONSTRUCTION, EIR.

4.1 BIM Construction Kick-off Meeting

The BIM 'Construction' Kick-off meeting, to be held soon after issuance of the IFC documents, is an essential step to open lines of communication. The Health Authority's BIM Consultant will provide a general review of the BIM requirements, identify areas of focus for the project and clarify any issues. It is required for all the trades involved in the project to have a qualified BIM representative attend the meeting as the specifics of the BIM processes will be discussed.

Note: Issues and agreements raised during the meeting must be addressed and resolved in the PEP.

The Construction Team should table a draft Construction PEP and be prepared to discuss:

- Workflow strategies and information exchanges.
- Project timeline (simplified to better visualize BIM requirements in the context of the construction of the project).
- Asset Registry and Data and Document collection requirements.
- Virtual coordination strategies, utilizing design and trade models.
- Record model strategy

4.2 Project Execution Plan (Construction PEP)

The Construction Team must continue to develop and maintain the Project Execution Plan (PEP) started during the Design Phase of the project. The Construction Team should plan to have an updated and complete version of the draft Construction PEP prior to the Construction Phase BIM Kick-off Meeting.

Appendix E contains an outline of the issues that must be addressed in the PEP. The main requirements are related to specific workflows and strategies regarding Virtual Coordination, Design Model Update and Change Management.

Please Note: An updated version of the Construction PEP must be provided when changes occur. The Health Authority's BIM Consultant will then review and flag issues.

4.3 Data Collection Requirements

The Data Collection Specification (DCS), **Appendix F**, defines the data and documents required to be collected during construction relative to each tracked asset, when part of the project.

Please Note: The collection parameters listed in the DCS will be created and managed in an external database by the Health Authority's BIM Consultant. These parameters will not be included in the design models.

The DCS contains the following information:

- Master list of tracked asset types organized by groups.
- Data/documents required relative to each asset type, if part of the design, to be collected during construction, such as approved shop drawings, serial number, manufacturer, warranty certificate, etc.
- Number of parameters required for data collection for each asset type.

Please Note: the Construction Team must associate, from a predefined list provided by the Health Authority, a Maximo Number to each required tracked asset label. The Maximo number assigned to each specific tracked asset must be replicated and entered against the relevant specific asset in the cloud collection interface. The Construction Team must define their method for quality control of this critical process.

4.4 Asset Registry

The Health Authority's BIM Consultant will generate a project specific Asset Registry based on the Design Team's models around the issuance of 95% CD to IFC, or after each IFT submission. This document will list all tracked assets that are part of the project against which additional data, documents and Maximo number must be collected during construction.

The Team must be available to provide clarifications to the Health Authority's BIM Consultant, to ensure the Asset Registry is accurate and includes all tracked assets that are part of the construction scope. The Health Athority will be responsible for the Asset Registry sign off.

4.5 Data/Document Collection Environment

Unless otherwise noted, it is the responsibility of the Health Authority or their designated BIM Consultant to provide, for the duration of the project, a Data Collection Environment (external database). This environment will be an external database that supports the association of data and documents to the design model elements such as approved shop drawings, warranty certificates and other installed information.

Please Note: The Design Team is **not** required to adjust any of the design information to reflect the installed product, within the design Revit models. All additional data and documents will be handled in the external database.

The Construction Team is required to work with the BIM Consultant to assign responsibility for all tracked assets to the specific responsible trade. The Construction Team is responsible for ensuring that the trade complies and uploads all the required data and documents, as defined in the Document Collection Specification (DCS), to the Data/Document Collection Environment.

The BIM Consultant will be responsible for:

- Extracting information from the design models and generating the Asset Registry.
- Managing the External Data base and providing the interface.
- Working with the Construction Team to undertake a QC review for alignment between asset registry and trade scope.

- Working in collaboration with the Construction Team, the BIM Consultant will assign responsibility, in the external database, to the agreed applicable trade, in accordance with their defined scopes.
- Generating accounts so that project participants can access and review information.
- Providing training and support to the appointed responsible party to facilitate the collection of the information.
- Providing periodic upload progress reports.
- Transferring uploaded information, at substantial completion, to the Health Authority for their final upload into their CMMS solution.
- Providing a structured digital report that presents data and documents collected in a structured, integrated, and easy to navigate format.

The Construction Team will:

- Work with the BIM Consultant to define trade scope and responsibility.
- Provide contact information within four (4) weeks of each trade contract award (company, name, email, scope of work)
- Provide and upload both metadata (text, dates) and documents to the Data Collection Environment.
- Flag any design data inconsistency that impairs the upload process.
- Address issues flagged or concerns raised about upload progress.
- Advise of any tracked assets within a trade's scope which are not included in the Asset Registry.
- Undertake a QA/QC process on uploaded information to ensure that the data required for FMO is accurate, associated to the correct element, and reflecting the installed asset information. This process must be documented in the PEP.

The Health Authority will:

- Undertake QA/QC reviews of the uploaded data and documents using the digital report provided by the BIM Consultant or the Data Collection Environment.

4.6 Data / Document Upload

The Health Authority's BIM Consultant will organize the external database so that each party responsible for providing upload information will only see the assets that they are required to provide information against. **Appendix J** defines the data collection workflow.

Trades will be required to participate in the data and document upload, providing the required information as noted in the Data Collection Specification (DCS). Requirements are specific to the different asset types. Shop drawing approval is the trigger for the trades to begin uploading information that is now fixed, e.g. shop drawings, life expectancy, manufacturer, model, type, vendor, etc.

The requirement, unless agreed otherwise and recorded in the PEP, is as follows:

- The Construction Team will provide to the Health Authority / Health Authority's BIM Consultant and keep up to date the submittal schedule for anticipated shop drawing approval.
- All required information defined in the DCS, which becomes fixed on approval of shop drawings, will be uploaded within 2 weeks of approval.
- Manufacturers' instruction manuals, maintenance schedules etc., will be uploaded to the cloud database as soon as they become available, to support development of critical preventative maintenance programs.
- Each PDF file will be specific to the asset type and no PDF file will be uploaded containing multiple asset types. For example, Pumps – shop drawings: should be by type, and not include all types of pumps on the project.

- All uploaded PDF's, including stamped approved shop drawings provided by trades, will be submitted as software-generated PDF's. No scanned documents will be accepted.

The following table, show on the following page for clarity, sets out the expected key triggers for the upload of required information.

Asset Type	Data + Document Collection (DCS) Required information to be provided at:	Shop Drawing Approval	Installation
High Voltage Distribution Bus (HVBUS)	Shop Drawings (Approved)	☒	
	Maximo Number		☒
	Vendor / Supplier	☒	
	Manufacturer	☒	
	Model	☒	
	Serial No.		☒
	Electrical Branch		☒
	Fed From (Electrical)		☒
	Manufacturers Instruction Manuals	☒	
	Installation/Substantial Completion Date		☒
	Warranty End Date		☒
	Warranty Certificate		☒
Air Conditioning Unit (ACU)	Shop Drawings (Approved)	☒	
	Maximo Number		☒
	Vendor / Supplier	☒	
	Manufacturer	☒	
	Model	☒	
	Serial No.		☒
	Manufacturers Instruction Manuals	☒	
	Installation/Substantial Completion Date		☒
	Warranty End Date		☒
	Warranty Certificate		☒

Please Note: to ensure that Commissioning has the required information, the specific timeline for the data and document collection is to be defined and approved in the PEP.

The Health Authority will provide a range of Maximo numbers for the use of the team for upload and association to the tracked assets by the Construction Team.

4.6.1 Data Transfer

All required data and documents must have been uploaded and reviewed prior to substantial completion. Collected information will be transferred to the Health Authority, by the Authority's BIM Consultant, at handover. The Health Authority will import information into their CMMS solution.

4.7 Constructability Analysis

Independent of contract type, once the contractor is involved and part of the project, the Construction Team will participate actively in the BIM process, reviewing the design for constructability issues, maximizing the efficiency of the construction schedule, and evaluating opportunities for prefabrication.

Design models will be shared with the Construction Team and must be used to generate a federated model for enhanced virtual coordination with sub-trade fabrication models, construction sequencing/optimization and other activities.

Please Note: The use of the design models is at the risk of the user. The Construction Team will be responsible to validate any models they use before basing decisions on their content.

4.8 Fabrication Models

The generation of fabrication models is encouraged for all major components. It is however, mandatory for Structure and Mechanical, (HVAC, Plumbing, Fire Suppression, Pneumatic Tubes and other significant systems), to mitigate risk and support prefabrication and virtual coordination. Of critical importance is to ensure that clearances for maintenance access, replacement and code clearances are maintained.

4.9 Construction Sequencing

It is expected that the Construction Team use the models and associated construction documents to optimize the construction sequencing by establishing optimal means and methods regarding construction. The strategy for construction sequencing must be defined by the Construction Team and described in the PEP.

4.10 Virtual Coordination

The expectation is that the design phase models will be used, in conjunction with fabrication models, to mitigate risk and maximize efficiency. The fabrication models must be created by the trades and linked into a federated model in which virtual coordination and clash detection processes will occur in order to mitigate risks and maximize efficiency.

Once in the construction phase of the project, the fabrication models must be used for virtual coordination and the trades must ensure that the virtual coordination process continues and that all clashes are resolved in a specific area in the model before construction is set to commence in that same specific area of the building.

A recommended workflow for virtual coordination can be found in **Appendix L**. The Construction Team must document in the PEP the process, participants, fabrication software and coordination software that they propose to use to manage this process. The following information should be considered:

- **Digital review -** Resolution of any remaining design phase issues.
- **Clash coordination –** Hard and soft clashes check. Hard clashes are physical conflicts between two objects. Soft clashes are objects impinging on required clearances for code, maintenance, or replacement needs. Clearances for maintenance must include the required access column to reach equipment.
- **Fabrication models -** List of trades providing fabrication models and the systems being represented. Coordination of fabrication level models, which should include hangers, seismic restraints, supports, accessories, etc. that have not been modeled during the design phase.

Please Note: Trades are required to generate fabrication models to support the virtual coordination workflow and mitigate risk. Any exemption must be recorded in the PEP, with the rational and be approved.

- **Software -** Software must have the ability to automate the clash review process based on customizable settings using the model geometry and underlying component information. It must also uniquely track issues, assign responsibility, save views of issues and maintain a record of the eventual resolution of coordination issues.
- **Schedule -** Frequency of reviews/meetings.

- **Issue Tracking Strategy -** How issues will be tracked, prioritized, assigned, and shared across the Team and with the Health Authority. Virtual coordination reports should include a unique identifier of the issue, date, location, level, disciplines involved, graphical representation of the issue, status field, severity/risk, assignment of responsibility and timeline for resolution.
- **Change Management -** Method for capturing changes that require feedback and updates in the Design Models, tracking and reporting any changes to tracked asset, location, orientation, or access requirements for maintenance.

4.11 Record Model Update

Of critical importance to the Health Authority is that the design models provided at substantial completion are an accurate representation of the actual built facility. To that end, the Construction Team is required to provide in the PEP their timeline and workflow for providing the Design Team with the information they require to update their models to reflect changes. This includes schematics, single line diagrams and panel schedules to reflect the equipment controlled.

The PEP should also record the accuracy of the information being relayed to the Design Team relative to different systems/assets, rooms, underground services, etc. The following changes should be considered:

- Size and routings (pipe/ducts).
- Count/number (added/removed elements).
- Location (level, room, x, y).
- Elevation (z).

The Design Team must update the design models during construction so that the external database is kept current and, at substantial completion, the models reflect the built facility. Changes that impact tracked assets must be recorded and reported to the BIM Consultant so that, if required, the external database can be updated.

Please Note: changes to tracked assets within the design model must be through a process of switching, not deletion, to ensure that the original unique asset Revit identifier is retained.

Appendix G: contains a recommended Accuracy Table establishing suggested accuracy requirements for model updates. The Team is expected to review and provide any requested changes for sign off.

Appendix L: has a recommended workflow for record model update. It assumes that the Construction Team will define focus areas in the building (e.g. a level, a room, a zone) before starting the development of fabrication models. These models will then be used for virtual coordination sessions.

Specific meetings involving the Design Team will be required to address unresolved or newly found design issues, discuss locations where fabrication models have deviated from design models and when services protrude into public spaces or below clearances. These meetings will be triggered by the Accuracy Table. When a focus area has no coordination issues, the area must be signed off by the Team.

After an area sign off, trades can proceed to install systems and equipment. Final updates to the fabrication models during this process may be required to reflect as installed conditions. Updated fabrication models, if available, must be shared by the Construction Team with the Design Team along with a 'Design Deviation Area Report', a document that highlights changes that triggered the Accuracy Table and that indicate where an update is required in the design models.

4.12 Laser Scanning

Laser scanning is highly recommended for critical areas of the building as it provides a high degree of accuracy for incorporating into the Record Model. These scans are also needed for virtual coordination in existing areas

that are part of the new construction phase. The Construction Team must record in the PEP the areas to be scanned for sign off by the Health Authority, as additional areas may be required on a project-by-project basis. All laser scans, as point clouds, are to be provided as part of substantial completion deliverables.

During construction, the Team may encounter existing conditions that are different from those reflected in the design drawings. If the difference results in a change in design, additional Laser scanning surveys will be performed by the Construction Team.

4.13 BIM Progress Review

The Health Authority's BIM Consultant will perform periodic upload progress reports, and checks to ensure that the required processes, as defined by the Construction Team in the PEP, meet the outcomes defined in the BIM Specifications.

The Construction Team and the Health Authority will define in the PEP the frequency and schedule for the BIM Compliance Reviews. Issues flagged by trades in the Data Collection Environment will be reviewed and may trigger changes in the asset registry or requests for design model updates.

Following each review, a data and document upload progress report will be generated by the Health Authority's BIM Consultant and shared with the Construction Team. This report will summarize main pending issues and give details about the upload performance of each trade.

4.14 Substantial Completion BIM Deliverables

The following requirements are specific to BIM deliverables and are to be available at substantial completion of the facility.

BIM deliverables	Design Team	Construction Team	Trades	BIM Consultant	Health Authority
SUBSTANTIAL COMPLETION					
Completed Project PEP	x	x			
Record Design Models (.rvt) updated to the version agreed in the PEP	x				
2D CAD (non-Revit, i.e. civil, landscape, single line diagrams, existing facilities and agreed exceptions	x				
Final consolidated Record drawings set (.pdf)	x				
Design specifications (.pdf)	x				
Laser scan point clouds (if requested)		x			
Federated fabrication models (if generated)		x	x		
Data transfer templates for CMMS					x
Project information extracted from the external database, as a consolidated digital building				x	
Structured digital report that presents data and documents collected in a structured, integrated, and easy to navigate format				x	
Data/document collection sign off					x
Tracked asset information and associated data and documents, exported in a format to be agreed, for import into The Health Authority's CMMS				x	
Lessons learned report				x	

5 CLOSEOUT

The relevant ISO 19650 section is as follows:

- ISO 19650 5.8 PROJECT CLOSEOUT

The concept is described in ISO 19650 as an approach to support a smooth transition into the operational phase of a project. This is charactized by a strategic plan and gradual handover which occurs throughout the projects life, from inception to completion and beyond, into the lifecycle of the building.

This concept has been adapted to align with the North Americian market and aligns with the structured workflows defined within this document, where information is collected iteratively, from early design onwards through construction to enable the development of preventative maintenance plans, support commissioning efforts, support QA/AC processes, provide clarity around maintenance reqirements and enable the data transfer into CMMS. The process aligns with the traditional roles, responsibilities and work effort. **See Appendix N**.

6 APPENDIX

6.1 Appendix A - Acronyms

Acronym	Description
3D	Three Dimensions (x,y,z)
2D	Two Dimensions (x,y)
BAS	Building Automation Systems
BIM	Building Information Management / Modeling
CAD	Computer Aided Design
CAFM	Computer-Aided Facility Management
CD	Construction Document (project phase)
CMMS	Computerized Maintenance Management System
CO	Change Order
DB	Design Builder
DCS	Data Collection Specification (Construction)
DD	Design Development (project phase)
DGS	Data and Geometry Specification (Design)
DWF	Design Web Format (file format)
FM	Facilities Management
FMO	Facility Maintenance and Operations
G#	Minimum Geometric Level of a tracked asset
GC	General Contractor
HVAC	Heating Ventilation and Air Conditioning
IFC	Issued for Construction (project phase)
IFT	Issued for Tender (project phase)
IT	Information Technology
MEP	Mechanical, electrical and plumbing
NIC	Not in Contract
NWC	Navisworks Cache (file format)

NWF	Navisworks Document (file format)
PDF	Portable Document Format (file format)
PEP	Project Execution Plan
PLC	Placeholder
QA/QC	Quality Assurance / Quality Control
RFI	Request for Information
RFP	Request for Proposals
ROI	Return on Investment
SI	Site Instruction
VDC	Virtual Design and Construction

6.2 Appendix B – Glossary

Term	Definition
Accuracy Table	Sets out the degree of accuracy required between the 'Record Model' and the actual as constructed condition for different assets, assemblies and building components. The Team is expected to review and provide and updated version of this table.
Asset Label	Shorthand name written on the asset nameplate, which is to be included in the Mark, Type Mark, or other agreed designated parameter, as appropriate.
Asset Registry	A list of every asset present in a project's design models which will have data and documents collected against it. The DCS will specify the parameters required relative to each asset type.
BIM Compliance Review	The project's BIM Consultant will be responsible of evaluating compliance of the Design Team models with the established BIM Requirements. While full compliance is not expected early in a project, the BIM Consultant will issue a report periodically to assist the Project Team in prioritizing compliance to ensure Vancouver Coastal Health Authority (the Authority) receives the full benefit of a BIM process. Submissions must work towards full compliance by their 95% CD milestone.
BIM Progress Review	The project's BIM Consultant will be responsible for ensuring that the required processes defined by the Construction Team in the PEP meet the outcomes defined in these requirements. BIM Progress Reports will be issued periodically with comments about the upload progress and construction workflows compliance.
Building Information Management/ Modeling (BIM)	BIM is a process for creating and managing information on a construction project throughout its whole life cycle. As part of this process, a coordinated digital description of every aspect of the built asset is developed, using a set of appropriate technology. It is likely that this digital description includes a combination of information-rich 3D models and associated structured data such as product, execution, and handover information. (NBS UK).
Clash Review Process	A virtual coordination activity that utilizes software rules and automation for the purpose of identification of physical and clearance (hard and soft) clashes.
Consolidated Digital Building	Augmented database that ties all required data and documents generated and collected during the project to the relevant 'Record Model' objects. Also includes new stakeholder custom views along with any 'Federated Models' used during the project.

Term	Definition
Construction Model	A model (Revit) developed and managed by the Construction Team for internal purposes such as enhanced virtual coordination, constructability and sequencing optimization.
Data and Geometry Specification (DGS)	The DGS is a spreadsheet which includes a master list of all assets that must be modeled, if they are part of the design, along with the data parameters that the Design Team must include during the Design Phase. Each asset type is associated with an OmniClass 2012 Title and Number to be used in the Design Models to identify FMO assets.
Data Collection Specification (DCS)	The Data Collection Specification (DCS) provides a master list of Model Elements (element types) that are tracked by the FMO Team. It is meant to be provided at the RFP stage to the Construction Phase Team for the purpose of communicating expectations, of the types of data and document requirements associated with elements types, if they are part of the project. The BIM Consultant will normally produce an Asset Registry once an IFC or IFT submission is generated for the purpose of facilitating Data collection. The BIM Consultant may generate a preliminary Asset Registry earlier than IFC to allow Trades to have a better idea of what data collection requirements will be for a specific project. Data collection will occur using the Data Collection Environment provided by the BIM Consultant.
Data Collection Environment	The Data Collection Environment is the platform to be used during the Construction Phase to link files and information to the database extract from the design models. The Data Collection Environment is an intermediate step to aid in the collection of installed asset information extracted and transferred to the facilities maintenance and operations (FMO) Computerized Maintenance Management System (CMMS) or other software systems.
Design Deviation Area Report	A document developed by the Construction Team that highlights construction changes triggered by the Accuracy Table. The Design Team is expected to use this document to generate record models that reflect as constructed conditions.
Design Models	Individual models (Revit) that are created and maintained exclusively by members of the Design Team and are used to produce construction documents. These models are kept current throughout construction incorporating construction changes.
Design Model Update	Refers to any and all issues during the construction phase with respect to deviations from IFC Design documents, i.e. via an RFI, SI, CO, Field Notice/Directive, other documented process or verbal clarification, whether or not associated with cost, which must be updated within the Record Model.
Fabrication Model	A fabrication model is a geometrically rich and detailed 3D model generated by a trade (Revit or non-Revit) to enable prefabrication and enhanced Virtual coordination prior to construction. For example, while a 'design model' for HVAC ductwork will include duct sizes at various elevations, the 'fabrication model' will additionally include necessary weld gaps, hangers, additional valves relating to design specifications, controls and other design tolerances necessary for building, assembling and operating the final product. Fabrication models will be used by the Construction Team, for virtual coordination during construction, not for association of data for FMO purposes.
Federated Model	A consolidated model (non-Revit) that is comprised of multiple models from various sources whose identity or integrity cannot be modified. Normally, a federated model is used to bring together 'design model', 'site/civil model' and 'fabrication models' into a single environment for the purpose of virtual coordination during Design and Construction phases.

Term	Definition
Focus Coordination Area	Area of the building in which coordination efforts will be concentrated. Typically, a level, room or zone, depending on the size of the building and construction phasing.
Geometric Level	A code that communicates the *geometric* level of a model element (G0, G1, G2, G3) as defined in this document.
Model Element	A 3D virtual representation of an object. May be at varying geometric levels.
Project Execution Plan (PEP)	The Project Execution Plan (PEP) is an editable "living document" which is to be maintained and updated throughout the project's life by the BIM lead by project phase. It is meant to capture project information, modeling and workflow strategies that are specific to a given project. The updated document must be included in all submissions.
Record Model	Final updated 'design models' (Revit), including updates to reflect the agreed as constructed condition. The models must contain all views, rooms, sheets, schematics, single line diagrams, auxiliary 2D/3D links and schedules used to generate 2D construction documents.
Site Model	A 3D civil engineering model (non-Revit), containing underground services. This model is to be aggregated into a 'federated model' to ensure virtual coordination with incoming services has occurred.
Shop Drawings (Approved)	Shop drawings in electronic PDF, software-generated document (not scanned) with necessary approval stamps, dates, and equipment selection clearly identified. Document should be uploaded by element type and must be text-searchable. No password or printing restrictions should be applied.
Tracked Asset	A model element of interest to Vancouver Coastal Health Authority (the Authority) which will be maintained post-handover with additional data and document collection requirements as outlined in the Data Collection Specification (DCS). Model elements must be placed in the models (as a component family) if the asset is part of the design.
Viewer/External Database	The Viewer/External Database is the environment/software used to distribute information for the purpose of access and review during design and construction of a project. The Viewer/External Database may also be the Data Collection Environment.
Virtual Coordination	Refers to the BIM workflows associated with the following three processes, Digital Building Review, Hard Clash and Soft Clash, used to capture issues and assign responsibility for resolution prior to construction. 1. **Digital Building Review:** A virtual coordination process used in design to explore the design by walking through the Federated Model in a virtual environment to track and note issues. Normally involves the colour coding of different building systems and captures design issues that are not necessarily physical conflicts (for example, a column directly in front of a window). 2. **Hard clashes:** clashes that occur due to the physical conflict of two objects not being able to occupy the same space. Emphasis will be placed in areas of high congestion of ductwork, piping or equipment. 3. **Soft clashes:** additional clashes set up to account for known clearance requirements that could limit or inhibit the adequate construction, maintenance servicing, operation or replacement of equipment.

Term	Definition
Virtual Coordination Report	A report to be generated by the Team for the purpose of documenting and demonstrating that virtual coordination is occurring, and that issues are being assigned and resolved.

6.3 Appendix C - Mechanical and Electrical System Prefixes

6.3.1 General Systems

System Name Prefix	Description
BAS	Building Automation System
COALRM	Carbon Monoxide Alarm Systems
CHW	Chilled Water
CODEB	Code Blue System
HPCOND	High Pressure Condensate
LPCOND	Low Pressure condensate
CNDTL	Conditional Power
CPE	Controlled Pressure Environment
DV	Delayed Vital
DCWS	Domestic Cold Water Supply
DHWS	Domestic Hot Water Supply
DHWR	Domestic Hot Water Return
DUST	Dust Extraction System
FP	Fire Protection

System Name Prefix	Description
FAS	Fire Alarm System
HHWS	Heating Hot Water Supply
HHWR	Heating Hot Water Return
HV	High Voltage
LAIR	Lab Air
MAIR	Medical Air
MGAS	Medical Gas
MVAC	Medical Vacuum
NC	Nurse Call System
PA	Public Address System
RO	Reverse Osmosis System
SB	Standby Power
STM	Steam
V	Vital

6.3.2 Piping Systems

System Name Prefix	Description
BFW	Boiler Feedwater
BP	Boiler Purge
BR	Breeching
CHWR	Chilled Water Return
CHWS	Chilled Water Supply
CDD	Condenser Drain
CR	Condenser Water Return
CS	Condenser Water Supply
CHTR	Constant High Temperature Return
CHTS	Constant High Temperature Supply
CRV	Corrosion Resistant
DE	Diesel Exhaust
DHUM	Dehumidification System
DCW	Domestic Cold Water
DHW	Domestic Hot Water
DHWR	Domestic Hot Water Recirculation

System Name Prefix	Description
HGLCDWR	Hydronic Glycol Condenser Water Return
HGLCDWS	Hydronic Glycol Condenser Water Supply
IRR	Irrigation
LPC	Low Pressure Condensate
LPG	Low Pressure Propane
LPS-kPa	Low Pressure Steam (Pressure noted in kPa)
LTWR	Low Temperature Water Return
LTWS	Low Temperature Water Supply
NATGAS	Natural Gas
P15W40	Process 15W-40
P5W30	Process 5W-30
PC	Pumped Condensate
PCWR	Process Chilled Water Return
PCWS	Process Chilled Water Supply
PATF	Process ATF
PHYD	Process Hydraul56

FOF	Fuel Oil Fill
FORA	Fuel Oil Return Above Grade
FORB	Fuel Oil Return Below Grade
FOSA	Fuel Oil Supply Above Grade
FOSB	Fuel Oil Supply Below Grade
FOV	Fuel Oil Vent
FPO	Fire Protection Other
FPPA	Fire Protection-Pre-Action
FPD	Fire Protection Dry
FPW	Fire Protection Wet
FTG	Footing Drain
GC	Gravity Condensate
GLR	Glycol Return
GLS	Glycol Supply
HPCOND	High Pressure Condensate
HPD	High Pressure Drip
HPS-kPa	High Pressure Steam (Pressure noted in kPa)
HPHWR	Heat Pump Hot Water Return
HPHWS	Heat Pump Hot Water Supply
HWR	Heating Water Return
HWS	Heating Water Supply
H	Humidification
HCDWR	Hydronic Condenser Water Return
HCDWS	Hydronic Condenser Water Supply

PNUT	Process Nuto32
PPC	Process Piping Coolant
PSANA	Process Sanitary Above Grade
PSANB	Process Sanitary Below Grade
PST	Pumped Storm
PVEN	Process Ventilation
PDI	Process Water Deionized
PW	Process Water
REF(L)	Refrigeration - Liquid
REF(V)	Refrigerant - Vapour
RWL	Rainwater Leader
SANA	Sanitary Drainage Above Grade
SANB	Sanitary Drainage Below Grade
SANP	Sanitary Drainage Pumped
STM	Storm
ST	Standpipe
STRA	Storm Drainage Above Grade
STRB	Storm Drainage Below Grade
STRP	Storm Drainage Pumped
SRV	Steam Vent
TW	Tempered Water
V	Vent
WT	Weeping Tile

6.3.3 Duct Systems

System Name Prefix	Description
EA	Exhaust Air
OA	Outdoor Air
RA	Return Air
SA	Supply Air

6.4 Appendix D – Modeling and Data Requirements

DESIGN PHASE: Modeling and Data Requirements			
	Title/Topic		**Description**
0	**Required Deliverables for each BIM Compliance Audit**		
	1	Models	○ All design models, including any CAD or Civil 3D files in their native format
	2	Documents	○ Current version of the PEP, risk assessment matrix, virtual coordination log / report
1	**Model Consistency**		
	1	PEP Reliability	○ Workflows and definitions approved in the PEP must be reflected in the models. ○ Attention must be given to model breakdown strategy, project file names, standard levels, phasing strategy, worksets strategy and parent / child relationships.
	2	Phasing Consistency	○ Phasing strategy proposed in the PEP must be followed, and consistency is expected, i.e. no 'Comments' parameter reading 'existing' and Revit phase set to 'New Construction'.
	3	Cleanup	○ CD and IFC submission models should not contain abandoned designs, testing models, empty worksets, personal views, 'design options' or unnecessary AutoCAD files. ○ All families not part of the project should be purged.
	4	Duplications/ Placeholder Objects	○ To ensure clarity and that only the intended element is used, all duplicate/placeholder objects must be tagged as such (e.g. 'PLC' acronym inside 'Mark'). Provide a clear strategy in the PEP for managing duplication, identifying which model is the host and which the placeholder. ○ The party responsible for generating, and the model in which, tracked assets are located should be clear and align with the DGS. For example; if there are several Architectural models, what assets are located in which model? If there are duplicates which model is the host and which the placeholder? Which model has valid rooms? etc. ○ All placeholder objects must be removed from the data set by 95% CD submission.
2	**Model Coordination**		
	1	Modeling Precision	○ To support effective virtual coordination, the expectation is that elements will be model to represent their correct size and location in space, including slopes and insulations if applicable. The Team should record in the PEP any elements that will not meet this fundamental requirement. ○ To support energy analysis, consistent materials are expected to be used in all assemblies that compose the building envelope. ○ Use of the out of the box "Basic Ceiling" is not allowed. The use of this element with no thickness, is a known and documented issue that causes problems downstream.
	2	Clearances	○ Mechanical and electrical equipment must comply with clearance requirements for code, maintenance, or replacement. ○ A strategy to ensure proper clearances must be described by the Team in the PEP (e.g. Model a solid geometry as a 'Generic Model' within the Revit Family Editor and assign to the subcategory 'Clearance').
	3	Virtual Coordination	○ Virtual coordination, as defined in this document, is expected to occur throughout Design. The expectation is that by the end of the design phase the models will be fully coordinated.

			○ Strategies for managing clearances for non modeled systems/objects must be recorded in the PEP.
3	**Assets Extraction**		
	1	Modeled Objects	○ All elements identified in the DGS are tracked assets that must be modeled if part of the project. Any exception must be documented in the PEP for review/approval.
	2	Geometry (G0/G1/G2/G3)	○ It is a fundamental requirement that objects shown/tagged in sheets are modeled (not lines, filled regions or symbols). ○ All tracked assets must have the 'G level' defined in the DGS. ○ Image files representing drawings is prohibited. ○ 2D representation can only be used for elements that do not impact virtual coordination and are not tracked assets. However, these elements must be modeled as families.
	3	Scope Clarification	○ The strategy for identifying assets as existing or future elements, or those that are not included in the contract (NIC) or purchased by the client and installed by others, must be consistently used across all models and recorded in the PEP. ○ If using sequential tendering, all tracked assets must contain their tender package association in a parameter.
	4	In-place Families	○ In-place families cannot be used for tracked assets.
	5	Asset Granularity	○ In some cases, assets can be split up unnecessarily in multiple instances or several assets can be combined into one object (e.g. skids). The breakdown of tracked assets into component parts should be in alignment with the DGS. Exceptions must be recorded in the PEP.
4	**Assets Location**		
	1	Model Alignment	○ All federated models, including civil files and laser scans, must be assembled utilizing the established Revit model origin datum to ensure accurate project geo referencing. ○ Grids and levels must be consistently named and located across all models.
	2	Room Bounding	○ Architectural rooms will be used to categorize tracked assets in the models. To achieve adequate quantification of components inside a room, room objects must use level offsets from the structural floor elevation in the associated level to the underside of the next structural floor/slab/deck above. ○ Ceilings, floors, and wall finishes must not be "Room Bounding'.
	3	Existing Rooms	○ For areas where tracked assets are being added or modified in existing areas, those rooms must be modeled using separation lines if necessary, to ensure objects can be properly assigned to the correct room.
	4	Associated Room	○ Each tracked asset must be associated to one specific room, as such all spaces with tracked assets must have a placed room object, e.g. shafts. ○ There should be no unplaced, redundant, or overlapping rooms present in any model. ○ Exterior and roof 'rooms' must be modeled using room separation lines and placed with the correct height, to capture elements outside the building envelope. ○ Exterior/Roof rooms must be identified with a prefix.
	5	Associated Level	○ Tracked assets must be associated to the correct level, i.e. the level they are immediately above. ○ Special care must be taken when copying elements inside a model. ○ Modeling across multiple levels must be avoided.

	6	Associated Unit Type	○ The relationships amongst tracked assets, rooms and room types must be captured for FMO purposes. A strategy to provide this information must be described in the PEP if applicable.
	7	Multiple Repetitive Rooms	○ All tracked assets and associated systems must be modeled in all rooms on all levels. ○ Each floor plate must be modeled in its entirety. ○ Each room must have a parameter that identifies the Room Type it belongs to. ○ A strategy to provide this information must be described in the PEP if applicable.
5	**Assets Classification**		
	1	OmniClass Classification	○ OmniClass 2012,Table 23: must be used to identify all modeled tracked assets. OmniClass numbers for each asset type are defined in the DGS.
	2	Room Classification	○ Room types must be defined using OmniClass Table 13 classification system, as defined in the Room Data Requirements tab in the DGS/DCS spreadsheet.
	3	Consistent Category	○ Built-in Revit categories must be used to place tracked assets. ○ 'Generic Models' and 'Specialty Equipment' categories should not be used to model tracked assets. ○ Any requested exemption must be recorded in the PEP.
	4	Descriptive Names	○ The use of 'standard', 'default', 'company initials' prefix, or the use of numbers alone is prohibited. ○ 'Family Name' and 'Type Name' must follow a consistent theme of naming general to specific as these will be used to identify objects during the construction phase.
	5	System Naming	○ The Team must use the 'prefix' in **Appendix C** to identify systems within the model dataset. ○ The DGS defines which asset types require system information.
6	**Data Clarity**		
	1	Built-in Parameters	○ Built-in parameters must be used when present unless an approved process is recorded in the PEP. Using these parameters ensures that the data is where it is expected to be and that it can be consistently used. ○ Custom or shared parameters should only be used if a 'Built-in' parameter is not available. ○ Built-in parameters should not be duplicated.
	2	Object tag and relationships	○ 'Mark' and 'Type Mark' must be used to tag tracked assets as defined in the DGS. ○ One of the proposed strategies to capture parent/child relationships of MEP equipment must be agreed by the Design Team and recorded in the PEP.
	3	Views and Schedules Data Usage	○ 2D text notes will not be accepted to tag tracked assets. Any notes or descriptions shown in documentation must be reflected in the modeled object parameters. ○ All project views and schedules must be generated directly from the model and its underlying data. Exceptions to this rule are limited to schematic diagrams, wiring diagrams, point to point diagrams, riser diagrams, details and 2D CAD details when approved
END OF DESIGN PHASE: Modeling and Data Requirements			

6.5 Appendix E – BIM Project Execution Plan (PEP)

DESIGN PHASE: PEP			
	Title/Topic		**Description**
PEP Overview			Brief description of project type including any additional information not provided elsewhere in this document along with the digital goals and uses.
1	**Project Information**		
			ID, name, description, address, contract type, BIM Specification version, standard units, number and name of buildings
2	**Site and Building Information**		
			Site location / key plan, orientation, ID, name, project type (new/existing/renovation), target occupancy date
3	**Schedules and Frequencies**		
	1	Project Timeline	Project schedule, list of submittals with proposed dates, list of Tender packages with milestone submission dates
	2	BIM Activities	BIM kick-off meeting date, frequency of BIM meetings, virtual coordination sessions and cost estimate submissions
	3	BIM Uses and Strategies	Agreed goals and uses, along with proposed strateges to achieve them
	4	BIM Exchanges	Method and frequency of model exchanges
4	**Team Definition**		
			BIM related participants with role, organization, name, email, phone, time zone
5	**Software**		
	1	Platforms and versions	Design authoring, design analysis (structural, lighting, power, energy, cost), issue tracking, specifications, virtual coordination, collaboration, communications, file/document exchange and management.
6	**Standards**		
	1	Naming structure	Disciplines, models, links, levels, worksets
7	**Model Information**		
	1	Model Files	Discipline/content, name, authoring company
	2	Model Hierarchy	Identify reference models using placeholder assets and models with rooms and tracked assets.
	3	External Links (.dwg, .ifc)	Discipline/content, name, authoring company
	4	Levels	Consistent level naming, project elevation, site elevation, across all models
	5	Coordinates	Consistent coordinates across all models, i.e. either shared coordinates or survey location.
	6	Grids	Consistent grid name and location across all models
	7	Phases	Name should be descriptive, i.e. Phase 1; Phase 2 rather than ‘new’ or ‘extg’.
	8	Worksets	Descriptive name must be used, default visibility (on/off)
Strategies and Workflows			
1	**Modeling Strategies**		
	1	Model Breakdown	Required for larger projects to keep model size manageable. The PEP should include an outline of what will be modeled in each file.
	2	Model Alignment	Define project origin, coordinate system and true north orientation to be consistent across all models.

	3	Phasing Strategy	Required to be consistent across all models.
	4	Clearances	Define how required clearances will be modeled and managed
	5	Typical Floors / Units	Modeling strategy to work with repetitive elements, floors, rooms, and room tags
	6	FF&E	Define strategy for management of fixed furniture, finishes (material and colour), and equipment.
2	**Workflow Issues Strategies**		
	1	Multiple Models	Process for managing multiple models within a discipline
	2	Non-Revit Models	Describe the process to coordinate across different software types
	3	Revit version update	Describe strategy to be used to update all models
	4	Object duplication	Strategy for managing duplication across all models (e.g. openings, housekeeping pads, plumbing fixtures, lighting fixtures, stairs, ceilings etc.). Strategy to include identifying which model is the host and which the placeholder.
	5	Parent Child Relationship	Strategy for managing this requirement amongst tracked assets.
	6	Naming	The naming strategy must be descriptive and applied to both Family and Type for all model objects.
	7	Room Association	Strategy for developing the relationship between rooms and their unit type + number
3	**Virtual Coordination Strategies**		
	1	Clash Detection	Proposed process to find issues (hard and soft clashes)
	2	Issue Tracking	Proposed process for assigning, and resolving issues
	3	Risk Mitigation	Describe the process for mitigating the risk for running virtual coordination with systems that have not been modeled, i.e. sprinkler system, pneumatic tube.
4	**Data Quality Strategies**		
	1	OmniClass 2012	Describe process to populate OmniClass (Table 23) number for tracked assets and OmniClass (Table 13) number for rooms along with the QC process to be used ti check for accuracy.
	2	Systems	Describe process to be used to ensure that all mechanical and electrical assets are associated with consistent systems.
	3	Mark and Type Mark	Define the QA/QC process to ensure consistent use across all models
	4	Relationships	Strategy to ensure accuracy of parent/child and equipment power source relationships between tracked assets within the same model and across models (e.g. pump/system)
	5	Shared Parameters	Provide list of all shared parameters in the project and the categories to which they apply.
	6	Record Model	Strategy to ensure the design models remain in alignment with the built condition and the accuracy table.
5	**Existing Conditions Strategies**		
	1	Risk Assessment	Develop risk assessment/analysis template
	2	Record Drawings	Detail strategy for mitigating risk relative to record drawings
	3	Existing Facility	Define extent of modeling to be undertaken
	4	Interface between New and Old	Define strategy for modeling the interface between new and existing
	5	New Elements within Existing Facility	Define strategy for modeling existing elements to be relocated, new tracked assets located in existing rooms and/or connected to existing systems.

6	**Cost Estimates Strategies**	
		Proposed process for generating cost estimates from the design models, list proposed assets, scopes and any exclusions.
7	**Project Specific Amendments and Exclusions**	
		Provide list of, and reasons for, any requested exemptions to the BIM Specifications. All requested exemptions require approval.
END OF DESIGN PHASE: PEP		

CONSTRUCTION PHASE: PEP			
	Title/Topic		**Description**
1	**Team Definition**		
			BIM related participants with role, organization, name, email, phone, time zone
2	**Trade Information**		
			List of trades responsible for data and document upload and their scope of work
3	**Virtual Coordination**		
	1	Design Model Sign off	Process for sign off on use of design models (if required)
	2	Fabrication Models	List fabrication models
	3	Software	Types and versions
	4	Timeline	Coordination session schedule, required participants
	5	Strategy + Workflows	Sharing strategy, resolution process, feedback, management of process for maintenance of service access and replacement paths
4	**Construction Sequencing**		
			Define strategy and workflows to optimize construction sequencing – list models that will be used
5	**Design Model Update**		
	1	Update Strategy	Define strategy, workflows and frequency for model updates
	2	Model Accuracy	Define strategy for defining and managing the accuracy of the design models to the built facility and the accuracy table
	3	Laser Scanning	If part of the strategy, define frequency, areas, timeline, accuracy and QC process
6	**Data and Document Upload**		
			Define strategy for managing participation and checking quality of the data and documents uploaded
7	**Project Schedule**		
			Provide updated project schedule, including substantial completion timelines
END OF CONSTRUCTION PHASE: PEP			

6.6 Appendix F:

6.6.1 Data and Geometry Specification (DGS) and Data Collection Specification (DCS): Notes

6.6.2 Data and Geometry Specification (DGS): Minimum Requirements

6.6.3 Room Specification

(shown on the next 17 pages for clarity)

This document provides the specifics around the requirements relative to assets and rooms tracked by Vancouver Coastal Health, and must be utilized in conjunction with Vancouver Coastal Health– BIM Requirements. It is comprised of a number of tabs:

1- Notes tab: this tab – provides an explanation of how to use the document and the information of each of the columns used.

2- DGS-DCS tab: a master list of all assets of interest to Vancouver Coastal Health organized around OmniClass 2012. This spreadsheet is separated in 4 coloured areas:

- **OmniClass 2012** and basic information for tracked assets (No fill):
  Information includes the asset group, their OmniClass classification, Acronyms to be used in the models for track assets, either in type mark or Mark parameters, and comments providing more information on the assets. Columns **A** to **E**

- **Project Information** (Yellow headers):
  Project specific information to be provided by the Design Team at the beginning of a project. It will indicate which assets from the master list are part of the project, assign responsibilities and facilitates communication between the Design Team and the BIM Consultant regarding specific asset types, the categories where the assets will be placed in the models. Columns from **F** to **K**

- **Data and Geometry Specification - DGS** (Pink):
  This area specifies the minimum data and geometry requirements relative to each asset type in Design along with the project phase by which the information should be present in the data set. In projects where there is sequential tendering, all tracked assets must contain their tender package association parameter. From Columns **L** to **U**

- **Data Collection Specification - DCS** (Blue) - This area specifies data and document upload requirements relative to asset type during Construction. Column AH provides more information on additional data expected to be included in uploaded document for selected tracked assets. From columns **V** to **AI.**

3- Room Specification tab: OmniClass Table 13 (This spreadsheet is separated in 2 coloured areas:

- **Project Information (Yellow) -** Project specific information to be provided by the Design Team at the beginning of a project. It will indicate which room types from the master list are part of the project.

- **Room Specification (Pink on row 3, columns A-G** which provides the data and **K-X** which provides the timeline/milestones when the data must be included in the models**) -** This area defines the data that must be present in the models for different room types along the project timeline.

***Minimum Data and Geometry Requirements**

Classification	Description	Requirements
G0	Conceptual Elements	Approximate Geometry (LOD 200)
G1	Accurate Elements	Accurate Geometry (LOD 300)
G2	Data Rich Elements	Plus accurate Family, Type, System, Mark, and Type Mark data if applicable**
G3	Data Rich Elements +	G2 requirements Plus Parent-Child relationship data if applicable**

** When G2 or G3 is prescribed for a Model Category, all of the mentioned parameters are expected to be part of the model element, but there may be instances where a certain asset does not require one or more of the parameters in the requirements, at which point it is up to the Design Team to review the Owner's requirements and the DGS-DCS when inputting the information for the element as to what is appropriate for that asset (i.e. Door asset classified as G2 but does not require the parameter 'System', or Mechanical Equipment asset classified as G3 but does not have a Parent-Child relationship).

Minimum Modelling Requirements

All model elements must be associated with the correct **Level** and **Room**.

All model elements must be on the correct **Workset**.

All Design Teams must follow the DGS in terms of their modelling responsibilities.

Asset Group	Asset Type	Acronyms	OmniClass Classification	Comments	PROJECT INFORMATION	DESIGN	DATA AND GEOMETRY SPECIFICATION (DGS)									CONSTRUCTION	DATA COLLECTION SPECIFICATION (DCS)													
							Minimum Geometric Level				Design Required Data						Data Collection Requirements												
							SD	DD	50% CD	75% CD	Type Mark	Mark	System Information (Name, Classification, Abbreviation. Refer to	Tender Package Number	Additional Design Parameters expected based on asset	Collection level	Shop Drawings (Aproved)	Maximo Number	Vendor / Supplier	Manufacturer	Model	Serial No.	Electrical Branch	Fed From (Electrical)	Pressure Vessel	Manufacturers Instruction Manuals	Installation/Substantial Completion Date	Warranty End Date	Warranty Certificate	Additional Construction Parameters expected in Documents
	ARCHITECTURAL																												
Architectural	Automatic Door	ADR	23-17 11 00 (Doors)				G0	G1	G2	G2	50%CD	50%CD		TBD	Fire Label, Hardware Group	I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Architectural	Floor Drain	FD	23-31 27 00 (Floor Drains)				G0	G0	G1	G2	75%CD			TBD		T	Y										Y			
Architectural	Guardrails	GR	23-39 11 11 11 15 (Guardrails)				G0	G0	G0	G1	75%CD			TBD		T	Y										Y			
Architectural	Overhead Door	OHDR	23-17 11 00 (Doors)				G0	G1	G2	G2	50%CD	50%CD		TBD	Fire Label, Hardware Group	I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Architectural	Roof	ROOF	23-13 39 00 (Roof Coverings, Claddings,	Including: All roofs under the root of			G0	G0	G1	G2	75%CD			TBD		T	Y		Y	Y	Y						Y	Y	Y	
Architectural	Roof Drain	RD	23-13 41 39 (Roof Drains)				G0	G0	G1	G2	75%CD			TBD		T	Y													
	CIVIL																												
Civil	Manhole	MH	23-39 29 13 19 15 (Storm Drainage				G0	G1	G2	G2	50%CD	50%CD		TBD		I/T	Y	Y												
Civil	Stormwater Interceptor	STINT	23-39 29 11 13 (Waste Water Storm Drain)				G0	G1	G2	G2	50%CD	50%CD		TBD		I/T	Y	Y	Y	Y	Y						Y	Y	
	ELECTRICAL																												
Electrical	Battery Charger	BATCHRG	23-35 21 00 (Battery Chargers)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Capacitor	CAP	23-35 23 19 17 (Capacitors)					G0	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Disconnect Switch	DS	23-35 37 19 (Disconnect Switches)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Distribution Panel	DP	23-35 31 13 (Distribution Panel Boards)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Fuel Oil Pump	FOP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Electrical	Fuel Oil Tank	FOT	23-27 29 19 (Tanks)	Including: Day Tank				G0	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Electrical	Generator	GEN	23-35 11 00 (Electrical Generators)	Including: Gas Generator Set, Diesel Generator Set, Other Generator Set, Remote Radiator, Selective Catalytic Reduction System (SCR)				G0	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Electrical	Generator Batteries	GENBAT	23-35 19 00 (Batteries)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Electrical	Heat Trace	HT	23-33 15 15 17 (Cable Heat Trace)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Electrical	High Voltage Distribution Bus	HVBUS	23-35 31 27 (Power Distribution Units)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	High Voltage Protective Relay	HVPR	23-35 43 00 (Electrical Relays)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Lighting Control Panel	LCP	23-27 15 21 11 (Building Lighting Control					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Load Shed Contactor	LSC	23-35 43 21 (Load Shedding Relays)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Main Circuit Breaker	MCB	23-35 29 00 (Circuit Breakers)	Larger size and voltage versions				G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Main Distribution Panel	MDP	23-35 31 13 (Distribution Panel Boards)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Motor Control Centre	MCC	23-35 31 23 (Motor Control Centers)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Panel Board	PNL	23-35 31 17 (Electrical Panel Boards)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Power Distribution Center	PDC	23-35 31 27 (Power Distribution Units)					G0	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Public Address System	PA	23-37 17 15 (Public Address Equipment)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Electrical	Reactor Bank	RB	23-35 23 19 15 (Inductive Power Correction					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Electrical	Safety Switch	SSW	23-35 37 19 (Disconnect Switches)					G0	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Substation	SUB	23-39 23 00 (Electrical Utility Equipment)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Switch Board	SWBD	23-35 31 29 (Switchboards)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Switchgear	SWG	23-35 31 31 (Switchgear)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Transfer Switch	TSW	23-35 37 13 (Manual Transfer Switches)					G0	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Transformer	TX	23-35 13 00 (Transformers)					G0	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Uniterruptible Power System	UPS	23-35 23 21 (Uninterrupted Power Supply					G0	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
Electrical	Variable Frequency/Speed Drive	VSD	23-35 17 15 (Variable Frequency Drives)					G0	G3	G3	50%CD	50%CD	50%CD	TBD		I	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	
	Elevators																												
Elevators	Conveyor	CONV	23-23 17 15 (Conveyors)	Including: Chute Conveyor			G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Elevators	Dumbwaiter	DUMB	23-23 17 11 (Dumbwaiters)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Elevators	Elevator	ELEV	23-23 11 11 (Elevators)	Including: Freight Elevator,			G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Elevators	Escalator	ESC	23-23 11 13 (Escalators)				G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Elevators	Monorail	MONO	23-23 15 13 11(Monorails)				G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Elevators	Scissor Lift	SL	23-23 13 11 (Lifts)				G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
	HOSPITAL EQUIPMENT																												
Hospital Equipment	Addressograph	ADG	23-37 13 23 (computer Printers)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Automatic Endoscope	AER	23-25 27 13 17 (Endoscopes Products)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Automatic Straining Equipment	ASE	23-39 41 11 39 (Automatic Straining				G0	G1	G1	G2	75%CD			TBD		T	Y											Y	Y	
Hospital Equipment	Bed Pan Disinfector	BPD	23-25 57 11 (Sterilizer Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Biosafety Cabinets	BSC	23-25 65 11 (Biological Safety Cabinets)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Cage Washer	CAGEW	23-25 61 13 11 10 (Cage Washers)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Cart Washer	CARTW	23-25 59 13 11 (Surgical Carts)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Clocks	CLK	23-19 27 13 (Clocks)				G0	G1	G1	G2	75%CD			TBD		T	Y			Y	Y					Y	Y	Y		
Hospital Equipment	Code Blue System	CODEB	23-37 27 17 13(Nurse Call Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Detergent Dosing Dispenser	DOSE	23-27 17 00 (Pumps)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Dialysis Water System	DIA	23-25 23 13(Endocrinology Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Dishwasher	DISH	23-21 21 19 (Commercial Dishwasher				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Dryer Cabinet	DC	23-25 23 13 15 (Continuous Renal				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Dust Extraction System	DUST	23-27 57 29 (Dust Collectors)	Elephant Trunk			G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Electric Drinking Fountain	EDF	23-31 31 00 (Drinking Fountains)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Bed	EB	23-25 45 11 11 (Patient Beds)				G0	G1	G1	G2	75%CD	50%CD				I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Emergency Shower	ES	23-29 37 15 (Emergency Showers)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
Hospital Equipment	Emergency Shower And Eyewash	ESEW	23-29 37 15 (Emergency Showers)				G0	G1	G1	G2	75%CD	50%CD		TBD		I	Y	Y	Y	Y	Y					Y	Y	Y	Y	

							DATA AND GEOMETRY SPECIFICATION (DGS)										DATA COLLECTION SPECIFICATION (DCS)														
							Minimum Geometric Level				Design Required Data							Data Collection Requirements													
Asset Group	Asset Type	Acronyms	OmniClass Classification	Comments	PROJECT INFORMATION	DESIGN	SD	DD	50% CD	75% CD	Type Mark	Mark	System Information (Name, Classification, Abbreviation. Refer to	Tender Package Number	Additional Design Parameters expected based on asset	CONSTRUCTION	Collection level	Shop Drawings (Aprroved)	Maximo Number	Vendor / Supplier	Manufacturer	Model	Serial No.	Electrical Branch	Fed From (Electrical)	Pressure Vessel	Manufacturers Instruction Manuals	Installation/Substantial Completion Date	Warranty End Date	Warranty Certificate	Additional Construction Parameters expected in Documents
Hospital Equipment	Eyewash Station	EW	23-29 37 13 (Emergency Eye Wash Stations)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
Hospital Equipment	Freezer	FRZ	23-21 21 27 (Commercial Refrigerators And	including tissue freezer			G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Fume Hood	FH	23-25 69 11 15(Laboratory Fume hoods)	Including: Laboratory Fume Hood			G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Garbage Chute	GC	23-39 45 25 17 (Refuse Disposal Chutes)	Including: Refuse Disposal Chutes			G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Grease Interceptor	GI	23-27 37 11 (Grease Traps)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
Hospital Equipment	Helipad	HPD	23-11 21 15 13 (Helicopter Landing Pads)				G0	G2	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
Hospital Equipment	Ice Machine	IM	23-21 21 29 (Commercial Ice Machines)	Includes Ice Dispensers			G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Incubator (Sterilizer)	INC	23-25 57 11(Sterilizer Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Instrument Washer	INSTW	23-25 57 11 25 (Powered Instrument				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Kitchen Appliance	APP	23-21 21 00 (Food Service Equipment and				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Ladder	LAD	23-17 23 15 (Ladders)	Includes structural ladders affixed to			G0	G1	G1	G2	75%CD			TBD			T	Y										Y		Y	
Hospital Equipment	Laundry Dryer	LDRY	23-21 23 51 (Residential Laundry Dryers)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Laundry Washer	LWASH	23-21 41 00 (Commercial Laundry				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Loading Dock Leveler	ED	23-23 23 13 (Dock Levelers)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Macerators	MAC	23-39 33 15 11 (Macerators)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Mowing Equipment	MOWE	23-11 27 11 35 (Mowing Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Nurse Call System	NC	23-37 27 17 13(Nurse Call Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	nurse racks	NR	23-37 27 17 13(Nurse Call Equipment)					G0	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Nurse phone	NPH	23-37 27 17 13(Nurse Call Equipment)					G0	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Nurse Calling - Bed Stations	BSTN	23-25 35 15 11 Nurse Stations					G0	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Nurse Calling - Dome Light	DL	23-37 27 17 13 Nurse Call Equipment					G0	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Panic Station	PS	23-37 27 17 13 Nurse Call Equipment					G0	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Oven	OVEN	23-25 69 13 27 (Laboratory Ovens)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Overhead Paging	OHP	23-37 27 13 (Mass Notification Systems)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Paging	PAGE	23-37 27 13 (Mass Notification Systems)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Pasteurizer	PAST	23-39 43 13 37 (Residuals Pasteurization				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Patient Wandering	PW	23-37 27 13 11 (Emergency Notification				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Plaster Trap	PT	23-25 17 13 25 29 (Dental Plaster Traps)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Pool	POOL	23-21 29 21 (Pools)	Including: Hydrotherapy Pool, Pool			G0	G2	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Reach In Cooler	RIC	23-21 21 27 13 25 (Commercial Upright				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Refrigerator	FRDG	23-21 21 27 (Commercial Refrigerators And	Including blood refrigerators			G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Reverse Osmosis System	ROS	23-27 55 29 19 (Reverse Osmosis Units)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Security Alarm	SA	23-29 11 00 (Security Detection and				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Steam Filter	STFLTR	23-27 55 11 (Liquid Filters)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
Hospital Equipment	Steam Kettle	STMK	23-21 21 13 29 (Commercial Kettles)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
Hospital Equipment	Steamer	STMR	23-21 21 13 39 (Commercial Food Steamers)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
Hospital Equipment	Sterilizer	STER	23-25 57 11(Sterilizer Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
Hospital Equipment	Tube Blower Motor	TUBEB	23-23 17 21 (Pneumatic Tube Systems)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Tube Station	TUBES	23-23 17 21 (Pneumatic Tube Systems)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Tube Transfer Unit	TUBET	23-23 17 21 (Pneumatic Tube Systems)				G0	G1	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Ultrasonic Cleaner	USC	23-25 57 11 41(Double Chamber Ultrasonic	Including: Single Chamber Ultrasonic			G0	G1	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Vehicle	VEH	23-21 35 19 (Vehicle Service Equipment)				G0	G1	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Waste Compactor	WSTC	23-39 45 15 17 11 (Waste Compactors and	Including: Waste Grinder			G0	G1	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Hospital Equipment	Waste Dumper	WSTD	23-21 39 00 (Commercial Washing and				G0	G1	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
	HVAC																													
HVAC	Air Compressor	AC	23-27 21 00 (Compressors)	Including: Compressor - Cooling			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Air Conditioning Condensing Unit	CU	23-33 37 00 (Refrigerant Condensing Units)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Air Conditioning Unit	ACU	23-33 39 00 (Air Conditioning Equipment)	Including: Fixed Air Conditioner,			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Air Curtain	ACUR	23-33 31 11 (Air Curtains)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Air Dryer	AD	23-33 47 00 (Air Dryers)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Air Filter	AF	23-27 57 27 (Air Filters)	Including: Desiccant Filter, High			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
HVAC	Air Handling Unit	AHU	23-33 25 00 (Air Handling Units)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Air Receiver	AR	23-27 29 15 (Specialized Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Air Separator	AS	23-27 55 35 (Liquid Separators)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Air Tank	AT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Boiler	BLR	23-33 11 00 (Commercial Boilers)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Building Automation System	BAS	23-27 15 00 (Building Automation and	Including: HVAC Building				G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	Chemical Feed Equipment	CFE	23-39 35 00 (Water and Wastewater				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Chemical Feed Tank	CFT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Chilled Water Heat Exchanger	CHWHEX	23-27 23 00 (Heat Exchangers)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Chilled Water Pump	CHWP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Chiller	CH	23-33 21 00 (Chillers)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Chiller Condensor Pump	CCP	23-27 17 00 (Pumps)	Including: Air, liquid and water side			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Coil	C	23-33 35 00 (HVAC Coils)	Including: HVAC Glycol Coils, HVAC				G0	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Cold Deck	CD	23-33 35 00 (HVAC Coils)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
HVAC	Compression Tank	CTK	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	
HVAC	Computer Room A/C Unit	CRAC	23-33 39 11 11 (Room Air Conditioners)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	

							DATA AND GEOMETRY SPECIFICATION (DGS)										DATA COLLECTION SPECIFICATION (DCS)														
							Minimum Geometric Level				Design Required Data							Data Collection Requirements													
Asset Group	Asset Type	Acronyms	OmniClass Classification	Comments	PROJECT INFORMATION	DESIGN	SD	DD	50% CD	75% CD	Type Mark	Mark	System Information (Name, Classification, Abbreviation. Refer to	Tender Package Number	Additional Design Parameters expected based on asset	CONSTRUCTION	Collection level	Shop Drawings (Aproved)	Maximo Number	Vendor / Supplier	Manufacturer	Model	Serial No.	Electrical Branch	Fed From (Electrical)	Pressure Vessel	Manufacturers Instruction Manuals	Installation/Substantial Completion Date	Warranty End Date	Warranty Certificate	Additional Construction Parameters expected in Documents
HVAC	Condensate Receiver	CONDR	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
HVAC	Condensate Tank	CONDT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
HVAC	Condensing Fan Unit	CONDF	23-33 43 00 (HVAC Condensing Units)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Condensing Unit	CU	23-33 43 00 (HVAC Condensing Units)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Controlled Pressure Environment	CPE	23-27 15 19 (Building Environmental					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	HVAC Cooler	COOL	23-33 45 00 (HVAC Coolers)	Including: HVAC Dry Coolers, HVAC			G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Cooling Tower	CT	23-33 23 00 (Cooling Towers)				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	De-Aerator	DA	23-27 55 35 (Liquid Separators)	Including: Boiler Deaerator			G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Dehumidifier	DHUM	23-33 27 13 (Dehumidifiers)	Including: Swimming Pool			G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Duct Silencer	DSIL	23-33 49 21 17 (Ductwork Sound				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	Economizer	ECON	23-27 23 11 (Heat Exchanger Economizers)	Including: Heat Exchanger			G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
HVAC	Exhaust Volume Control Box	EVCB	23-33 41 17 13 (Variable Air Volume				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y						Y	Y	Y	
HVAC	Electric Duct Heater	EDH	23-33 15 17 11 (Fuel Fired HVAC Duct				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Exhaust Fan	EF	23-33 31 19 (Fans)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Expansion Tank	ET	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
HVAC	Fan	F	23-33 31 19 (Fans)	Including: Cooling Fan, Heating Fan			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Fan Coil Unit	FCU	23-33 33 11 (Fan Coil Units)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Flash Tank	FT	23-27 29 15 13 (Flash Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
HVAC	Force Flow Heater	FF	23-33 15 27 (Forced Air Electric HVAC				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y		Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Fume Hood Exhaust Fan	FHEF	23-33 31 19 (Fans)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Heat Exchanger	HEX	23-27 23 00 (Heat Exchangers)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
HVAC	Heat Pump	HP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Heat Recovery Unit	HRU	23-33 55 00 (Energy HVAC Recovery				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Hot Deck	HD	23-33 35 00 (HVAC Coils)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
HVAC	Humidifier	HUM	23-33 27 15 (Air Humidifiers)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	HVAC Temperature Controllers	HVACTC	23-27 11 11 15 (Temperature Controllers)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	HVAC Temperature Detectors	HVACTD	23-27 11 11 17 (Temperature Detectors)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	Isolation Monitor / Controls	IMC	23-35 41 00 (Electrical Isolation Equipment)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
HVAC	Isolation Room Exhaust Fan	IEF	23-33 31 19 (Fans)					G0	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Kitchen Exhaust Fan	KEF	23-33 31 19 (Fans)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Manual Dampers	DAMP	23-33 29 19 13 (Manual Dampers)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	Mixing Box	MB	23-33 41 15 (HVAC Mixing Boxes)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	Motorized Dampers	DAMP	23-33 29 19 11 (Automatically Control				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Negative Air Units	NAU	23-33 27 15 (Air Humidifiers)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Pressure Relief Valve	PRV	23-27 31 49 11 (Pressure Relief Valves)				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			T	Y		Y	Y	Y						Y	Y	Y	
HVAC	Pressurization Fan	PF	23-33 31 19 (Fans)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Radiant Heat Panel	RHP	23-33 15 17 13 (Fuel Fired HVAC Radiant				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y			Y	
HVAC	Radiant Heating System	RHS	23-33 15 17 13 (Fuel Fired HVAC Radiant				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	Radiological Exhaust Fan	REF	23-33 31 19 (Fans)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Refrigerant Controller	REFC	23-33 51 11 (Refrigerant Monitors)				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
HVAC	Refrigerant Detection System	REFD	23-33 51 11 (Refrigerant Monitors)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
HVAC	Return Fan	RF	23-33 31 19 (Fans)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Safety Valve	SV	23-27 31 53 (Safety Valves)				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			T	Y		Y	Y	Y						Y	Y	Y	
HVAC	Stairwell Pressurization Fan	SPF	23-33 31 19 (Fans)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Supply Air Intake	SAI	23-33 49 27 (Ventilators)	Including: Intake Ventilators, Relief			G0	G1	G1	G2	75%CD			TBD			T	Y									Y	Y		Y	
HVAC	Supply Fan	SF	23-33 31 19 (Fans)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Terminal Heating Unit	THU	23-33 15 00 (HVAC Heating Units)				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Unit Heater	UH	23-33 15 00 (HVAC Heating Units)				G0	G1	G2	G2	50%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
HVAC	Variable Air Volume Box	VAV	23-33 41 17 13 (Variable Air Volume				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
	LIFE SAFETY																													
Life Safety	Carbon Monoxide Alarm Systems	COALRM	23-27 11 17 17 (Other Gas Concentration					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Life Safety	CO2	CO2SEN	23-27 11 17 13 (Carbon Dioxide (CO^2) Concentration Measuring Instruments)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Life Safety	NO2 Sensor	NO2SEN	23-27 11 17 17 (Other Gas Concentration					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Life Safety	Dry Pipe Sprinkler System	DPSS	23-29 33 00 (Fire Suppression System					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
Life Safety	Duct Smoke Detector	DSD	23-29 29 13 11 (Smoke Detectors)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
Life Safety	Emergency Lighting	EML	23-35 47 13 (Emergency Lighting)				G0	G1	G1	G2	75%CD	50%CD		TBD	Control 24 night ligh		I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
Life Safety	Exit Light	EXL	23-35 47 15 (Exit Illuminated Signs)	Including: Exit Illuminated Signs			G0	G1	G1	G2	75%CD			TBD	Control 24 night ligh		T	Y		Y	Y	Y					Y	Y	Y	Y	
Life Safety	Fire Alarm Annunciator	FAAN	23-29 31 11 (Fire Alarm Annunicator Panels)	Including: Audible Fire Alarm Annunicator Panels, Visible Fire Alarm Annunicator Panels, Combination Fire Alarm Annunicator Panels				G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Life Safety	Fire Alarm Flow Switch	FAFS	23-29 29 15 (Fire Switches)	Including: Fire Tamper Switches,				G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
Life Safety	Fire Alarm Magnetic Door Holder	FAMAG	23-17 19 11 31 15 (Electromagnetic Door					G0	G1	G1	75%CD			TBD	Fire Label, Hardware Group		T	Y		Y	Y	Y					Y	Y	Y	Y	
Life Safety	Fire Alarm Control Panels	FAPNL	23-29 31 13 (Fire Alarm Control Panels)	Fire Alarm Node, Individual				G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y					Y	Y	Y	
Life Safety	Fire Alarm Speaker	FASP	23-29 31 21 Fire Alarm Communicators					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
Life Safety	Fire alarm Visual and Strobe	FAV	23-29 31 21 Fire Alarm Communicators					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y						Y	Y	Y	
Life Safety	Fire Department Connection	FDC	23-29 25 15 19 13 (Fire Fighting Pumper					G0	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y		Y	Y	Y					Y	Y	Y	Y	

					PROJECT INFORMATION	DESIGN	DATA AND GEOMETRY SPECIFICATION (DGS)									CONSTRUCTION	DATA COLLECTION SPECIFICATION (DCS)													
							Minimum Geometric Level				Design Required Data							Data Collection Requirements												
Asset Group	Asset Type	Acronyms	OmniClass Classification	Comments			SD	DD	50% CD	75% CD	Type Mark	Mark	System Information (Name, Classification, Abbreviation. Refer to	Tender Package Number	Additional Design Parameters expected based on asset		Collection level	Shop Drawings (Aproved)	Maximo Number	Vendor / Supplier	Manufacturer	Model	Serial No.	Electrical Branch	Fed From (Electrical)	Pressure Vessel	Manufacturers Instruction Manuals	Installation/Substantial Completion Date	Warranty End Date	Warranty Certificate	Additional Construction Parameters expected in Documents
Life Safety	Fire Doors	FDRS	23-17 11 31 (Fire Doors)				G0	G1	G2	G2	50%CD	50%CD		TBD	Fire Label, Hardware Group		I	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Life Safety	Fire Extinguisher	FEXT	23-29 25 19 (Fire Extinguishers)	Including: Fire Extinguisher Cabinet				G0	G1	G2	75%CD			TBD			T	Y								Y	Y		Y	
Life Safety	Fire Hose Cabinet	FHC	23-29 25 15 15 (Cabinets for Fire Hoses)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y						Y	Y	Y	
Life Safety	Fire Hydrant	HYD	23-29 25 13 (Fire Hydrants)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Life Safety	Fire Protection Backflow	FPBFP	23-27 31 11 (Backflow Preventors)	Including: Double Check Valve			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	
Life Safety	Fire Protection Dry -Air	FPDAC	23-27 21 00 (Compressors)	Including: Fire Sprinkler Compressor			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Life Safety	Fire Protection Water Pump	FPWP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	
Life Safety	Fire Protection Water Storage	FPWT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Life Safety	Fire Pump Automatic Transfer	FPATS	23-35 37 11 (Automatic Transfer Switches)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	
Life Safety	Fire Pump Switch Gear	FPSW	23-35 31 31 (Switchgear)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	
Life Safety	Fire Sprinkler System	FSRP	23-29 33 00 (Fire Suppression System					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	
Life Safety	Fire Suppression System (specialized)	FSUPP	23-29 33 00 (Fire Suppression System Components)	Including: Fire Suppression – AFFF, Fire Suppression - CO2, Fire Suppression - Dry Chemical, Fire Suppression - Halon Gas, Fire Suppression - WHDR				G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Life Safety	Fire Switches	FASW	23-29 29 15 (Fire Switches)	Fire Flow Switches, Fire Tamper Switches, Pressure Fire Alarm Water Flow Switches, Paddle Fire Alarm Water Flow Switches				G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y						Y	Y	
Life Safety	Fire System Damper	FDAMP	23-33 29 23 (Fire Dampers)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	
Life Safety	Gas Detector	GD	23-39 35 11 17 (Gas Storage, Weighing, and	Including: Gas Detection System				G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Life Safety	Heat Detectors	HD	23-27 11 19 11 (Heat Detectors)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y				Y			Y	
Life Safety	Jockey Pump	JP	23-27 17 00 (Pumps)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Life Safety	Kitchen Hood Fire Suppression	KHFS	23-33 31 17 (Exhaust Hood Fire Suppression				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Life Safety	Pullstations	PS	23-29 29 11 Fire Alarm Pull Stations					G1	G1	G2	75%CD			TBD			T	Y		Y	Y					Y	Y	Y	Y	
Life Safety	Standpipe	STP	23-29 25 15 19 11 (Fire Fighting Standpipes)					G0	G1	G2	75%CD			TBD			T	Y		Y	Y					Y	Y	Y	Y	
	Warning Lights	WL	23-35 47 13 Emergency Lighting					G1	G1	G2	75%CD			TBD			T	Y		Y	Y					Y	Y	Y	Y	
Life Safety	Wet Pipe Sprinkler System	WPSS	23-29 33 00 (Fire Suppression System					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y				Y	Y	Y	Y	
	Medical Gas																												
Medical Gas	Liquid Nitrogen Tank	LNT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Medical Gas	Liquid Oxygen System Equipment	LOS	23-39 35 11 25 (Liquid Oxygen Storage and					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Medical Gas	Liquid Oxygen Tank	LOT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Medical Gas	Medical Air Compressor	MAIRC	23-25 11 13 29 17 (Oxygen Compressors)				G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Medical Gas	Medical Air Dryer	MAIRD	23-33 47 00 (Air Dryers)				G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Medical Gas	Medical Air Outlet	MAIRO	23-33 49 21 11 (Air Outlets and Inlets)				G0	G1	G2	G2	50%CD	50%CD		TBD			I	Y		Y	Y	Y				Y	Y	Y	Y	
Medical Gas	Medical Gas/Vacuum Local Alarm	MGASLA	23-25 33 13(Medical Gas Alarm modules)				G0	G0	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Medical Gas	Medical Gas/Vacuum Master Alarm	MGASMA	23-25 33 13(Medical Gas Alarm modules)				G0	G0	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Medical Gas	Medical Vacuum Pump	MVACP	23-25 11 13 23 11 (Anesthesia Inhalation				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Medical Gas	Nitrogen Cylinder Manifold	NCM	23-25 33 23 (Medical Gas Manifolds)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	
Medical Gas	Nitrous Oxide Cylinder Manifold	N2OCM	23-25 33 23 (Medical Gas Manifolds)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	
Medical Gas	Nitrous Oxide Equipment	NO2E	23-25 33 00 (Medical Gas Products)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	
Medical Gas	Nitrous Oxide Outlet	N2OMO	23-25 33 25 (Medical Gas Outlets)				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	
Medical Gas	Oxygen Cylinder Manifold	O2CM	23-25 33 23 (Medical Gas Manifolds)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	
Medical Gas	Oxygen Outlet	O2MO	23-25 33 25 (Medical Gas Outlets)				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	
Medical Gas	Vacuum Outlet	MVACO	23-33 49 21 11 (Air Outlets and Inlets)				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	Y	
Medical Gas	Vacuum Tank	VACT	23-27 29 19 11 13 (Multiple Walled Vacuum				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Medical Gas	Dental Vacuum	DVAC	23-25 17 13 25 41 (Dental Vacuum Units)				G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Medical Gas	High Press Nitro Equipment	HPN	23-25 69 13 21 11 (Liquid Nitrogen Dewars)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y			Y	Y	Y	Y	
Medical Gas	Liquid Nitrogen System Equipment	LNS	23-25 69 13 21 25 (Liquid Nitrogen Freezers)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y		Y	Y	Y	Y			Y	Y	Y	Y	
	PATIENT CARE																												
Patient Care	Bed	BED	23-25 45 11 11(Patient Beds)	Including: Birthing Beds, Electric			G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Blanket Warmer	BW	23-25 29 13 19 27 (Therapeutic Heating				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Carbon Dioxide Equipment	CO2E	23-39 35 11 21 (Carbon Dioxide Gas Feed				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Commode	COMM	23-25 45 11 17 13 (Patient's Combination				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	
Patient Care	Medical Suction Pump	MSP	23-25 11 13 33 19 (Intubation Suction				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Operating Room Table	ORT	23-25 59 11 15 15(Surgical Operating				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Exam Light	EXML	23-25 59 13 17 (Surgical Lighting Fixtures)	Ceiling mounted/mountable			G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Or Light	ORL	23-25 59 13 17 11(Surgical Operating Room				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Wheelchair	WHCH	23-25 49 11 25 (Wheelchairs)				G0	G1	G1	G2	75%CD			TBD			T	Y		Y	Y	Y					Y	Y	
Patient Care	Mobile Patient Lift	MPL	23-25 49 13(Patient Lifts)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Overhead Patient Lift	OHPL	23-25 49 13(Patient Lifts)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Overhead Patient Lift Gantry	OHPLG	23-25 49 13(Patient Lifts)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Patient Lift Scale	PLS	23-25 49 13(Patient Lifts)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Stretcher	STRH	23-25 49 11 21 (Patient Stretchers)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Surgical Booms	BOOM	23-25 59 13(Surgical Equipment)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	
Patient Care	Tub Lift	TL	23-25 49 13(Patient Lifts)				G0	G1	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	

							DATA AND GEOMETRY SPECIFICATION (DGS)									DATA COLLECTION SPECIFICATION (DCS)														
							Minimum Geometric Level				Design Required Data						Data Collection Requirements													
Asset Group	Asset Type	Acronyms	OmniClass Classification	Comments	PROJECT INFORMATION	DESIGN	SD	DD	50% CD	75% CD	Type Mark	Mark	System Information (Name, Classification, Abbreviation. Refer to	Tender Package Number	Additional Design Parameters expected based on asset	CONSTRUCTION	Collection level	Shop Drawings (Aproved)	Maximo Number	Vendor / Supplier	Manufacturer	Model	Serial No.	Electrical Branch	Fed From (Electrical)	Pressure Vessel	Manufacturers Instruction Manuals	Installation/Substantial Completion Date	Warranty End Date	Warranty Certificate	Additional Construction Parameters expected in Documents
	PLUMBING																													
Plumbing	Acid Netralization Tank	ANT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Backflow Preventer	BFP-*TYPE*	23-27 31 11 (Backflow Preventors)	Include BFP Type (DCVA, RPBA, PVB, SRPVB) in Acronym (e.g., BFP-DCVA)			G0	G2	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Combination Fire And Domestic	CWT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Condensate Pump	CONDP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	De-Ionized Water System	DIS	23-27 55 21 (Liquid Deionizers)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Domestic Hot Water Expansion	DHWET	23-31 29 13 (Hot Water Tank Heaters)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Domestic Hot Water Recirculation	DHWRP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Domestic Hot Water Tank	DHWT	23-31 29 13 (Hot Water Tank Heaters)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Domestic Water Bladder Tank	DWBT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Domestic Water Pressure Reducing Valve	DCWPRV	23-27 31 47 (Pressure Regulating Valves)				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Domestic Water Storage Tank	DWT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Elevator Sump Pump	ESP	23-27 17 35 11 (Submersible Sewage				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Gas Fired Domestic Hot Water	GFDWH	23-31 29 11 13 (Gas Instantaneous Hot				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Glycol Pump	GLP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Heating Hot Water Pump	HHWP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Hose Bibb	HB	23-29 25 15 19 (Fire Hose Connectors)				G0	G1	G2	G3	50%CD		75%CD	TBD			T	Y		Y	Y							Y	Y	Y	
Plumbing	Hot Water Heater	HWH	23-31 29 11 (Instantaneous Hot Water				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Hydraulic Oil Pump	HOP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Hydraulic Oil Tank	HOT	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Irrigation Sprinkler System	IRR	23-11 27 15 11 (Irrigation Sprinklers)				G0	G1	G2	G3	50%CD		75%CD	TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
Plumbing	Pump	P	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Pump Station	PSTN	23-39 31 11 11 (Packaged Pumping Stations)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Sand Filter	SDF	23-27 55 11 (Liquid Filters)				G0	G1	G2	G3	50%CD	50%CD	75%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y		Y	
Plumbing	Sanitary Sump Pump	SSP	23-27 17 35 11 (Submersible Sewage	Includes all sump pumps which			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Secondary Chilled Water Pump	CHWSP	23-27 17 00 (Pumps)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Sediment Interceptor	SEDINT	23-39 37 15 (Sediment Removal Equipment)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y			Y	
Plumbing	Steam Domestic Water Heater	SDWH	23-27 25 15 (Liquid Steam Heaters)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Steam Trap	ST	23-27 37 15 (Steam Traps)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
Plumbing	Storage Tank	STO	23-27 29 19 (Tanks)				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
Plumbing	Storm Sump Pump	STSP	23-27 17 35 11 (Submersible Sewage	Includes all sump pumps which			G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Valve	V	23-27 31 00 (Valves)	Including: Ball Valves, Butterfly				G0	G2	G3	50%CD	50%CD	75%CD	TBD			T	Y		Y	Y	Y					Y	Y	Y	Y	
Plumbing	Water Filter	WF	23-27 55 11 11 (Water Filters)	Includes filtered water				G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y					Y	Y	Y	Y	
Plumbing	Water Meter	WM	23-27 11 15 17 (Flow Detector)					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Water Treatment Package Unit	WTPU	Water Treatment Package Unit				G0	G2	G3	G3	50%CD	50%CD	50%CD	TBD			I	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	
Plumbing	Scrub sink		23-35 39 17 Surge Protection Devices					G0	G1	G2	75%CD	50%CD		TBD			I	Y	Y										Y	Y	
	Specialty																													
Specialty	RTLS Telehealth Touchpad	TRTLS	23-19 15 00 Communication Specialties					G0	G1	G2	75%CD			TBD			T	Y		Y	Y	Y									

Room Type	OmniClass Number T13 (Shared Parameter Required for Rooms at **SD** Phase and later)	Spaces by Function (Shared Parameter Required for Rooms at **SD** Phase and later)	Space/Room in Project (Y/N)	Name	Number	Area Required	Capacity	HA Room Number	Drain Floor Required	STC Rating	Occupiable	Risk Level	Room Lock Required	Room Type	Security Access Required	Motion Detector	Other possible Omniclass numbers	
Pneumatic Tube Station	13-23 11 21	Chute	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Control Room	13-23 13 00	Control Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Security Station	13-23 13 13	Guard Stations	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Washroom-Patient	13-23 17 00	Restroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Washroom-Public	13-23 17 00	Restroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Washroom-Public-Bariatric	13-23 17 00	Restroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Washrooms-Staff-Small	13-23 17 00	Restroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Washroom-Staff	13-23 17 00	Restroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Washroom-Staff-Small	13-23 17 00	Restroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Compressor Room	13-23 19 11	Refrigerant Machinery Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Storage-Recycled Waste	13-23 21 00	Waste and Recycling Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Waste Holding	13-23 21 00	Waste and Recycling Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Storage-Bio-Waste	13-23 21 11	Hazardous Waste Storage	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Storage-Bulk Building Materials	13-23 23 00	Building Service Support Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Storage-Central	13-23 23 00	Building Service Support Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Wash-Down Room	13-23 23 00	Building Service Support Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Engineers	13-23 23 00	Building Service Support Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Housekeeping Closet	13-23 23 13	Custodial Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Housekeeping Room	13-23 23 13	Custodial Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Carpentry	13-23 23 15	Shop Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Electrical	13-23 23 15	Shop Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Locksmith	13-23 23 15	Shop Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Maintenance MW5	13-23 23 15	Shop Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Metal/Welding	13-23 23 15	Shop Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Paint	13-23 23 15	Shop Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Plumbing	13-23 23 15	Shop Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Vestibule-Entrance	13-25 13 11	Entry Vestibule	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Vestibule-Steam Sterilizer	13-25 13 11	Entry Vestibule	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	13-25 13 17	Vestibule
Lobby Circulation	13-25 13 13	Entry Lobby	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Change Room-Vestibule	13-25 13 17	Vestibule	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Vestibule	13-25 13 17	Vestibule	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Anteroom	13-25 13 25	Anteroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Breakout Room	13-31 11 00	Breakout Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Lecture Room	13-31 13 11	Lecture Classroom	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Computer Training Room	13-31 17 11	Computer Lab	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Exercise Room	13-33 11 15 41 13-51 61 25 11	Exercise Space rehab exercise space….	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Art Wall	13-37 13 00	Display Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Foundation Donor Wall	13-37 13 00	Display Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Body ID Room	13-47 17 13	Morgue	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Walk-In Cooler	13-47 17 13 11	Morgue Compartment	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Exam Room	13-51 11 11	Exam Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Exam Room-Neuro Diagnostic	13-51 11 11	Exam Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Assessment Room	13-51 11 11	Exam Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Anteroom-Secure Room	13-51 14 17	Anteroom, Inpatient Isolation/Seclusion	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-Ante/Post Partum	13-51 14 19	Labor, Delivery, Recovery, Postpartum Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		

Room Type	**OmniClass Number T13** (Shared Parameter Required for Rooms at **SD** Phase and later)	**Spaces by Function** (Shared Parameter Required for Rooms at **SD** Phase and later)	Space/Room in Project (Y/N)	Name	Number	Area Required	Capacity	HA Room Number	Drain Floor Required	STC Rating	Occupiable	Risk Level	Room Lock Required	Room Type	Security Access Required	Motion Detector	Other possible Omniclass numbers	
Patient Room-Ante/Post Partum-Shared	13-51 14 19	Labor, Delivery, Recovery, Postpartum Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-LDRP	13-51 14 19	Labor, Delivery, Recovery, Postpartum Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-NICU	13-51 14 25	NICU Nursery	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-NICU-AIR	13-51 14 29	Nursery, Airborne Infection Isolation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room	13-51 14 35	Patient Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-Bariatric/AIR	13-51 14 35 11	Patient Room, Airborne Infection Isolation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-LDRP-AIR	13-51 14 35 11	Patient Room, Airborne Infection Isolation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-Bariatric	13-51 14 35 13	Patient Room, Bariatric	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Ensuite-MH	13-51 14 35 29	Patient Room, Seclusion	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Ensuite-MH-Bariatric	13-51 14 35 29	Patient Room, Seclusion	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-MH	13-51 14 35 29	Patient Room, Seclusion	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Room-MH-Bariatric	13-51 14 35 29	Patient Room, Seclusion	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Secure Room	13-51 14 35 29	Patient Room, Seclusion	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Clean Supply Room	13-51 17 13	Clean Supply Room, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Multi-Purpose Room-Cognitive	13-51 17 17	Consultation Room, Patient	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Telehealth	13-51 17 17	Consultation Room, Patient	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Consult Room	13-51 17 19	Mental Health Interview/Counseling Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	13-51 17 17	Consultation Room, Patient
Consult Room-Large	13-51 17 19	Mental Health Interview/Counseling Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	13-51 17 17	Consultation Room, Patient
Group Therapy Room-Large	13-51 17 19	Mental Health Interview/Counseling Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	13-51 17 17	Consultation Room, Patient
Alcove-Equipment	13-51 17 21	Equipment Storage Room, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Dictation Room	13-51 17 23	Nurse Workspaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Nursing Station	13-51 17 23 11	Nurse Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Nursing Station-MH	13-51 17 23 11	Nurse Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Alcove-Dictation	13-51 17 23 13	Nurse Station/Communication Center	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Triage Bay	13-51 17 23 17	Nurse Triage Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Soiled Laundry Holding Room	13-51 17 25	Soiled Utility Room, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Utility Room-Soiled	13-51 17 25	Soiled Utility Room, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Multi-Purpose Room	13-51 17 29	Mental Health Multipurpose Room w/Control Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Lounge-Patient	13-51 17 35	Mental Health Quiet Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Multi-Sensory Room	13-51 17 35	Mental Health Quiet Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Assessment/Prep/Recovery Bay	13-51 31 35	Pacemaker/Holter Monitor Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	Is this space specfic to heart & lung?	
Alcove-Viewing	13-51 31 37	Procedure Viewing Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Laboratory-Stress Testing	13-51 31 51	Stress Testing Treadmill Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Assessment Room	13-51 11 11 13-51 34 17	Exam Room Antepartum Testing (NST) Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Alcove-Emergency Shower/Eye Wash	13-51 34 53	Infectious Disease Decontamination Shower	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Alcove-Hand Hygiene Station	13-51 44 45	Scrub/Gowning Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
RO System Room	13-51 51 49	Laboratory, Water	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Anteroom-Hazardous-Sterile	13-51 54 13	Compound Sterile Preparation Space - High Risk	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Compounding Room-Hazardous-Sterile	13-51 54 13	Compound Sterile Preparation Space - High Risk	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Staging Area	13-51 54 13	Compound Sterile Preparation Space - High Risk	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Staging Area/Hazardous Storage	13-51 54 13	Compound Sterile Preparation Space - High Risk	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Anteroom-Non Hazardous-Sterile	13-51 54 15	Compound Sterile Preparation Space - Low Risk	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Compounding Room-Non Hazardous-Sterile	13-51 54 15	Compound Sterile Preparation Space - Low Risk	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Compounding Area-Non-Sterile	13-51 54 17	Compounding Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		

Room Type	**OmniClass Number T13** (Shared Parameter Required for Rooms at **SD** Phase and later)	**Spaces by Function** (Shared Parameter Required for Rooms at **SD** Phase and later)	Space/Room in Project (Y/N)	Name	Number	Area Required	Capacity	HA Room Number	Drain Floor Required	STC Rating	Occupiable	Risk Level	Room Lock Required	Room Type	Security Access Required	Motion Detector	Other possible Omniclass numbers	
Medication Room	13-51 54 25	Medication Preparation Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Patient Medication Holding Area	13-51 54 25	Medication Preparation Room	TBD															
Order Entry Area	13-51 54 31	Pharmacy	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Cart Storage/Tray Prep Area	13-51 54 32	Pharmacy, Dispensing Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Dispensary Area	13-51 54 32	Pharmacy, Dispensing Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Prepackage Unit Dose Area	13-51 54 33	Pharmacy Manufacturing & Prepack Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Storage-Bulk Drug/Supplies	13-51 54 37	Pharmacy, Bulk, Breakdown and Verification Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Shipping/Receiving Area	13-51 54 3713-59 21 00	Pharmacy, Bulk, Breakdown and Verification Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	13-23 17 00	Loading Dock
Storage-Secure/Narcotics	13-51 54 39	Pharmacy, Controlled Substances and Secured Dispensing	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Alcove-Equipment Cleaning	13-51 57 00	Medical Services Logistic Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Cabinet Dryer Area	13-51 57 19	Clean Cart Holding Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Cart Drying Area	13-51 57 19	Clean Cart Holding Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Exchange Cart Marshalling Room	13-51 57 21	Clean Linen Preparation and Storage Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Secure Linen Room	13-51 57 21	Clean Linen Preparation and Storage Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Instruments Drying/Cooling Area	13-51 57 23	Clean Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Packaging/Assembly Area	13-51 57 23	Clean Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Storage-Clean	13-51 57 23 13-51 57 41	Clean Supply Preparation and Assembly Area, Healthcare Sterile Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Sterilizer Area-Steam	13-51 57 29	Ethylene Oxide Gas Sterilizer Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Sterilizer Area-Flash	13-51 57 31	Instrument Sterilization Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Sterilizer Area-Low Temperature	13-51 57 31	Instrument Sterilization Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Washing Area	13-51 57 32	Central Sterile, Receiving and Decontamination	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Cart Return Vestibule	13-51 57 35	Soiled Cart Holding Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Soiled Receiving/Unloading Area	13-51 57 37	Soiled Cart Receiving Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Instrument Washer	13-51 57 39	Soiled Instrument and Equipment Receiving and Decontamination Room, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Passthrough	13-51 57 39	Soiled Instrument and Equipment Receiving and Decontamination Room, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Cart Cooling Area	13-51 57 41	Sterile Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Clean Elevator Loading Area	13-51 57 41	Sterile Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Empty Case Cart Hold Area	13-51 57 41	Sterile Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
STAT Supply Room	13-51 57 41	Sterile Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Storage-Sterile	13-51 57 41	Sterile Supply Preparation and Assembly Area, Healthcare	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Exercise Room	13-33 11 15 41 13-51 61 25 11	Exercise Space rehab exercise space….	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Gym Area	13-51 61 25 13	Exercise/Therapy Gymnasium	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Assessment Room-OT	13-51 61 50	Occupational Therapy, Daily Living Skills Training and Evaluation Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Rehab Room	13-51 61 65	Rehabilitation Therapy Gym	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		
Workroom-Wheelchair Repair	13-51 61 71	Wheelchair Repair Workspace	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD		

Room Type	**OmniClass Number T13** (Shared Parameter Required for Rooms at **SD** Phase and later)	**Spaces by Function** (Shared Parameter Required for Rooms at **SD** Phase and later)	Space/Room in Project (Y/N)	Name	Number	Area Required	Capacity	HA Room Number	Drain Floor Required	STC Rating	Occupiable	Risk Level	Room Lock Required	Room Type	Security Access Required	Motion Detector	Other possible Omniclass numbers
Office	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office- 2 Shared	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office/Staff Lounge	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office-2 Shared	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office-3 Shared	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office-Diet	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office-Large	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office-Multi	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Office-Receiving	13-55 11 00	Office Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Business Centre	13-55 11 11	Office Service	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Workstation	13-55 11 13	Dedicated Enclosed Workstation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Workstation-Equipment Repair	13-55 11 13	Dedicated Enclosed Workstation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Workstation-Patient	13-55 11 13	Dedicated Enclosed Workstation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Workstation-Small	13-55 11 13	Dedicated Enclosed Workstation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Workstation-Touchdown	13-55 11 13	Dedicated Enclosed Workstation	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Filing	13-55 11 23	General File and Storage	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Alcove-ATM	13-55 13 13	Automatic Teller Machine Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Cashier	13-55 19 00	Sales Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Gift Shop	13-55 19 00	Sales Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Lost & Found	13-55 19 11	Checkout Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Alcove-Vending Machine	13-55 19 17	Vending Machine Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Electronic Wayfinding Board	13-55 29 11	Information Counter	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Wayfinding Station	13-55 29 11	Information Counter	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Wayfinding/Information Kiosks	13-55 29 11	Information Counter	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Alcove-Phone	13-55 29 13	Lobby Non-Circulation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Alcove-Mail	13-55 29 17	Mail Room Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Business Center/Mail Room	13-55 29 17	Mail Room Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Meeting Room-Small	13-55 29 21	Meeting Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Boardroom	13-55 29 21 11	Conference Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Meeting Room	13-55 29 21 11	Conference Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Video Conference Room	13-55 29 21 11	Conference Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Lounge Patient/Waiting-Way	13-55 29 23	Waiting Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Lounge Patrient/Waiting-Entry	13-55 29 23	Waiting Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Waiting Area-Inside	13-55 29 23	Waiting Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Waiting Area-Outside	13-55 29 23	Waiting Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Reception	13-55 29 23 11	Reception Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Reception/File Storage	13-55 29 23 11	Reception Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Reception-Main	13-55 29 23 11	Reception Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Lounge-Family	13-55 29 23 13	Waiting Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Waiting Area	13-55 29 23 13	Waiting Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Distribution Prep	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Docking Stations	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Feeding Preparation Room	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Ingredient Control Room	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Nourishment Preparation Room	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Pod Assembly Area	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Prep Kitchen Area	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Prepared Cart Holding Area	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Servery	13-57 13 13 11	Food Preparation Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Prepare and Cook Room	13-57 13 13 13	Cooking Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Cart Staging Area	13-57 13 13 15	Dishwashing Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	

Room Type	**OmniClass Number T13** (Shared Parameter Required for Rooms at **SD** Phase and later)	**Spaces by Function** (Shared Parameter Required for Rooms at **SD** Phase and later)	Space/Room in Project (Y/N)	Name	Number	Area Required	Capacity	HA Room Number	Drain Floor Required	STC Rating	Occupiable	Risk Level	Room Lock Required	Room Type	Security Access Required	Motion Detector	Other possible Omniclass numbers
Cart Washer	13-57 13 13 15	Dishwashing Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Clean Cart Staging Area	13-57 13 13 15	Dishwashing Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Dishwasher	13-57 13 13 15	Dishwashing Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Dishwashing Area	13-57 13 13 15	Dishwashing Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Dishwashing-Pots/Pans	13-57 13 13 15	Dishwashing Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Lounge-Donor	13-57 13 15	Dining and Drinking Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Lounge-Patient	13-57 13 15	Dining and Drinking Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Seating Area	13-57 13 15	Dining and Drinking Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Dining/Lounge-Patient	13-57 13 15 11	Dining Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Prep/Service Station-Special	13-57 13 15 17	Snack Bar	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Alcove-Nourishment	13-57 13 15 23	Beverage Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Alcove-Water Dispensing	13-57 13 15 23	Beverage Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Convenience Station	13-57 13 15 25	Table Bussing Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Prep/Service Station	13-57 13 15 27	Serving Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Self-Service Station	13-57 13 15 27	Serving Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Display	13-57 13 15 31	Cafeteria Vending Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Queueing Area	13-57 13 15 31	Cafeteria Vending Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Waste Station	13-57 13 15 35	Food Discard Station	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Lounge-Staff	13-57 17 13	Break Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Cart Storage/Loading Area	13-59 11 00	Material Handling Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Decanting Area	13-59 11 00	Material Handling Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Loading/Staging Area	13-59 11 00	Material Handling Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Marshalling Area	13-59 11 00	Material Handling Area	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Parts	13-59 21 00	Production Service and Repair Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Workroom-Bed Repair	13-59 21 00	Production Service and Repair Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Workroom-Biomed	13-59 21 00	Production Service and Repair Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage	13-63 13 11	Storage Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Paper/Supply	13-63 13 11	Storage Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Back of House Room	13-63 13 11 11	GNS–General Storage	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Dry	13-63 13 11 11	GNS–General Storage	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Change Room-Staff	13-63 13 17	Locker Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Locker Area	13-63 13 17	Locker Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Patients' Property	13-63 13 23	Unit Storage	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Rapid Response Ready Room	13-63 13 29	Operational Storage (Misc)	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Dry	13-63 13 29	Operational Storage (Misc)	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Equipment	13-63 13 29	Operational Storage (Misc)	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Equipment	13-63 13 29	Operational Storage (Misc)	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Detergent Room	13-63 13 31	Operational Hazardous/Flammable Storage	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Chemical	13-63 13 31	Operational Hazardous/Flammable Storage	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Cold +2 to +6C	13-63 17 11	Refrigeration Compartment	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Cold +2 to +6C (POD)	13-63 17 11	Refrigeration Compartment	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Cold -20C	13-63 17 13	Freezing Compartment	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Secure Holding Room	13-63 19 00	Specialty Storage Spaces	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Storage-Soiled	13-63 19 13	Soiled Storage Room Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
On Call Room	13-65 11 00	On-call Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Ensuite	13-65 13 11	Shower Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Ensuite/Tub	13-65 13 11	Shower Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Ensuite-Bariatric	13-65 13 11	Shower Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Ensuite-Bariatric/AIR	13-65 13 11	Shower Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Shower/Tub Room	13-65 13 11	Shower Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Washroom/Shower	13-65 13 11	Shower Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	

Room Type	**OmniClass Number T13** (Shared Parameter Required for Rooms at **SD** Phase and later)	**Spaces by Function** (Shared Parameter Required for Rooms at **SD** Phase and later)	Space/Room in Project (Y/N)	Name	Number	Area Required	Capacity	HA Room Number	Drain Floor Required	STC Rating	Occupiable	Risk Level	Room Lock Required	Room Type	Security Access Required	Motion Detector	Other possible Omniclass numbers
Washroom/Shower-Secure Room	13-65 13 11	Shower Space	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Laundry Room	13-65 17 00	Laundry Room	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	
Outdoor Patio Area-MH	13-69 23 00	Deck	TBD	SD	SD	SD	DD	50%CD	75%CD	50%CD	50%CD	DD	50%CD	SD	50%CD	50%CD	

6.7 Appendix G – Accuracy Table

The goal of the accuracy table is to ensure that the record model handed over to the Health Authority at the end of construction is an accurate representation of the built facility. Of specific importance are all tracked assets, along with their associated systems, as defined generally in the DCS and specifically in the project asset registry. The Construction Team is responsible for managing, recording, and providing all required information to allow the update of construction changes in the design models by the design consultants.

MAXIMUM DEVIATION ALLOWED						
	Asset Group	**Examples**	**Location** (X + Y)	**Elevation Accuracy** (Z)	**Slope**	**Count** (number of assets)
1	Tracked assets as defined by the DCS	**Mech:** Valves, Pumps, AHU, Equipment clearances **Elec:** Panels, Transformers, Lighting	100mm	100mm		Exact
2	All systems associated with the required tracked assets	**Mech:** Gravity fed piping, Duct work, Domestic hot water, Gas lines, Hydraulic systems	100mm	100mm	+/- 5%	
		Elec: Conduits when grouped, Cable trays	100mm	100mm		
3	Model elements directly associated with a tracked asset	**Mech:** Grilles, Louvers, Vents, Dampers, Access Panels, Drains	100mm	100mm		Exact
		Elec: Fire Alarms, Receptacles, Switches, Sensors	300mm	300mm		
4	Non tracked assets - room bounding model elements	**Arch:** Walls, Roofs, Floors, Windows, Doors, Ceilings,	100mm	100mm	+/- 5%	Exact
		Strt: Floors, Columns, Beams, Walls	100mm	100mm	+/- 5%	Exact
5	Non tracked asset - general model elements	House Keeping Pads, Cable trays, Washroom fixtures	WCT*	WCT*		Exact
6	Fixed furnishing/equipment	Casework, Fire hose cabinets, Fire extinguishers, Kitchen cabinets, Bathroom vanities	100mm	100mm		Exact
7	Underground services	Drains, Catch basins, Incoming services - gas, water	50mm	50mm	+/- 5%	Exact

* WCT – Within Construction Tolerences

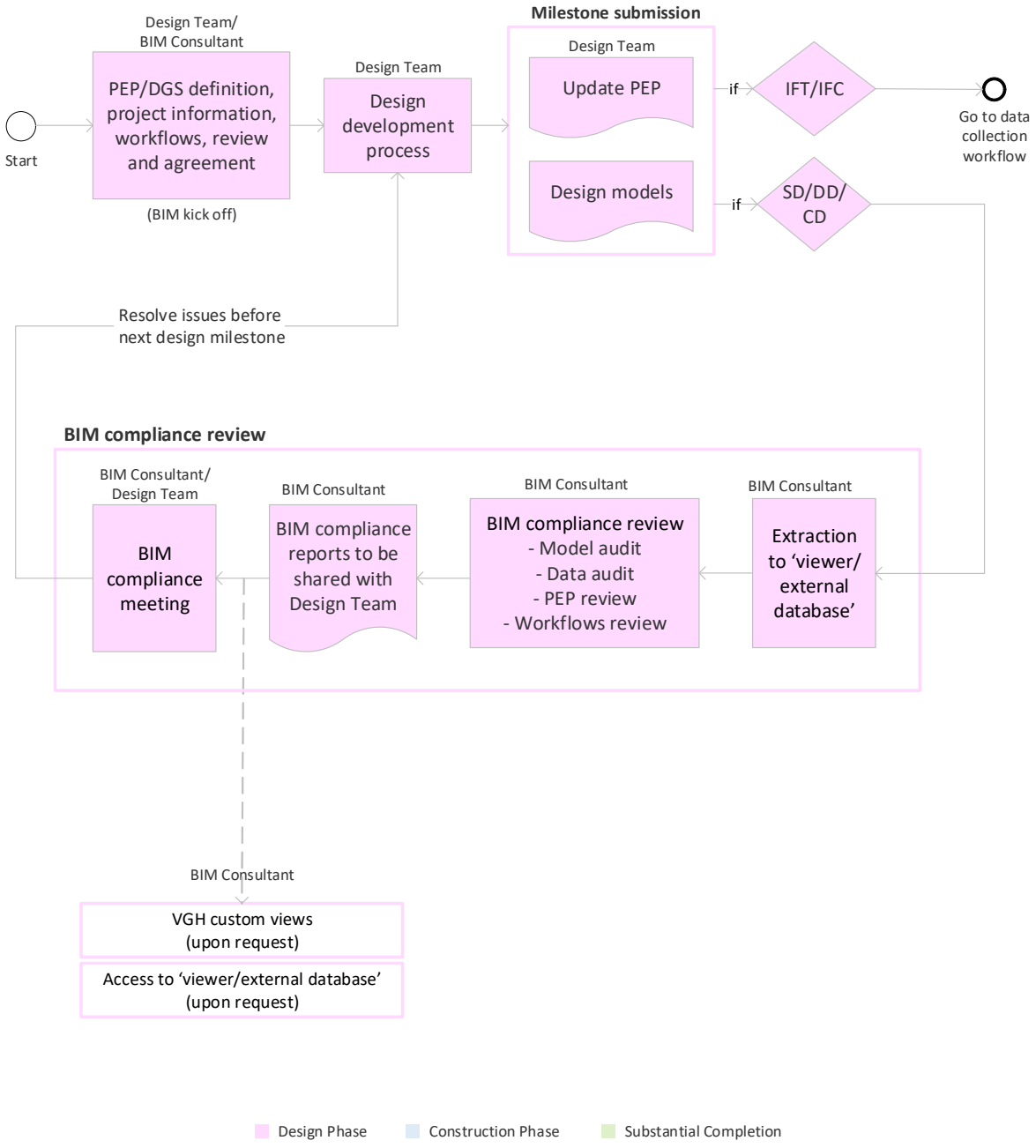
6.8 Appendix H – BIM Scope of Work

Task	Team			The Health Authority Team	
	Design Team	Construction Team	Trades	BIM Consultant	The Health Authority
DESIGN					
Generate and update Design PEP	x				
Create design models based on DGS geometric level	x				
Add DGS data in model elements	x				
Manage design process	x				
Share design models with team	x				
Perform building requirements compliance review					x
QA/QC of design data required for FMO	x			x	x
Perform virtual coordination	x				
Find, track, and solve clash coordination issues	x				
Generate stakeholder custom views				x	
Perform BIM requirements compliance review				x	
Monitor compliance of workflows defined in the PEP				x	
Extract data from design models for Viewer/External Database				x	
Generate asset registry				x	
Provide clarifications regarding modeled elements and scope	x				x
Provide asset registry sign off					x
CONSTRUCTION					
Generate and update construction PEP		x			
Perform construction analysis		x			
Perform construction sequencing		x			
Generate fabrication models			x		
Perform virtual coordination with construction federated models		x			
Resolve coordination issues generated by fabrication models	x	x	x		
Provide laser scanning		x			
Redline mark ups sharing for record model update		x			
Update design models to reflect construction changes	x				
Share updated design models with team	x				
Extract updated design models in case of critical changes in tracked assets				x	
Review agreed processes and protocols defined in the PEP				x	
Provide the Data Collection Environment and training				x	
Setup and management of Data Collection Environment				x	
Trades scope assignment		x		x	
Generate data/document upload progress report				x	
Generate stakeholder custom views				x	

Task	Team			The Health Authority Team	
	Design Team	Construction Team	Trades	BIM Consultant	The Health Authority
SUBSTANTIAL COMPLETION					
Provide building documentation of installed tracked assets		x	x		
Generate structured digital data collection reports				x	
Validate data/documents provided by trades		x			x
Provide consolidated digital building handover				x	
Provide data transfer templates to CMMS system					x
Transfer data to CMMS system				x	x

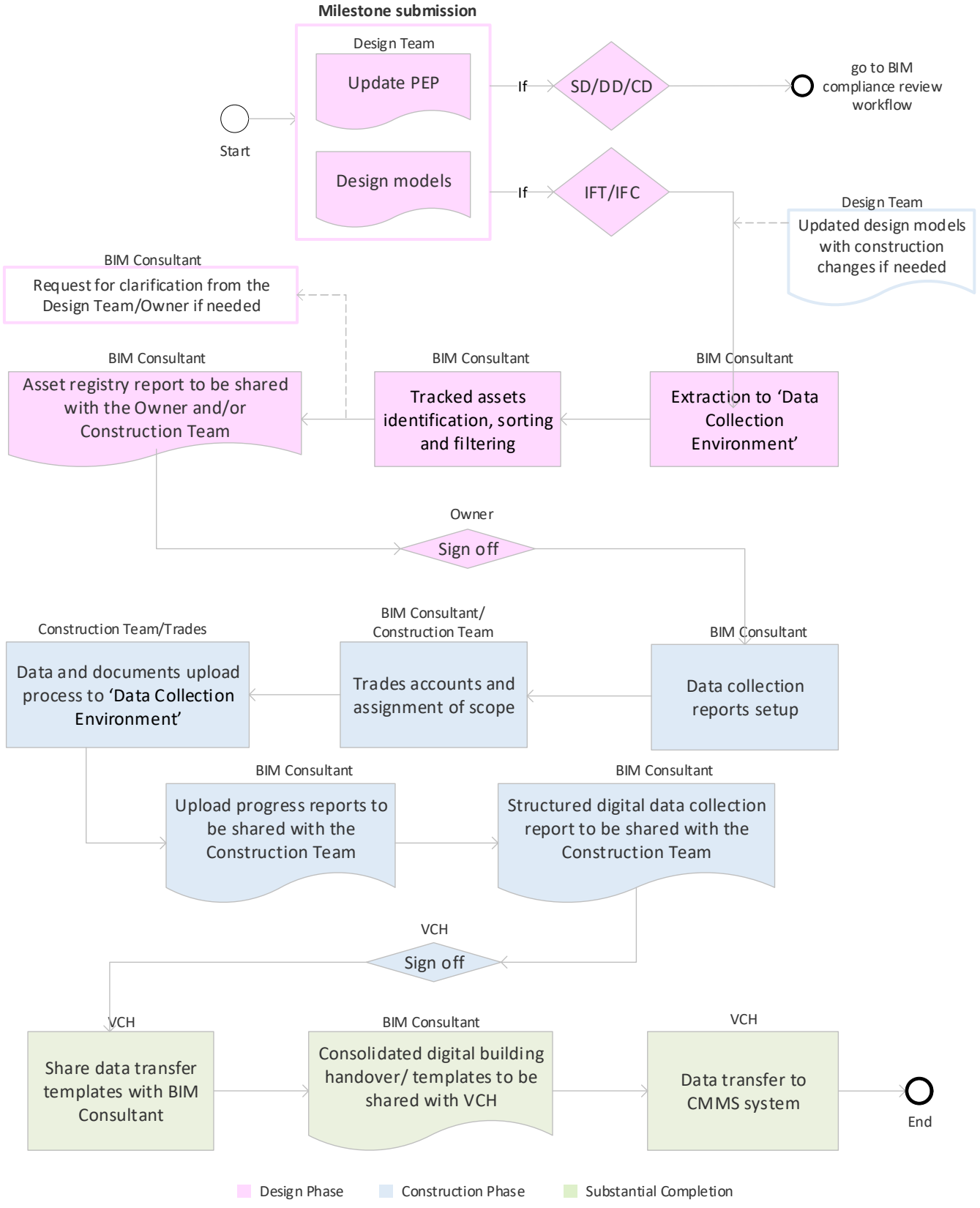
6.9 Appendix I – BIM Compliance Review Workflow

- (ISO 19650 5.6 Collaborative information production)



6.10 Appendix J – Data Collection Workflow

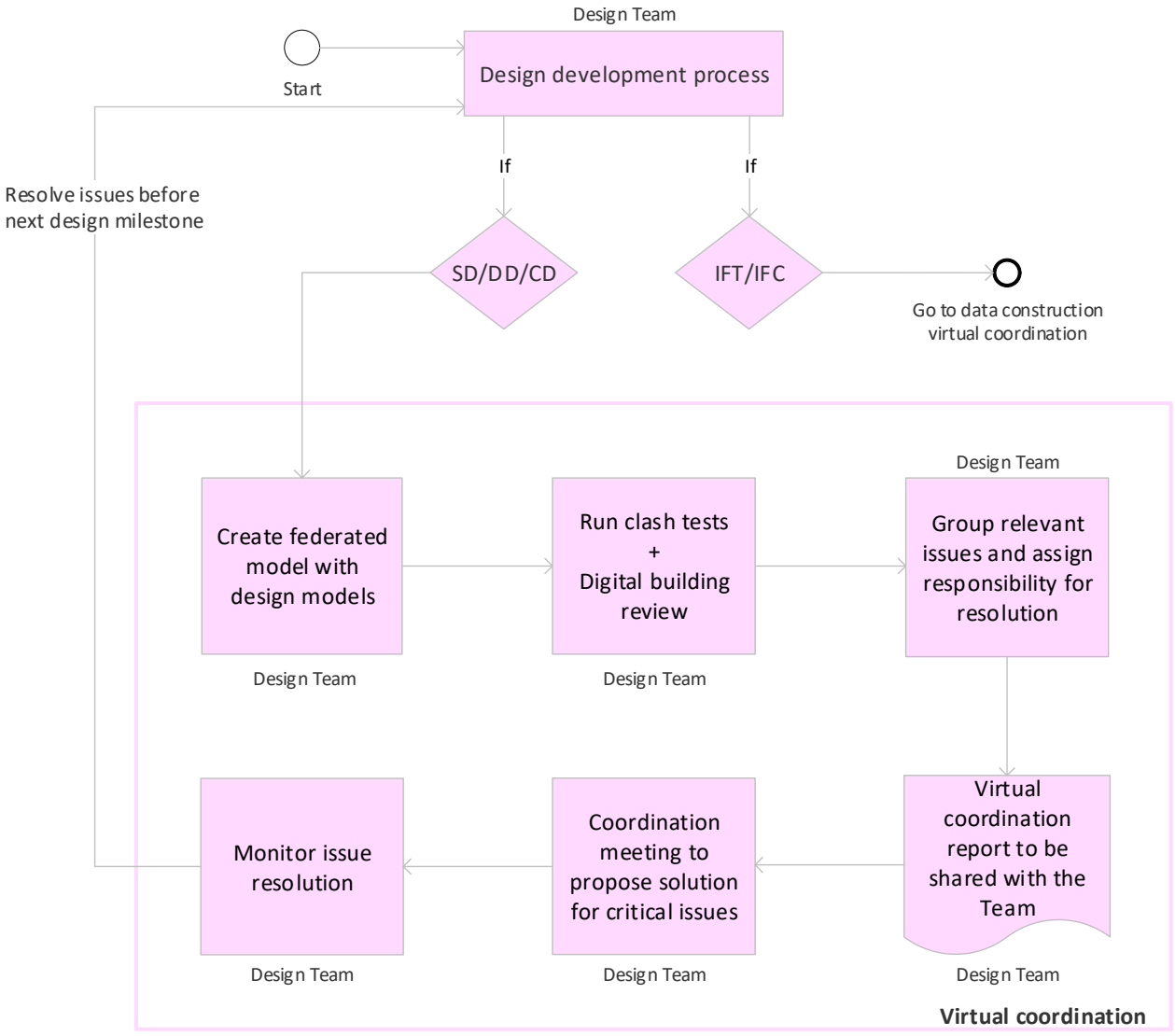
- (ISO 19650 5.7 Information Delivery Model)



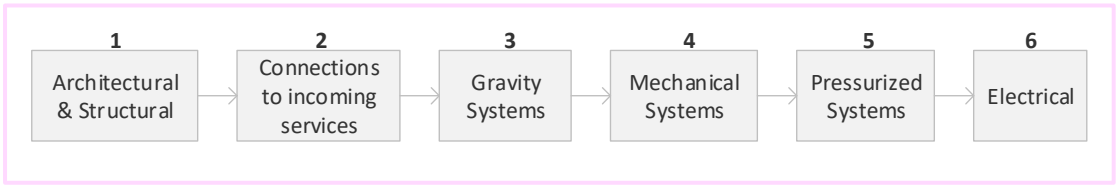
6.11 Appendix K – Virtual Coordination Workflow (Design)

- (ISO 19650 5.4 Appointment process & 5.6 Collaborative information production)

Virtual Coordination – design workflow



Recommended hierarchy of clashes

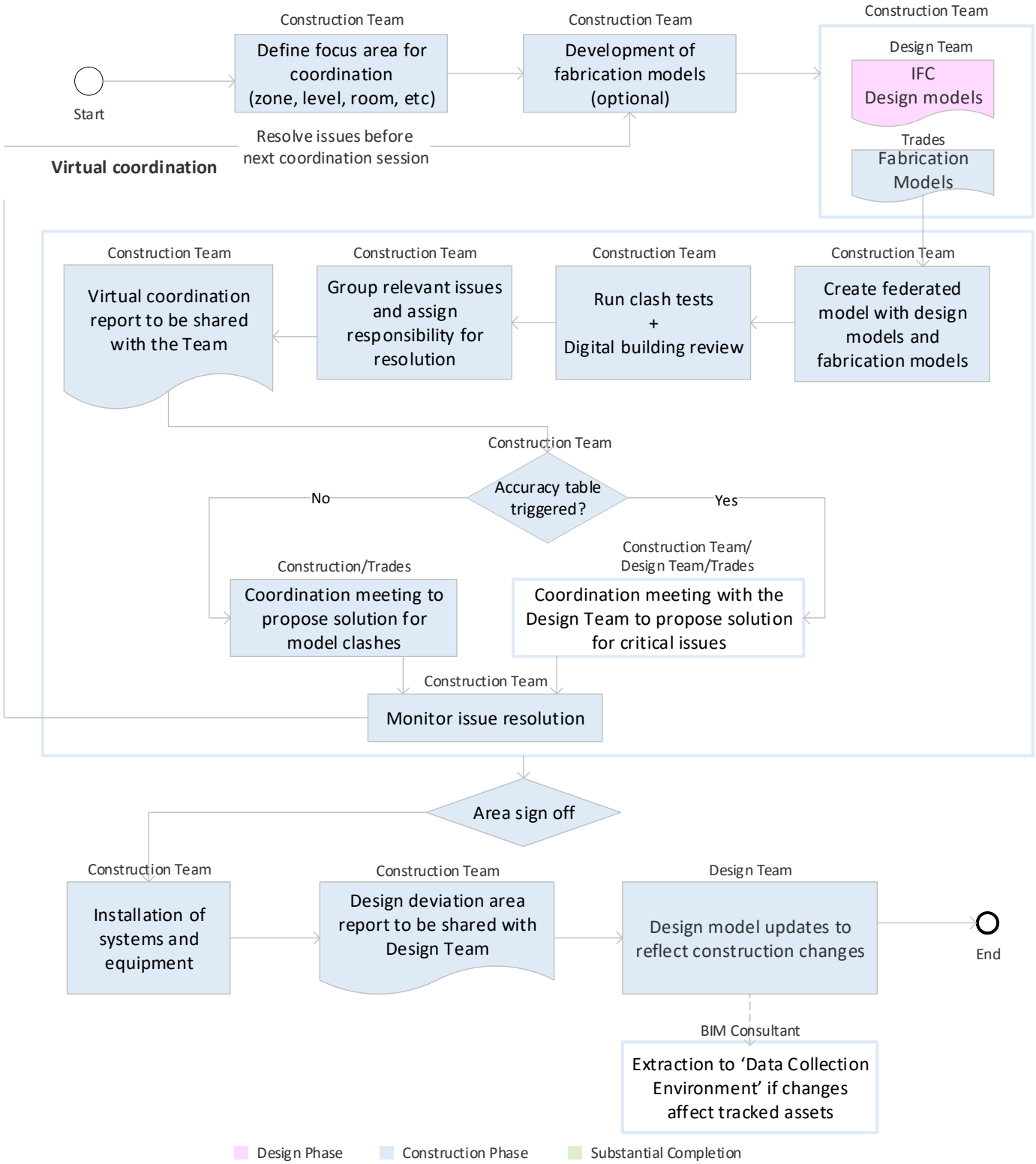


Design Phase Construction Phase Substantial Completion

6.12 Appendix L – Virtual Coordination/Record Model Update Workflow (Construction)

(ISO 19650 5.4 Appointment process & 5.6 Collaborative information production)

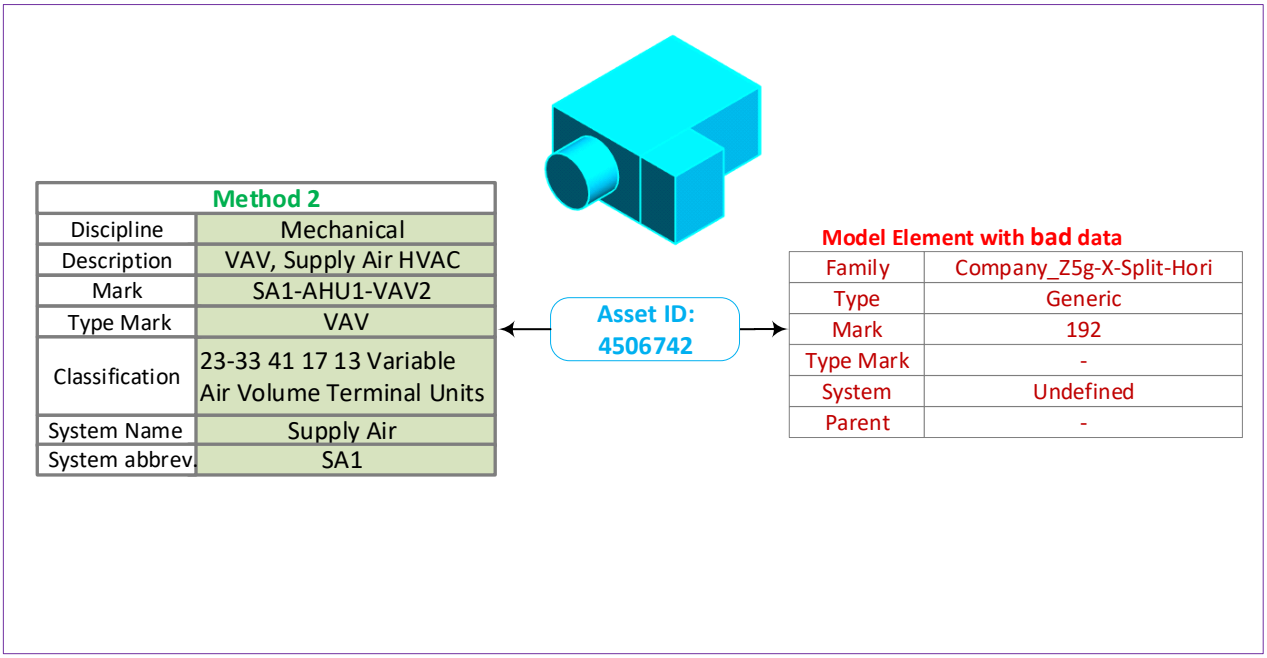
Virtual Coordination – construction workflow



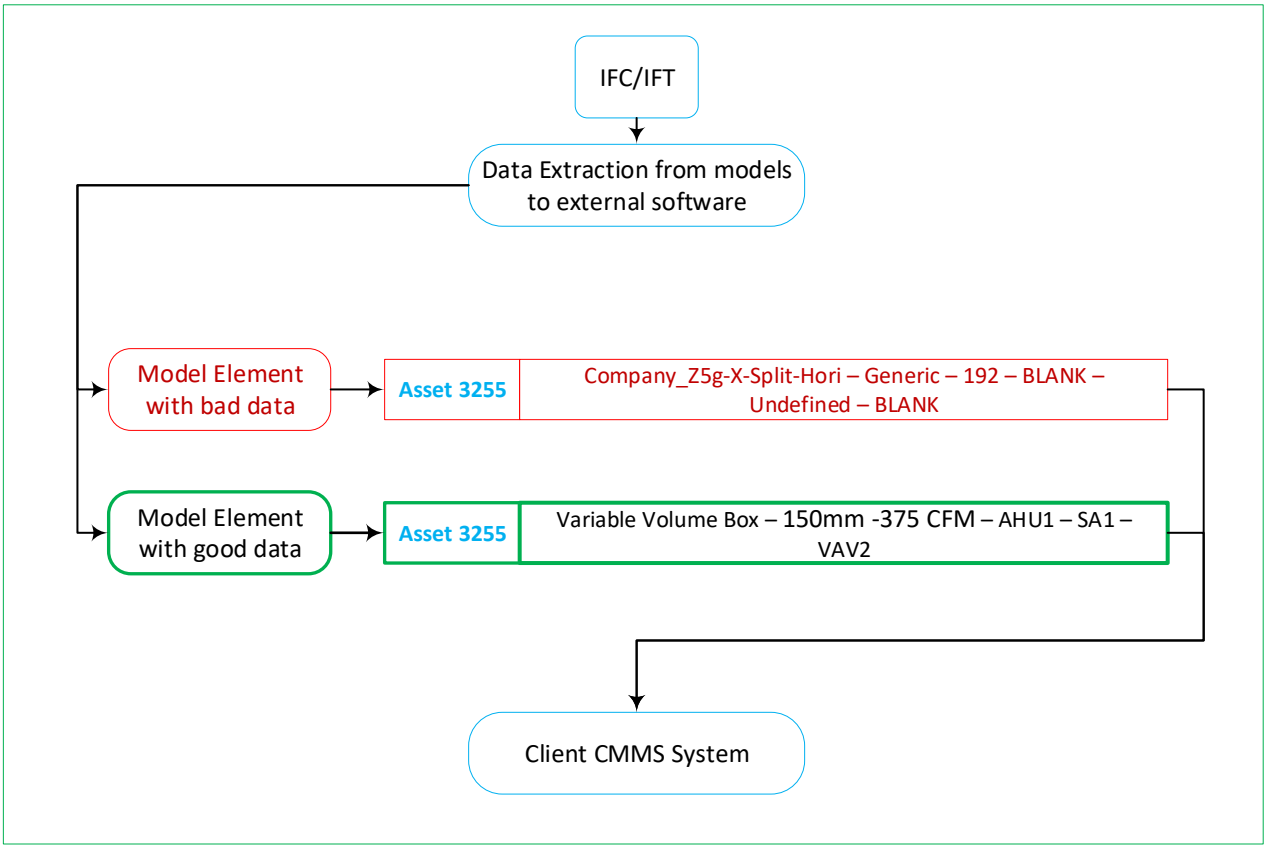
6.13 Appendix M – Modelling Environment – Data Requirements

- (ISO 19650 AIR Asset Information Requirements)

Modelling Environment – Design Phase

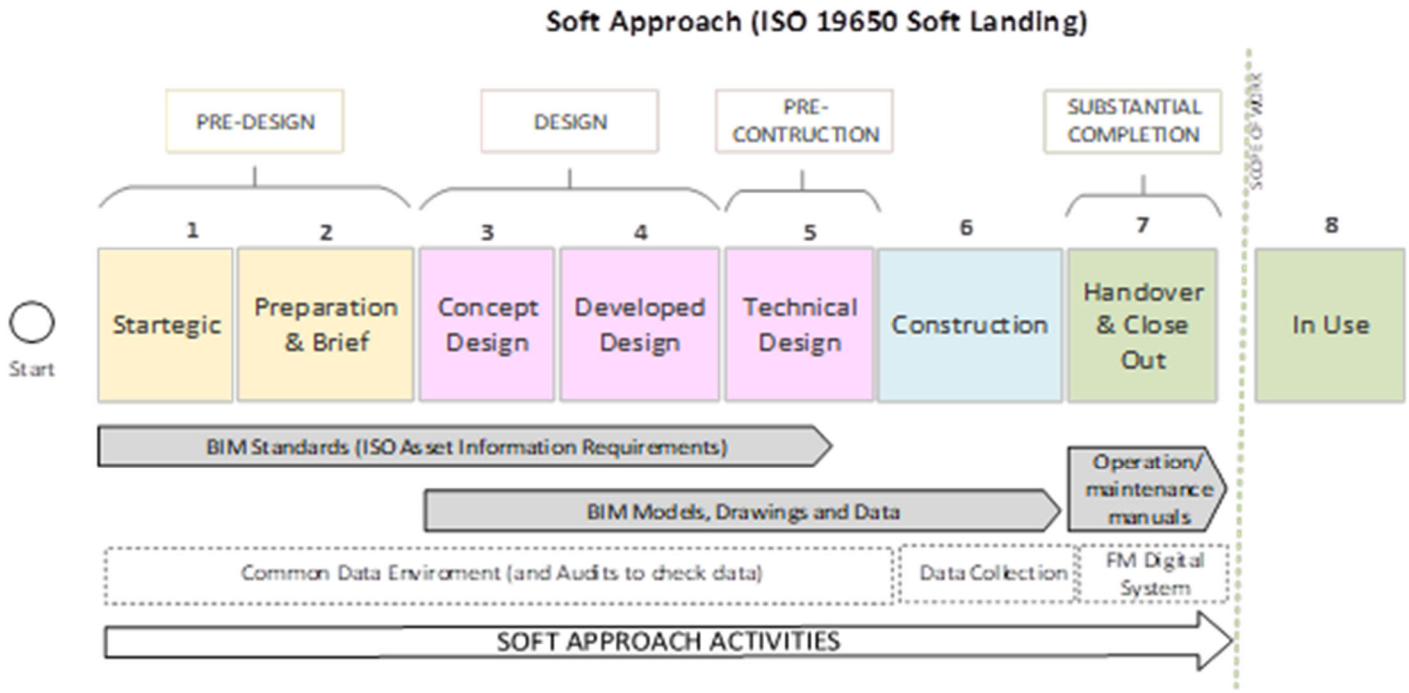


Data Extraction Environment – Data Collection Phase

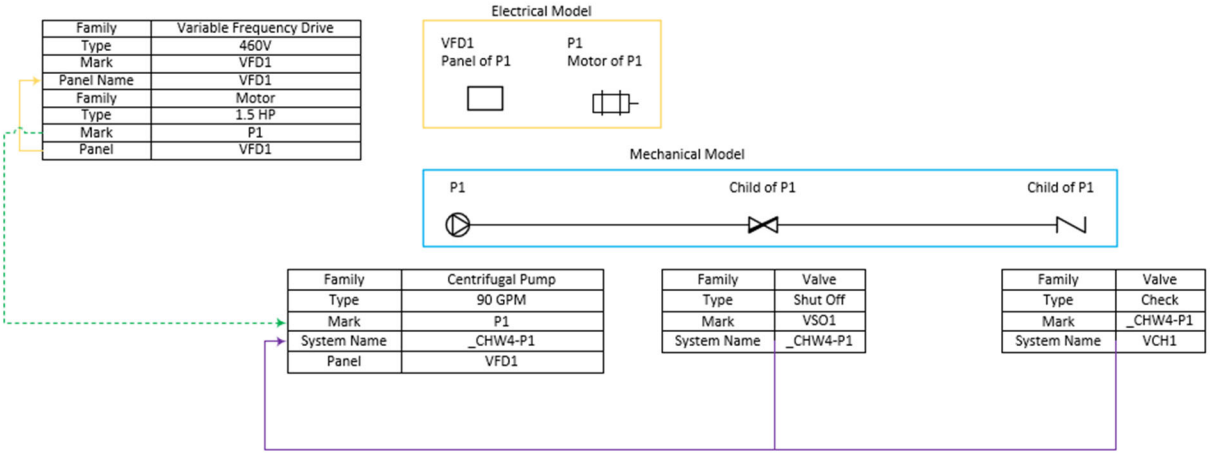


6.14 **Appendix** N **– Soft Approach**

- (ISO 19650 5.1 Assessment & Need,
  - 5.6 Collaborative Information Production,
  - 5.7 Information Delivery Model,
  - 5.8 Project Closeout)



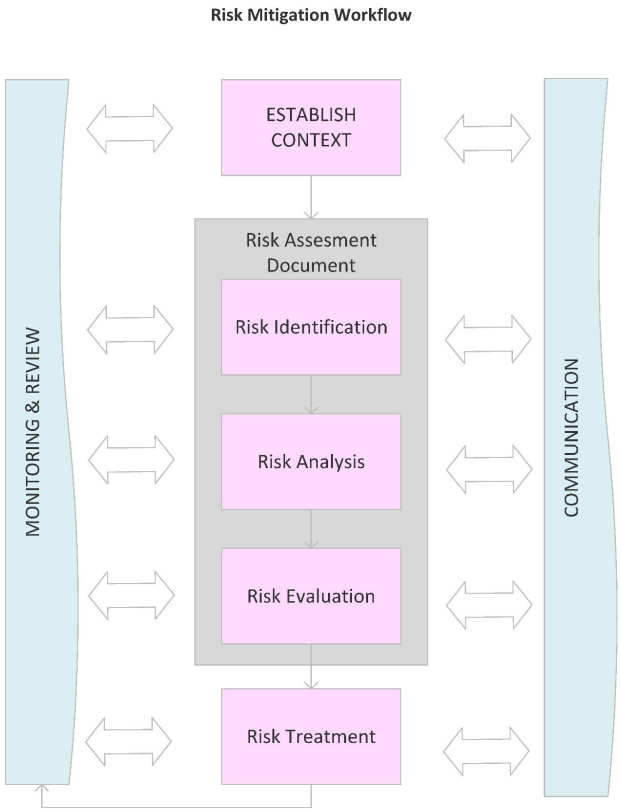
6.15 Appendix O – Parent-Child Relationship Workflow



<Mechanical Equipment Schedule>

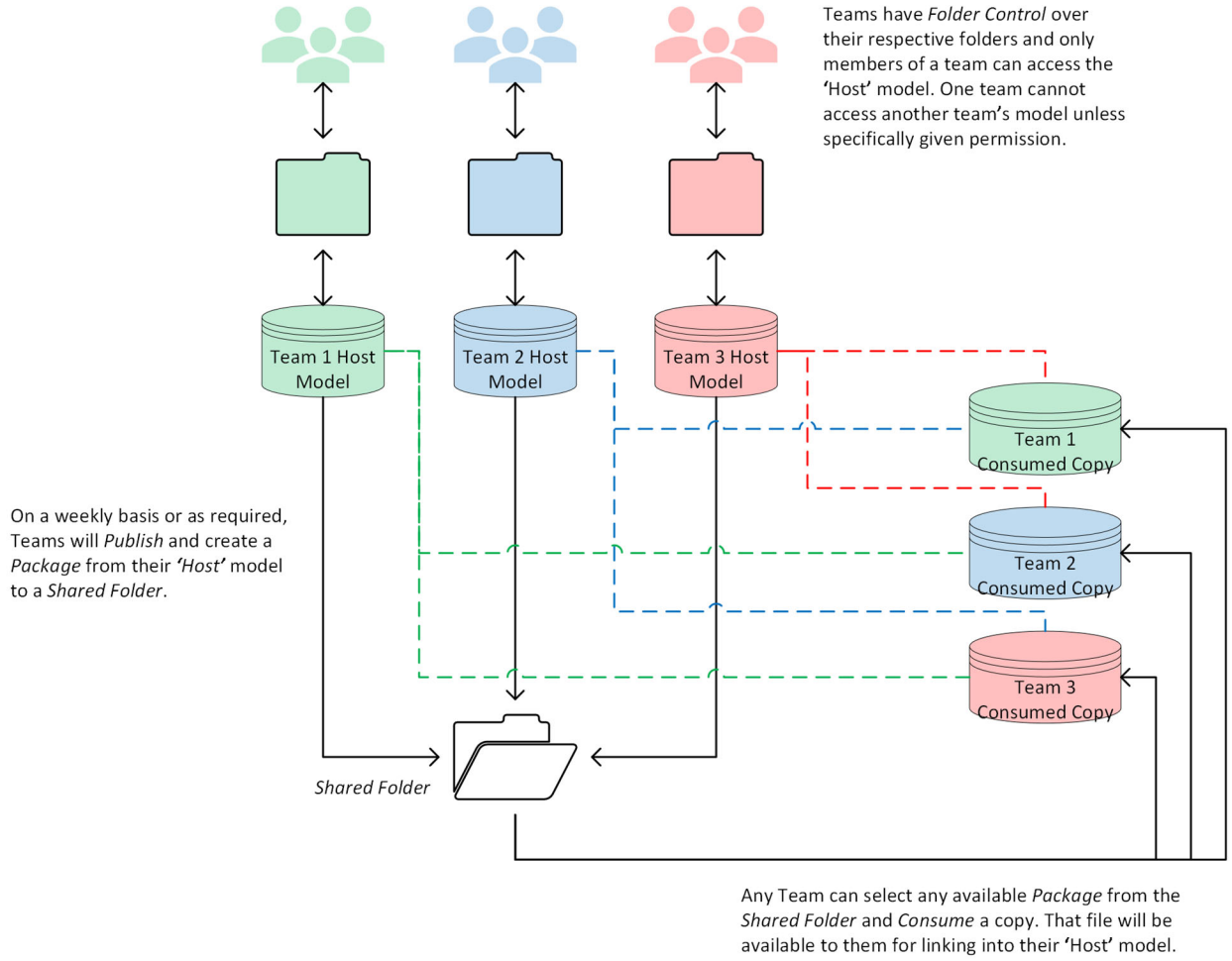
A	B	C	D	E
Family	Type	Mark	System Name	Panel
Outdoor AHU - Horizontal	6 Square Feet of Coil	AHU1	_SA1-1-AHU1	EP1
VAV Unit - Parallel Fan Powered	Size 2 - 10 inch Inlet	VAV1	_SA1-1-AHU1,_SA1-2-VAV1	
Coil - Hot Water	Standard	RH1	_SA1-2-VAV1,_SA1-3-RH1	

6.16 Appendix P - Risk Assessment Matrix



6.17 Appendix Q – File Sharing Workflow

BIM360 Collaboration Workflow
PEP Worflow



Appendix E
Valve Tags V2

FMO VALVE TAG SPEC 2019 – 150mm X 40mm

LINE - DCW

SERVICE TO - LBP Tower RM

INSTALLED – 06/22/2017

VALVE # - 0001

LINE – DHW SUPPLY

SERVICE TO - LBP Tower RM

INSTALLED – 06/22/2017

VALVE # - 0001

LINE – DHW RECIRC

SERVICE TO - LBP Tower RM

INSTALLED – 06/22/2017

VALVE # - 0001

LINE – HEATING SUPPLY

SERVICE TO - LBP Tower RM

INSTALLED – 06/22/2017

VALVE # - 0001

LINE - OXYGEN

SERVICE TO - LBP Tower RN

INSTALLED – 06/22/2017

VALVE # - 0001

LINE - LAB AIR

SERVICE TO - LBP Tower RN

INSTALLED – 06/22/2017

VALVE # - 0001

LINE – DHW RECIRC

SERVICE TO - LBP Tower RN

INSTALLED – 06/22/2017

VALVE # - 0001

LINE – LAB VACUUM

SERVICE TO - LBP Tower RN

INSTALLED – 06/22/2017

VALVE # - 0001

LINE – NITROGEN

SERVICE TO - LBP Tower RN

INSTALLED – 06/22/2017

VALVE # - 0001

Appendix F
Asset Data Collection Requirements

FMO Asset Data Collection Requirements

Overview

Facilities Maintenance & Operations (FMO) maintains new owned and operated facilities and removated spaces as soon as they become occupied. As such, FMO requires an inventory of all new assets within these facilities before they open to ensure that this information can be entered into FMO's Computerized Maintenance Management System (CMMS) and preventative maintenance can begin in a timely fashion. This document describes the process for identifying and capturing the relevant information required to efficiently maintain and operate new equipment. The general process for collecting this information is:

1. Identify all of the "Maintainable" assets within the new facility;
2. Collect these assets' specifications for upload into FMO's CMMS; and,
3. Label each asset with the applicable CMMS asset number.

1. Identifying Maintainable Assets

FMO tracks all mechanical, electrical and hospital equipment that they maintain within a facility in its CMMS. Many of these assets are made up of many smaller assets that are not practical or relevant to collect information on. Given this, consideration must be given to which assets need to be tracked in the CMMS.

As a general guideline, FMO captures assets at the level that is logical to efficiently perform their maintenance while still maintaining adequate documentation on individual assets. This can vary depending on the nature of the system. For example, fire alarms are typically maintained by an outside vendor and a single "Fire Alarm" asset typically provides an adequate level of detail (i.e., fire alarm dampers, sprinkler heads, etc. are not required to be identified separately in the CMMS). Alternatively, some smaller components, such as backflow preventers, are tracked individually since these need to be serviced annually and this documentation must be provided to the municipality for each backflow preventer separately.

Appendix 1 contains a template for capturing the asset data. The second and third tabs of this file include some additional guidance on the level of granularity that is typically captured in FMO's CMMS for various systems (noting that not all systems will apply to all projects). It is recommended that the party responsible for asset data collection review this document with FMO and remain in close contact with FMO throughout the work to avoid wasted effort collecting information on unnecessary assets.

2. Asset Specification Data Collection

Asset specifications are to be collected in the excel template in Appendix 1. Before work commences, the pre-assigned asset numbers that have been reserved in the CMMS for this project should be obtained from the FMO department. Having the numbers beforehand will allow assets to be physically labeled during the data collection phase without risk that the numbers will be assigned to other assets within the CMMS before this information has been loaded.

The generic specifications required for all "maintainable" assets are:

- ***Asset Description***: should be consistent and information in the description should start at a general level and become more detailed
- ***Parent Asset***: see template in Appendix 1 for asset hierarchy samples
- ***Location***: building, floor and room
- ***Serial Number***
- ***Tag Number:*** typically based on site standard though LMFM standards are available if a site standard does not exist
- ***Asset Category***: see breakdown of these categories in Appendix 1
- ***Model***
- ***Vendor***: company that the item is purchased from
- ***Manufacturer***: company that makes the asset
- ***Electrical Branch***: electrical distribution assets only
- ***Fed From***: electrical distribution assets only
- ***Installation Date***
- ***Warranty Expiry Date***
- ***Pressure Vessel Number***: if applicable
- ***List Price:*** if available

The first tab of Appendix 1 provides examples of how each of these specifications is to be filled out. Most of these attributes are easily obtained from the asset nameplate with the exception of the "Parent" asset which can be completed by indicating which asset this asset should be associated with in the hierarchy. More guidance on how FMO's CMMS hierarchies are built can be found on tabs 3 to 6. Additional guidance can be obtained through consultation with FMO.

3. Asset Labeling

Labels should show the asset number in a large font (i.e., 1 inch high labels) and include a barcode as well. Labels in relatively dry areas, such as electrical closets and vaults, can be attached using adhesive labels. Plastic tags with ties are more appropriate for assets in mechanical spaces that may become wet (e.g., for labeling pumps or tanks). Speak to the site FMO department about specific labelling requirements (e.g., some sites have pre-made labels for attaching to new assets).

Sample Labels

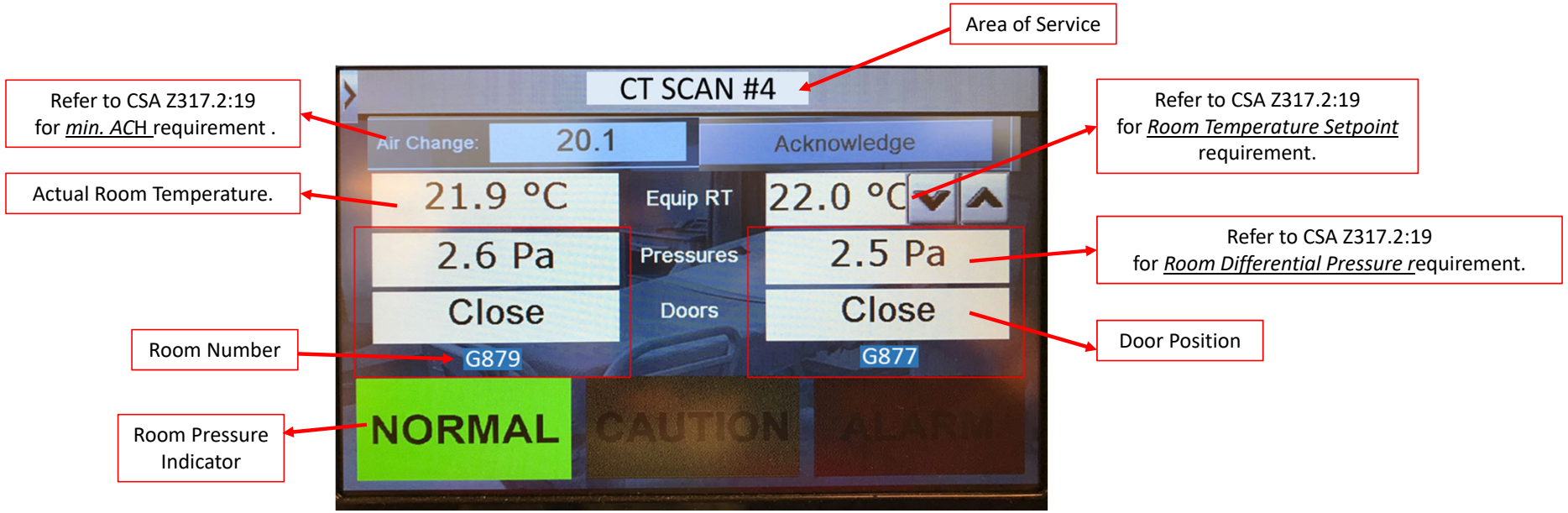
Appendix G

HMI Controller Display Content

Rev.0

Touch Panel HMI (*Human-Machine Interface*) Display Standard Content

(for CT Scanner / Cath Lab / EP Lab / X-Ray / CT – Angio / Procedure Room)



Note:
1. This Touch Panel HMI (Human-Machine Interface) should be controlling the VAV's to meet the setpoint of *Room Differential Pressure*.
2. All above points need to connect to DDC based BMS.
3. Use the " *VGH_Generic_Controlled_Pressure_Room_and Air Changes per Hour_Test_Sheet_05.02.2020_Rev. 0*" for functional verification, submit to FMO-HVAC prior Demonstration Training and include to final commissioning report.
4. Install HMI to the main entrance door (area of service).

Appendix H

VGH Generic Controlled Pressure Room and Air Changes per Hour Test Sheet V.0

VGH – Generic Controlled Pressure and Air Changes per Hour Test Sheet

(for Mechanical Commissioning Agent)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Mode: Positive ☐ Negative ☐

CONTROLLED PRESSURE TEST

System Conditions:

	Supply	Exhaust
Static Press Setpoint:	_____ (avg)	_____ (avg)
Static Press Actual. :	_____ (avg)	_____ (avg)

No. of AHU's Running: _____

Supply VFD Speed (%): _____

No. of Exhaust Fan Running: _____

Exhaust VFD Speed (%) : _____

Room Serves:

CT Scan : ☐ CT / Angio : ☐

X-Ray : ☐ Procedure Rm.: ☐

Cath Lab. : ☐ EP Lab. : ☐

Room Conditions:

Door Seal good .....: Yes ☐ No ☐

Return / Exhaust grille clean ....: Yes ☐ No ☐

Type I - ☐ Type II - ☐ Type III - ☐

Test Data:

Room No.	Required Mode	Smoke Pencil Result	Supply VAV Tag No.	Supply Air VAV Boxes Volume (L/s)		Exhaust VAV Tag No.	Exhaust Air VAV Boxes Volume (L/s)		Differential Pressure (*As per CSAZ317.2:19*) (Pascal)		Notes
				Set point	Actual		Set point	Actual	Required	Actual	

Note:

A. *For differential pressure measurement, please indicate the type of instrument used for readings.*
Manufacturer: _____ *Model No.:* _____ *Calibration Date:* _____

B. *Ensure that DDC graphics, Room DP (differential pressure) Display and Instrument used for readings are correlated.*
Correlated: Yes ☐ *No* ☐

Is Room meeting the RT (*Room Temperature*) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Temp range.

Is Room meeting the Humid (Humidity) Setpoint: Yes ☐ No ☐ Setpoint: ____ Actual: _____

Note: As per CSA Relative Humidity (RH) range.

Local Audible Alarm operational : Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Door Command Functional: Yes ☐ No ☐ N/A ☐

BAS / DDC Graphics Completed : Yes ☐ No ☐ (*Please attached, graphics screen shot of room and system condition at the time of commissioning*).

VGH – Generic Controlled Pressure and Air Changes per Hour Test Sheet

(for Mechanical Commissioning Agent)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

AIR CHANGES PER HOUR

No.	Room Name	VAV No.	Control ID No.	Supply Air Volume (L/s)		Room Dimension (in.)			Required ACH (As per *CSAZ317. 2:19)* ACH	Actual ACH	Notes
				Design (CFM)	Actual (CFM)	Area (sq. ft.)	Height (ft.)	Volume (cu. ft.)			

Additional Information:

VGH – Generic Controlled Pressure and Air Changes per Hour Test Sheet

(for Mechanical Commissioning Agent)

Date: __. __. __. (YY.MM.DD) Controlling Device ID: _____ Room Type: Positive ☐ Negative ☐

ATTACHED HERE THE SCREENSHOTS OF ROOM CONDITION FROM DDC GRAPHICS

Appendix I
Plumbing Requirements

APPENDIX I

Vancouver Coastal Health

Facilities Maintenance & Operations - Plumbing System Standard Documentation for New Construction and Renovation Project

Design Principles:

Maintenance - provide clear access to all equipment maintenance requirements and routines and minimize the need for the Owner to undertake work that causes disruption to occupants and the Owner's operations.

Accessibility:

- Provide adequate space around equipment for serviceability, balancing, commissioning, safety, equipment removal, and to accommodate component removal such as tube bundles, filter media, and large motors.
- Provide permanent access platform structure for any serviceable major equipment requiring maintenance (e.g., AHUs) located above 2000 mm within a mechanical room.

Commissioning:

- All commissioning activities shall be completed prior to facility turnover.
- Functional performance testing shall include testing of the integration of all the associated equipment and systems concurrently. Integration testing shall be carried out under actual conditions, not simulated conditions, under all modes of operation.
- Hand over as built drawings (accurate) before FM&O takes ownership
- Provide all PM procedures in writing before FMO takes ownership of assets.

- Provide O&M manuals before FMO takes ownership.

Design:

.1) Mechanical systems and equipment shall be designed with the following features:

a. Easy access and maintenance, especially with systems needing frequent maintenance, or where infection control is a concern (e.g., airborne isolation rooms, for which particular requirements for HVAC and plumbing systems apply);

b. Ability for staff to safely use, maintain, and repair systems and equipment;

c. Ability to maintain and repair systems and equipment with no impact to patient care (e.g. provide valve isolation box outside patient room(s))

d. Provision for zones of care with the capability to isolate HVAC systems to respond to emerging infectious diseases;

e. Measures to prevent the propagation of legionella and other infectious micro-organisms in plumbing systems, in accordance with CSA Z317.1.

.2) Equipment connections shall be as follows:

a. 2" and smaller: grooved, unions or threaded fittings

b. 2 ½" and larger: grooved or flanged connections

.3) Acceptable piping materials and joining methods for potable water system:

Service	Size	Material	Joint
Domestic Hot and Cold Water	≤ 2"	Stainless steel, ASTM A312, Type 304/304L, NSF/ANSI 372 and ASME B36.19M, Copper Type K	Press joint Pro press preferred
Domestic Hot and Cold Water	> 2"	Stainless steel, ASTM A312, Type 304/304L, NSF/ANSI 372 and ASME B36.19M	Coupled (RX Groove Rolls) Victualic Preferred
Domestic Hot Recirculation	All	Stainless steel, ASTM A312, Type 304/304L, NSF/ANSI 372 and ASME B36.19M	Press joint or Coupled (RX Groove Rolls) Pro Press Preferred

.4) For isolation valves, gate or ball valves are preferred over butterfly valves. Use of balancing valves for isolation is not acceptable. This includes heating, cooling, domestic water supply and medical gas.

.5) Isolating valves shall be accessible and identified by marking that are permanent, distinct, and easily recognized and shall be provided for each:

a) Building incoming water main (monitored valve where serving both domestic and fire)
b) Branches connected to a water main
c) Base of a riser and each floor branch connection on a riser
d) Multiple areas in the same floor to minimize shutdown impact
e) Connection at each fixture
f) Connection to equipment
g) Valve isolation box outside treatment and patient room
h) Valve ID tags, reference OR Phase 1 project sample tags

.6) Install in parallel at each entry location, approved backflow prevention devices (each sized for full-flow capacity) on the main water service to ensure water availability during testing and maintenance and provide adequate drainage

.7) Provide an electric actuated ball valve on main cold water supply for emergency shut off during plugging incident such as toilet to mitigate flooding risk. Provide an emergency push button with enclosure at nurse station to isolate a localized zone or a floor quadrant, or as approved by the FMO Manager

.8) Backflow devices shall be installed according to CSA B64.10 and accessible to prevent musculoskeletal injuries

.9) No backflow devices installed in confined spaces.

.10) Backflow devices shall be installed with additional isolation valves upstream and downstream of device with additional strainer installed upstream of device.

.11) All future tee's also end of line runs shall be valved and capped. This includes heating, cooling, domestic water supply and medical gas.

.12) Water supply to individual fixtures shall be fitted with check valves on both hot and cold to prevent future crosses.

Accessibility and Maintenance:

.1) Ensure equipment and valves are easily accessible for cleaning and inspection.

.2) Provide isolation valves at all the supply and return of all equipment, all branches, supply and return mains, zone branches located in corridor, and risers.

.3) For isolation valves, gate or ball valves are preferred over butterfly valves.

.4) FM&O will not accept any backflow devices under sinks, inside cabinets or under shelves.

.5) For all confined space entries FM&O requires that a qualified rescue team be used. FMO preferred CSE team shall be Ronin Rescue or SPI.

Plumbing Fixtures and Equipment

.1) General Requirements

.1) Provide plumbing fixtures in accordance with the requirements of the National Plumbing Code and BC Plumbing Code.

.2) All fixtures and fittings shall meet the requirements of CAN/CSA Z317.1, Special Requirements for Plumbing Installations in Health Care Facilities

.3) Coordinate with the FMO Manager to determine the appropriate fixture and trim types.

.4) Coordinate with the FMO Manager to determine where bariatric plumbing fixtures are required.

.5) Provide provision for regulating the temperature delivered from faucets in accordance with CAN/CSA Z317.1, Special Requirements for Plumbing Installations in Health Care Facilities.

.6) Provide fixtures of any one type by the same manufacturer.

.7) Provide barrier-free fixtures where required by the BC Building Code that are installed in accordance with the requirement of CSA-B651, Accessible Design for the Built Environment and the BC Building Code.

.8) Provide back-flow prevention devices.

- Chemical or Detergent Mixing Station: RPBA shall be installed immediately upstream of the unit. All janitor rooms should have RPBAs for hot and cold piping.

.9) All water closets shall be a certified MAP rating of 1000 flush performance and equipped with a pressure assist.

.2) Emergency Fixtures

.1) Where the eyes or body of any person may be exposed to injurious corrosive materials, provide suitable facilities for quick drenching or flushing of the eyes and body within the work area for immediate use.

.2) Provide a tempered water supply to emergency eyewash and shower fixtures in accordance with ANSI/ISEA Z358.1, Emergency Eyewashes and Shower Equipment, American National Standards Institute (ANSI).

.3) Hose Bibbs

.1) Provide key-operated, non-freeze hose bibs every 30 m (100 ft.) around the building perimeter or as required to suit the irrigation requirements.

.2) Provide non-freeze cold water hose bibs for roof areas that contain equipment that requires periodic cleaning.

Drainage Systems

.4) General Requirements

.1) Design plumbing, drainage, and vent systems in accordance with the National Plumbing Code.

.2) Design plumbing systems in accordance with CAN/CSA Z317.1, Special Requirements for Plumbing Installations in Health Care Facilities.

.3) Provide a minimum of 3 ½" (8.9 cm) high curb water containment around the entire perimeter of mechanical rooms with water services and equipment. This shall include door thresholds and around all penetrations. Any funnel drains shall be less than the curb height to allow for overflow drainage to ensure that any water release is captured and not allowed to escape from the room.

.4) Avoid designing drainage systems to pass over areas where leakage or condensation could cause a hazard (i.e. food preparation areas, electrical areas, and patient care areas).

.5) Locate equipment that requires accessibility outside of patient care areas (i.e. valves, cleanouts, control dampers, fire dampers, etc.).

.6) Where a sump is required for an elevator shaft, locate the sump remotely (outside) from the elevator shaft.

.7) Provide interceptors in the waste piping of areas such as:

a) Dental and other laboratories

b) Food preparation areas

c) Fracture rooms sinks and other room where casts may be applied or removed.

d) Autopsy suites.

.8) Provide vapor vents to atmosphere for sterilizer units.

.9) Trap primer piping to be hard sleeved from valve manifold to trap. Each valve shall be tagged with location of trap it serves.

.3) General Requirements

.1) Coordinate the requirement for a sampling manhole with the Authority Having Jurisdiction and the Civil Consultant for facilities containing laboratories.

.2) Provide interceptors and neutralization tanks with adequate service space.

.3) Building shall be designed to avoid the use of sewage pump. Sewage pumps shall not be used when gravity flow can be employed.

.4) Sewage pumps shall be duplex grinder type with an automatic alternator and a lag pump starting feature, supplied from the essential electrical system in accordance with CSA Z32; and have alarms for the lag pump start and high water level.

.5) Install an in-line grinder (e.g. Muffin Monster) upstream of the sump.

.6) Provide sanitary vents in accordance with the National Plumbing Code and as required by the Authority Having Jurisdiction.

.7) Provide adequate and accessible service space for cleanouts. Locate at accessible height and ensure the clean out is at wall edge to ensure no fluid escapes into wall cavity.

.8) VGH site standard for drainage piping is Cast Iron and Orion pipe and fittings

.4) Clinical and Hazardous Waste Drainage Systems

.1) Hazardous waste shall meet the requirements of CSA Z317.10, Handling of Waste Materials within Health Care Facilities and be piped to a neutralizer and treated prior to discharge or collected in a holding tank for off-site disposal.

.2) Sanitary waste from buildings containing laboratories and infectious areas shall comply with waste water discharge requirements of local bylaws, codes, and environmental and health regulations.

.3) Hospital macerator is not permitted without written approval from Owner. Bedpan washer (e.g. Meiko Topline) is the preferred method of waste disposal.

.5) Storm Drainage System

.1) Storm water shall be piped separately from the sanitary sewer.

.2) Building shall be designed to avoid the use of storm pump.

.3) Avoid the use of controlled flow roof drainage systems.

.4) Provide internal drainage systems with open flow drains connected to 100 mm (4 in) diameter pipes (minimum).

.5) Provide a minimum of two roof drains per drainage area.

.6) Provide cast iron or aluminum dome strainers over roof drains.

.7) Where storm water is not directly connected to the storm water service main, terminate roof drain exterior discharge outlet with an elbow at least 1.0 m (3 ft.) above grade.

.8) Sumps shall consist of two compartments (a settling compartment and a pumping compartment) if the amount of suspended matter is likely to interfere with the operation of the pumps or cause excessive wear. The pumping compartment shall be sized to limit the frequency of pump starts to that recommended by the manufacturer.

.9) Sump pumps designed for permanent installation shall be duplex, controlled to automatically alternate between lead/lag statuses, and have alarms for the lag pump start and high water level.

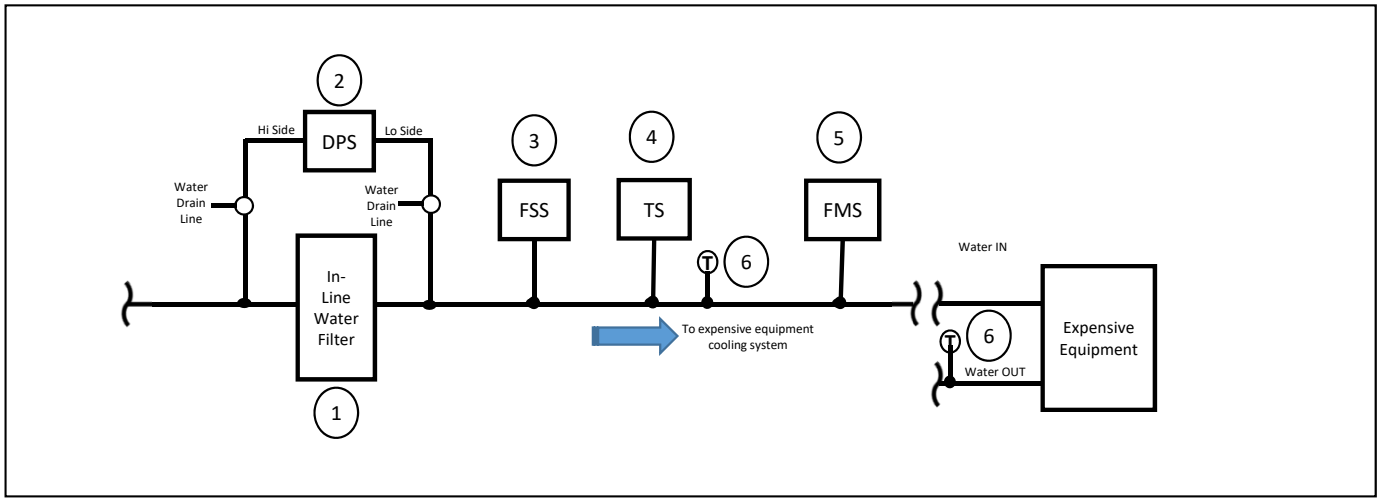
.10) Provide provisions for fuel spill control in accordance with NFPA 418, Standard for Heliports.

Appendix J

Cooling System Installation of Associate Components for Expensive Equipment Rev.0

Installation of Associated CHW/DHW Cooling System Components for Expensive Equipment. (CT Scan / MRO / MRI).

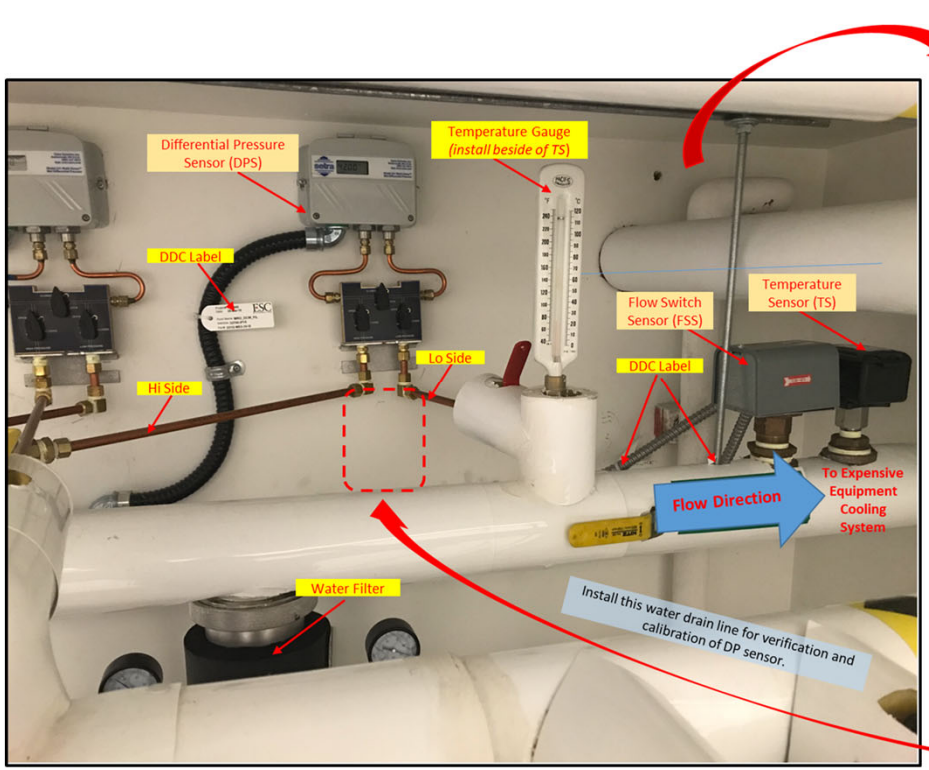
CHW / DCW Cooling System Diagram:

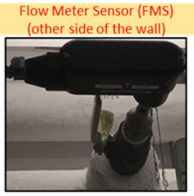


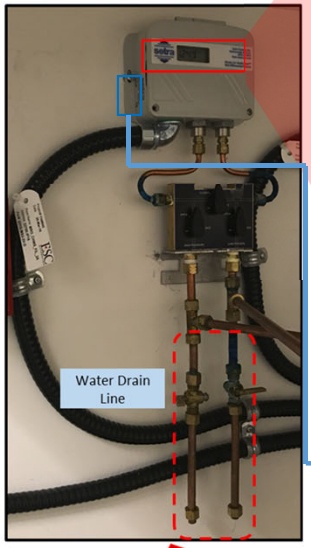
Notes:

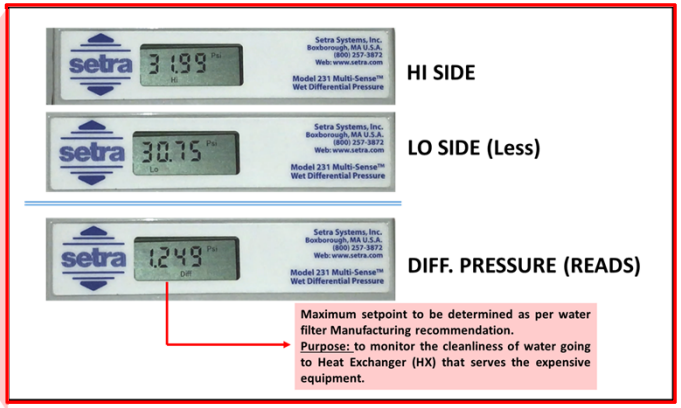
1. Install In-Line Water Filter (*with replaceable Media Cartridge*) into cooling supply line.
2. Install Differential Pressure Sensor (DPS) for filter and connect to hospital DDC based BMS.
3. Install Flow Switch Sensor (FSS) at indicated location and connect to hospital DDC based BMS.
5. Install Temperature Sensor (TS) at indicated location and connect to hospital DDC based BMS.
6. Install Temperature Gauges at indicated location.

Reference Installation Details:









Install the same Make and Model **OR** equivalent features from different manufacturer / supplier.

Appendix K
Metering Matrix

Energy (Y/N)	End Use	Strategy	LEED Requirements	Meter Type	SOR Requirements	Responsible Party	Fuel	Requirement Reference	Existing buiding condition	Rational for new Building	Require by	Comments
	Metering Matrix - Richmond Hospital, YFP											

Energy (Y/N)	End Use	Strategy	LEED Requirements	Meter Type	SOR Requirements	Responsible Party	Source	Requirement Reference	Existing buiding condition	Rational for new Building	Requested By	Comments
N	Domestic Cold Water (Main incoming)	Flow meter		BMS connection to keep the trend of the flow		Mechanical	Water		RH currently have flow meter, one for westminster, one for south power plant feeding south tower and one for north power plant feeding north tower	Should have new one on main mechanical room	FMO	
	Domestic cold water (main incoming)	Flow meter										ciry's meter will be monitored by city
N	Irrigation Water	Flow meter		BMS connection to keep the trend of the flow		Mechanical	Water		don't have it	Current irragation system comes from main water entry, we need one flow meter on irrigation system at main mechanical room	FMO	
N	RO makeup Water for MDRD	Flow meter		BMS connection to keep the trend of the flow		Mechanical	Water		we have it only in lab	we might needed for MDRD		need to confirm with complience team if we need RO water and why
N	Heating Hot Water Make-up	Flow meter		BMS connection to keep the trend of the flow		Mechanical	Water		don't have a meter	To monitoring water fow for consumption and detecting flood	FMO	
	Domestic Cold Water(Main take off to each floor)	Flow meter		BMS connection to keep the trend of the flow		Mechanical	Water		don't have it	Helps with flood detection monotoring consumption and troubleshooting	FMO	Install on each zone of each floor by riser
	Domestic hot water (Main take off to each floor)	Flow meter		BMS connection to keep the trend of the flow		Mechanical	Water		don't have it	Helps with flood detection monotoring consumption and troubleshooting	FMO	Install on each zone of each floor by riser
Y	Domestic Hot Water	BTU Meter		BMS connection to keep the trend of the BTU		Mechanical	Energy		we don't have it	It helps to calculate the energy consumption and equipment energy output		install BTU meter on each boiler
Y	AHU air flow rate (supply, exhust and return)	Airflow measurement	IEQ prerequisite requirement	BMS connection to keep the trend of the flow		Mechanical	Airflow			Is to controll the flow in event of fire to maintent fire code requireement on air sullpy and exhust	FMO	install airflow displau on the HAU and connect to BMS
Y	Electricity Total	Electrical meter	Consumption and demand. Power fa	Hydro meter Cell		Electrical	Electricity		it is in south power plant	To meassure total energy consumption		
	Medical Imaging load	Electrical meter		Power Metering System		Electrical	Electricity					
Y	MV Feeders	Electrical meter		Power Metering System		Electrical	Electricity					
Y	Secondary main breakers	Electrical meter		Power Metering System		Electrical	Electricity					
Y	Switchgear and switchboards	Electrical meter		Power Metering System		Electrical	Electricity					
	Distribution Panels each floors	Electrical meter		Power Metering System		Electrical	Electricity					
Y	Electrical Branches	Electrical meter		Power Metering System		Electrical	Electricity					
Y	Emergency generators	Electrical meter		Power Metering System		Electrical	Electricity					
N	Emergency generators	Manual recording				Mechanical	Diesel Fuel					
N	Transfer switches	Electrical meter		Power Metering System		Electrical	Electricity					
	EV Charger	Electrical meter		Power Metering System		Electrical	Electricity					
Y	Motor control centres	Electrical meter		Power Metering System		Electrical	Electricity					
	Heat recovery chiller	BTU meter		BMS connection to keep the trend of the BTU		Mechanical	Energy			It helps to calculate the energy consumption and equipment energy output		Install BYU meter on each HRC on the hot and cols side
Y	Chillers	Electrical Meter		Power Metering System		Electrical	Electricity					Cooling chillers and heat recovery chillers, each separately. Recommended that pumps be separate. May not have VFD or built-in speed output for BMS so allow for actual meter.
	Boilers	Electrical meter		Power Metering System		Electrical	Electricity					
Y	MDRD Load	Electrical Meter		Power Metering System		Electrical	Electricity					
N	Colling tower	BTU meter		BMS connection to keep the trend of the BTU		Mechanical	Energy					Install on each tower on both pipe
Y	Interior and process lighting	BMS points	Consumption and Demand. Demand can be combined with other lighting.			Electrical	Electricity					
Y	Exterior lighting	BMS points	Consumption and Demand. Demand can be combined with other lighting.			Electrical	Electricity					
Y	Elevator feeders	Electrical meter	Consumption and Demand.	Power Metering System		Electrical	Electricity					
Y	Plug loads	By deduction from shared upstream electrical meters	Consumption and Demand. Demand can be combined with other plug loads.			Electrical	Electricity					
Y	Retail areas	Electrical meter		Power Metering System		Electrical	Electricity					
Y	Shelled spaces	Revenue grade electrical meter			Kitchen, café, patient discharge spac	Electrical	Electricity					
Y	Distribution equipment	Electrical meter		Power Metering System	Feeding mechanical equipment and elevators	Electrical	Electricity					
Y	Elevators	Electrical meter		Power monitorin system		Electrical	Electricity					Install in Each bank of elevators feed
	Main Med gas manifold	Flow meter		BMS connection and monitor by med gas master alarm station								
	Medical gas flow meter	Flow meter		BMS connection to keep the trend of the flow		Mechanical			don't have it now	troubleshooting,leak detection , monitoring consuption		Install on each take off from the main risers on each floor
Y	Fans (variable speed)	BMS from VSD	Consumption and Demand. Demand can be combined with other fans.		Each separately if for AHU or if greater than 5hp. Includes supply, ehxaust and return.	Mechanical	Electricity					don't needs meter,Require trending the consumtion and demang
Y	Fans (constant speed)	BMS status	Consumption and Demand. Demand can be combined with other fans.		Each separately if for AHU or if greater than 5hp. Includes supply, ehxaust and return	Mechanical	Electricity					don't needs meter,Require trending the consumtion and demang

Y	Pumps (variable speed)	BMS from VSD	Consumption and Demand. Demand can be combined with other pumps of same type.	Mechanical	Electricity	Including but not limited to hot/cold water supply/return pumps, domestic water (re)circulation pumps, service water booster pumps. Recommended to meter pumps separately from their associated equipment, such as chillers, cooling towers, etcdon't needs meter,Require trending the consumtion and demang
Y	Pumps (constant speed)	BMS status	Consumption and Demand. Demand can be combined with other pumps of same type.	Mechanical	Electricity	Don't needs meter,Require trending the consumtion and demang .Recommended to meter pumps separately from their associated equipment, such as chillers, cooling towers, etc

General LEED Requirements for Whole Project:
All end-uses greater than 10% shall be monitored
Electrical meters for end uses greater than 10% of building energy use shall meter both consumption and demand
All metered data must be stored for at least 60 months
All metered data must be accessible remotely
All meters must meter addition only, not whole building
LEED allows grouping "fans" and "pumps", but requirements of SOR are more granular
LEED requires an energy usage terminal. SOR 6.10.2.7.(20) also requires an "interactive energy usage terminal"

General SOR Requirements for Whole Project:

SOR

6.3.11.1. Basic Requirements

6.3.11.1.(1) Provide a networked, digital microprocessor metering system that will display detailed information on the SCADA HMI about status of electrical equipment, alarms, trouble conditions, power quality (including harmonics measured values compared to values referenced in IEEE 519) and power consumption at key points throughout the ACF. Key points include:

6.3.11.1.(1) i MV feeders;

6.3.11.1.(1) ii Secondary main breakers for all 12.47kV/25KV-600V power transformers;

6.3.11.1.(1) iii All 600V and 208V Switchgear and switchboards including the mains, ties and each feeder breaker;

6.3.11.1.(1) iv Emergency generators;

6.3.11.1.(1) v Transfer switches;

6.3.11.1.(1) vi Motor control centres;

6.3.11.1.(1) vii Cooling systems including chillers, cooling towers, associated pumps and controls;

6.3.11.1.(1) viii Heat recovery plant including chillers and pumps;

6.3.11.1.(1) ix Air handling and make up air systems including each supply fan and return fan and exhaust fan greater than 5hp;

6.3.11.1.(1) x MDRD electrical power draw;

6.3.11.1.(1) xi Kitchen electrical items (plus all future equipment);

6.3.11.1.(1) xii Interior lighting;

6.3.11.1.(1) xiii Exterior lighting;

6.3.11.1.(1) xiv Process lighting;

6.3.11.1.(1) xv Elevator feeders;

6.3.11.1.(1) xvi Laundry;

6.3.11.1.(1) xvii Equipment charging;

6.3.11.1.(1) xviii UPS systems;

6.3.11.1.(1) xix Booster pumps;

6.3.11.1.(1) xx UV electrical;

6.3.11.1.(1) xxi Plug load per floor;

6.3.11.1.(1) xxii Medical gas compressors;

6.3.11.1.(1) xxiii Sump pumps;

6.3.11.1.(1) xxiv Retail areas;

6.3.11.1.(1) xxv Shelled spaces Kitchen, Café and Patient Discharge spaces (meters shall be certified revenue grade);

6.3.11.1.(1) xxvi Distribution equipment feeding mechanical equipment,

6.3.11.1.(1) xxvii Distribution equipment feeding elevators.

6.3.11.1.(2) Ensure that metering is provided to record total energy consumed by luminaires and equipment. Integrate information from all meters on a common software platform residing on a dedicated electrical metering server.

6.3.11.1.(3) Metering will be provided on all UPS, normal, vital, delayed vital, and conditional power branches.

6.3.11.1.(4) Ensure that sufficient metering is provided to record the energy consumed by all major mechanical equipment including chillers, fans and pump motors.

6.3.11.1.(5) Implement a networked metering/SCADA system with terminals for maintenance and plant administration, and data transfer to the BMS.

6.3.11.1.(6) Connect electrical demand and consumption meters to the BMS. Also connect the meters to the LGH ION network.

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

6.3.11.1.(8) Provide additional meters as required to achieve Measurements and Verification requirements for LEED; refer to other sections within the DBA including sustainability sections.

6.3.11.1.(9) The SCADA metering HMI shall also display all items noted within the DBA plus the following (with interfaces to the BMS):

6.3.11.1.(9) i Switchgear and switchboard breaker status including causes for breakers tripping such as: ground fault, overload, and under voltage.

6.3.11.1.(9) ii Substation transformer temperature

6.3.11.1.(9) iii Entire power generation system including generator status including all alarm and trouble conditions including those recommended by CSA 282-15.

6.3.11.1.(9) iv Unit substation transformer temperature trouble and alarms,

6.3.11.1.(9) v Station batteries status

6.2.5.2.(4) Meter and trend data related to flow of electrical power, natural gas steam and domestic water to the Facility and as required to monitor energy performance.

6.2.5.2.(5) Meter and trend data related energy use for the heating and cooling systems at the Facility and as required to monitor energy performance.

6.2.5.4.(4) The BMS will meter and trend all data related to the flow of services into and out of the Acute Care Facility including, but not limited to, domestic water, chilled supply and return, natural gas, and electricity.

6.2.5.4.(5) The BMS will monitor, control, indicate alarms, and provide trending where applicable for all connected sensors and control points.

6.2.3.1.(3) i The domestic water supply will have a water meter and a dual reduced pressure backflow preventer and a dual (high/low flow) PRV c/w independent shut-off valves.

6.3.19. Energy Management

6.3.19.1. Basic Requirements

6.3.19.1.(1) Provide an integrated energy management system to monitor, record, analyse, report on and control energy consumption from all sources that supply energy; it shall provide an energy use breakdown as outlined within the DBA and meets the monitoring and verification requirements. This system to be networked to the metering/SCADA systems and connected to the BMS.

6.3.19.1.(2) Design the system to provide sufficient information to enable the Owner to make “demand-side management” decisions relating to overall energy demand, with the intent of reducing overall energy consumption and demand. Incorporate data from the digital meters. Provide and coordinate with the Owner to provide an IP address for energy management monitoring capabilities, the system shall incorporate an energy dashboard.

6.3.19.1.(3) Provide a system and equipment that is flexible, controllable, and will form an integral part and integrates to the new and existing building management systems.

6.3.19.2. Performance Criteria

6.3.19.2.(1) Design the energy management system to be accessible from any networked computer using appropriate software.

6.3.19.2.(2) Provide a minimum of five site software licenses.

LEED v4

NEW CONSTRUCTION, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES AND DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Install advanced energy metering for the following:

- all whole-building energy sources used by the building; and
- any individual energy end uses that represent 10% or more of the total annual consumption of the building.

The advanced energy metering must have the following characteristics.

- Meters must be permanently installed, record at intervals of one hour or less, and transmit data to a remote location.
- Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate.
- The data collection system must use a local area network, building automation system, wireless network, or comparable communication infrastructure.
- The system must be capable of storing all meter data for at least 36 months.
- The data must be remotely accessible.
- All meters in the system must be capable of reporting hourly, daily, monthly, and annual energy use.

Appendix L

VCH Elevator Technical Guidelines and Requirements Rev.11

Vancouver Coastal Health Facilities Management

Elevator Technical Guidelines and Requirements

Division 14 – Vertical Transportation

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Revision	Description	Date
0	First Draft check for formatting and overall direction.	April 16, 2014
1	Add Elevator Selection Criteria, Create Six (6) Separate Sections	July 3, 2014
2	Update formatting for easier reading, operational sections require additional wording.	September 12, 2014
3	Updated based on Clinical tour.	November 1, 2014
4	Major revisions for LMFM team review. [Ref 890473-0025(2.0)]	March, 2015
5	Revisions for LMFM team review. [Ref 890473-0025(3.0)]	April 29, 2015
6	Issued with RFP for Definition Phase Prime/Elevator Consultant [Ref 890473-0025(4.0)	May 13, 2015
7	Revision 7 Release revised Clause 62 and 97. Appendix A97 removed. [Ref 890473-0025(5.0)]	May 21, 2015
8	Revision 8 Release as noted in Technical Bulletin No. 1 doc. 890473-0116(3.0) [Ref 890473-0025(6.0)]	January 12, 2017
9	Revision 9 Release as noted in Technical Bulleting No. 2	February 9, 2018
10	Revision 10 Release update Definitions, Sections 3, 21, 29, 90, Appendix A drawings, added Section 27 Phones, formatting to version 10.1	April 17, 2020 December 30, 2020
11	Revision 11 Release update: Header and Footer. Definitions. Part 1 Section 3 Standard Keying. Part 2 Section 38 Remote Elevator Display, Monitoring, and Control, Section 53 Medical Device Reprocessing Vertical Transportation. Part 3 Elevator Quantity, Speed, Size and Capacity. Part 5 Warranty Requirements. Appendices	Draft March 7, 2024 Release March 22, 2024

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DEFINITIONS AND ACRONYMS

Term	Acronym	Definition
Best Practices	-	The preferred solution for Health Care Facilities between discretionary options.
British Columbia Safety Authority	TSBC	The Authority having jurisdiction over elevators in the Province of British Columbia.
Elevator Modernization	-	The elevator is deemed to be modernized when a majority of the parts have been replaced with new parts. This should include the motor, machine, controller, and the door operator.
Health Authority	HA	British Columbia Health Authority, primarily referring to Vancouver Coastal Health in this document
Handling capacity	-	Handling capacity refers to the number of passengers that are transported by the elevator for a certain period of time)
Health Care Facility	HCF	A building operated by personnel involved with providing health care for people, including but not limited to Acute Care Hospitals, Residential care homes, specialty care centres, and administration offices
Intellectual Property	IP	This is a legal term that refers to creations of the mind. Examples of intellectual property include music, literature, and other artistic works; discoveries and inventions; and words, phrases, symbols, and designs.
Interval	-	The average time between elevator departures from the ground floor during a peak period.
Keys	-	Where the term “key” is used in this document, this refers to keys directly related to the function of the elevators and are in the form of barrel keys, flat keys, or other arrangements
Medical Emergency Operation	MEO	Medical Emergency Operation (previously referred to as “Code Blue”) is a priority elevator operation mode that allows medical staff to call an elevator to their location as a priority, over-riding all other elevator calls made. It allows medical staff to obtain and retain control of an elevator to move a patient/equipment in an urgent manner.
Medical Emergency Operation Stage 1	MEO Stage 1	The operation where an elevator is recalled directly to a specific level as requested by HCF Staff

Term	Acronym	Definition
Medical Emergency Operation Stage 2	MEO Stage 2	The operation of the elevator after MEO has been initiated from within the cab. This is considered a form of “attendant” operation as defined by the B44 Safety Code for Elevators
Non-Proprietary	-	Non-proprietary shall refer to all elevator systems and equipment meeting established standards for Universal Serviceability and Maintainability. Refer to Part 1 - Section 4 Non-Proprietary Equipment for further detail.
Original Equipment Manufacturer	OEM	Original Equipment Manufacturer
Operations and Maintenance Manual	O&M Manual	An O&M Manual contains all information that a technician requires to install, operate and maintain the equipment provided.
Priority Service Operation	PSO	An elevator operation that dispatches an elevator for staff use such that the elevator will arrive to the landing as an empty cab.
Restricted Access	-	An elevator operation that restricts access to the elevator and/or certain floors that the elevator serves.
Standards	-	The minimum requirement of these guidelines
Vancouver Coastal Health	VCH	Vancouver Coastal Health is a Provincial Health Services Authority. The Manager, Contracts and Optimization for Vancouver Coastal Health manages the Elevator Program.

PART 1 – GENERAL REQUIREMENTS

1 INTRODUCTION

1.1 These Technical Guidelines (the “guidelines”) are provided to project and operational maintenance delivery teams - including but not limited to design consultants, facility managers, project managers, project directors, contract managers hospital staff, and other stakeholders – as the basis for “Division 14 – Vertical Transportation” specifications for new elevators in new and existing facilities, and for modernization of existing elevators in existing facilities. A Division 14 specification shall be provided for each HA Project that includes an elevator, for review and approval by Manager, Contracts and Optimization. Deviations from the Technical Guidelines and Requirements require acceptance by Manager, Contracts and Optimization and VCH stakeholders.

1.2 It is the responsibility of the consultant responsible for authoring the specification for each Project to address any questions or concerns arising from these guidelines, including but not limited to conflicts between these guidelines and regulatory requirements, best practices and/or professional disagreement. The HA is not responsible for errors in specification produced for Projects. Deviations from the Guidelines shall be presented in a simple format spreadsheet as per Appendix

1.3 Elevators are the primary means used for vertical movement in HCFs and are expected to transport of patients, staff, visitors, animals, and materials in a safe, reliable, effective, and responsible manner. The intent of the guidelines, as appropriate to each Healthcare Facility (“HCF”) in the HA portfolio, is to:

.1 Establish the highest level of elevator service, maintenance, repair and upgrade achievable and appropriate to each HCF;
.2 Provide consistency of operational features including but not limited to features such as Medical Emergency Operation (“MEO”, previously referred to as Code Blue) and Infection Control standards;
.3 Provide standard interfaces between elevator control equipment and HCF signals.
.4 Provide design considerations, performance expectations, operational features, and equipment characteristics for elevators.

1.4 The guidelines are considered to be best practice and are mandatory unless otherwise indicated. HA’s expect these guidelines to be followed unless justification for non-compliance is provided and accepted by the Manager, Contracts and Optimization. Final specifications, including any deviations from these guidelines, require written approval from the Manager, Contracts and Optimization for each project prior to the procurement of contractors.

1.5 These guidelines cover the following types of equipment:

.1 Passenger Elevators (including service elevators in a variety of usages)
.2 Freight Elevators
.3 Dumb waiters
.4 Lifts for Persons with Physical Disabilities (B355 Handicap Lifts)
.5 LULA (Limited Use Limited Application Lifts)

1.6 The guidelines are subject to revision due to changes including but not limited to changing technology, safety code requirements, infection control standards and/or other best practices that are deemed suitable for inclusion at any time.

1.7 The guidelines are based on facility experiences and lessons learned, all specific to HCFs.

2 CODES AND STANDARDS

All codes and standards shall be the latest edition for the project location.

2.1 Applicable codes and standards shall include but are not limited to the following and in every case the latest adopted version shall apply:

.1 A17.1/B44 Safety Code for Elevators
.2 B355 Lifts for Persons with Physical Disabilities
.3 CSA Z8000 - Canadian Health Care Facilities - Planning, Design and Construction section 12.2.6 – Elevators
.4 BC Building Code
.5 Vancouver Building By-Law
.6 Canadian Electrical Code
.7 CSA Z317.13 - Infection control during construction, renovation and maintenance of Healthcare Facilities
.8 Fire Code
.9 Safety Orders, Directives and Information Bulletins as published by the BC Safety Authority

3 STANDARD KEYING

3.1 The following keys shall be used as standard for elevator functions. Keys shall be provided with bow covers colour or anodized colour coded to their function on the respective key switches. Key switches shall have a matching colour coded ring. Review with Contract Manager, Facilities, FMO and project team for items that do not have designated colours TBD :

.1 Fire Fighter Operation:	FEO-K1	Red
.2 Standby Power Operation:	FEO-K1	Red
.3 Medical Emergency (formerly Code Blue):	X4004	Blue
.4 Independent (Porter/Cleaner) Service:	X4001	Green
.5 Service Panel Covers:	X4001	Green
.6 In Cab Lights:	X4001 (6)	Green
.7 Access Enable Restricted to Elevator technicians only	X4002	No colour used.
.8 Hoistway Access Restricted to Elevator technicians only	X4002	No colour used.
.9 Priority Service OperationMedical Staff	X4005	Yellow
.10 Restricted Access – Medical Staff	X4006	TBD
.11 Restricted Access - Facilities Staff	X4007	TBD
.12 Reserved for Other Restricted Access	X4008	TBD

.13	Security Override	X4009	TBD
.14	Special Feature (Run/Stop Key Switch COP	X4010	Black
.15	Emergency Communications Failure	X4011	TBD
.16	Special Feature	X4012	TBD

4 NON-PROPRIETARY EQUIPMENT

4.1 Non-proprietary shall refer to all elevator systems and equipment meeting established standards for Universal Serviceability and Maintainability.

These standards shall include but are not limited to the following elements:

.1 Parts and equipment can be purchased, installed and maintained by any qualified elevator maintenance provider, as certified by the TSBC at a reasonable cost.
.2 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 shall be readily available for the life of the product not less than 25 years.
.3 Control systems shall include diagnostic tool functions on-board 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.
.4 A proprietary tool shall not be required for any reason. Any lost or damaged tool may be promptly replaced or repaired at reasonable market cost.
.5 Manuals, engineering drawings, circuit diagrams and prints shall be provided with the equipment at time of delivery. All documentation shall be available for replacement purchase, at reasonable cost, by any installing or maintaining elevator contractor or persons so designated by the building owner.
.6 Software or software keys shall not expire.
.7 Software operation shall not degrade and all service updates to the original software shall be provided by the control manufacturer free of charge to the end user for the life of the product not less than 25 years.
.8 The control manufacturer shall provide direct support and diagnostic information to the "end user" and their designated maintenance company. Factory and/or on-site training regarding installation, adjustment, maintenance and troubleshooting the equipment shall be available from the original equipment manufacturer for the life of the product not less than 25 years. Training fees shall be reasonable and appropriate to the market.

5 ELEVATOR CONTROLLERS AND OUTSIDE SIGNALS INTERFACE

5.1 Each elevator controller shall be equipped with an interface panel, separate from the elevator controller, to provide connection points for both inputs from various building systems including but not limited to security, building automation systems, backup power, and automatic emergency recall operation.

5.2 The interface panel shall be a minimum of an 18” x 18”’ box with adequate terminal blocks for the amount of inputs and outputs between the elevator controller and the signals being provided.

PART 2 – TECHNICAL REQUIREMENTS

6 INTRODUCTION

6.1 Part 2 of these guidelines is intended to provide consistent technical processes across all HCFs.

7 BARRIER FREE ACCESS

7.1 All elevators shall meet requirements of the latest edition of the B44-16 Safety Code for Elevators for barrier free access.

7.2 Additional requirements to the information specified in the Appendices of B44-16 (per applicable clause) shall be provided at facilities identified as requiring greater access, including but not limited to residential care facilities, specialty HCFs (i.e. GF Strong and Blusson), or providing services to Clients with limited mobility security requirements.

7.3 All elevators shall be equipped with the required functionality to restrict access. The inputs for security shall be separate from the cab (or hall) inputs.

7.4 An interface between the elevator controller and the security system shall be provided to facilitate isolation of the systems from one another for testing purposes.

7.5 Elevator software shall be programmed to ensure Fire Service Phase II shall override any call restrictions.

8 SECURITY

8.1 Secutiry requirements are to be assessed on a case by case basis for Healthcare Facilities and approved by the HA, FMO and IPS.

9 ELEVATOR PERFORMANCE

9.1 Elevator performance shall be based on industry standards with respect to speed, levelling accuracy and door operation times. At a minimum, performance specifications shall meet all relevant code requirements and any additional site specific requirements, including per Appendices to this document.

9.2 Elevator performance criteria shall be considered when evaluating, calculating and specifying the quantity, speed, and capacity of the elevators in each HCF. Elevator performance shall meet or exceed the intended specific requirements of each HCF.

9.3 Door Hold/Re-Open Process

If an obstruction is encountered that prevents the elevator door from closing, the following process shall occur:

.1 The door shall stop and re-open. The elevator nudging sequence shall commence as follows:

a) Doors shall close at reduced speed and energy (in accordance with the B44 Safety Code for Elevators).
b) If the doors cannot close, they shall re-open and wait for 30 seconds before attempting to close again.
c) The elevator shall cycle through this sequence three (3) times before removing itself from service.
d) After a five (5) minute interval has elapsed, the elevator shall re-start the sequence.
e) If after three (3) complete cycles the doors fail to close, the elevator shall be removed from group operation.
f) If the elevator is equipped with remote monitoring, it shall be programmed to alert the Elevator maintenance provider, and/or a facility designates(s), of the issue.
g) The cab operating panel information display screen shall be programmed to inform the public of the issues as it cycles though the program cycles noted in this clause.

.2 MEO and PSO shall have the ability to override the nudging sequence at any time.

10 PERFORMANCE REPORTING

10.1 One (1) eight (8)-digit electromechanical trip counter shall be provided in each elevator controller. It shall be programmed such that the number will advance for each trip the elevator makes and will not advance for door re-opening.

10.2 Recording of elevator faults and events shall be included as part of the elevator control system.

10.3 If the elevator is equipped with remote monitoring, it shall be programmed to alert facility designate(s), of any faults that arise for each elevator.

11 RIDE QUALITY

11.1 Horizontal and vertical acceleration within the cab during all ride and door operating conditions shall typically be not more than 20mg peak to peak (adjacent peaks) in the 1-10 Hz range.

11.2 Acceleration and deceleration shall be smooth, constant and typically not less than 3 feet/second, with an initial ramp between 0.5 and 0.75 seconds.

11.3 Sustained jerk shall be not less than 6 feet/second.

11.4 Measurement and evaluation of the ride quality shall be consistent with ISO 18738, using a low pass cut-off frequency of 10.

12 RUNNING CLEARANCE

12.1 Where achievable based on the design of the elevator equipment, the running clearance between the hall sill and the cab sill shall be reduced to less than 1” and not exceed the code

maximum of 1.25” to provide a smooth transition for wheeled carts and/or equipment over the gap.

13 VIBRATION AND ACOUSTICAL ISOLATION

13.1 Elevator equipment shall be sufficiently isolated to avoid transmitting noise and vibration to the structure.

13.2 Design for vibrations and isolation of structural components shall meet the requirements of CSA Z8000.

13.3 Design of all elevator components shall consider the frequency of the surrounding building.

14 ACOUSTICAL LIMITS

14.1 Machine room noise levels shall not exceed 80 dBA.

14.2 Door operation noise levels shall not exceed 63 dBA (CSA 8000).

14.3 Sound levels shall be measured in accordance with industry standard sound meters and specification.

14.4 Sound meters, if deemed necessary for clinical reasons shall be provided in the machine room, the cab and in any areas deemed sensitive to acoustical limits by the HCF. The sounds meters shall monitor and record data, that can be provided to the HCF.

15 PAINTING

15.1 At the end of the construction or modernization project, elevator pits shall be thoroughly cleaned to remove any residual grease, oil and any debris. Elevator pit floor and walls, shall be painted with a grey, high-gloss durable paint up to the level of the lowest landing. The Elevator pit floor shall be painted with a white or grey semi-gloss durable paint.

15.2 At elevator construction completion, the machine room floor shall be thoroughly cleaned to remove any residual grease, oil and debris. Any holes in a concrete floor will be patched or repaired with concrete to match existing floor. The floors shall be painted with a white or grey semi-gloss durable paint.

15.3 For clean and sterile processing elevators (including dumbwaiters), the full height of hoistway walls, including the elevator pit walls, shall be painted with a white high-gloss, anti-microbial, durable paint to aid infection control.

15.4 Paint product specifications shall be provided by the contractor to the Project Manager for approval by HA before painting commences.

15.5 Paint safety guards and moving parts such as the outside of the elevator sheave related components safety yellow.

15.6 Where practical, provide a painted yellow line 8” wide on the floor with the word “CAUTION” stencilled in contrasting colour separating the immediate machine area(s) from remaining elevator equipment room.

16 EMERGING TECHNOLOGIES

16.1 Proposals for new technologies shall be provided including but not limited to those that aid in limiting patient risk, increase infection control and improve passenger circulation times.

16.2 Particular consideration shall be given to technologies that address energy efficiency and environmental performance.

16.3 All technologies proposed for implementation must have an established and proven track record to be included in the specification. Final approval is required from the Manager, Contracts and Optimization.

17 GUIDES

17.1 Elevators shall be equipped with roller guides for the cab and counterweights.

18 TRAVELLING CABLES

18.1 Travelling cables shall be designed for the appropriate elevator use.

18.2 A suitable number of spare conductors shall be provided:

.1 Four (4) shielded pairs above those pairs used for the control and operation of the elevator
.2 Two (2) spare #14 gage conductors
.3 Ten (10) spare #18 conductors

18.3 Travelling cables shall take into account future technological needs at the time of installation.

18.4 Travelling cables shall be round, not flat, for all elevators.

19 DOOR OPERATORS

19.1 Heavy duty door operators with closed loop control shall be provided to all elevators.

19.2 Preference shall be given to heavy duty linear door operators. Acceptable products are the VFE2500 Linear Door Operator by GAL Canada or approved equivalent.

19.3 Where linear door operators are not practical, spring door operators shall be utilized. Acceptable products are the MOVFR or ECI 2500 Harmonic Operator by GAL Canada or approved equivalent.

19.4 Where door operators are replaced, all door rollers, linkages and guides shall be replaced.

20 FRONT AND REAR ENTRANCES

20.1 Front and rear elevator entrances in the same cab shall only be used when there is an unavoidable operational necessity. Their use shall be limited as much as possible to reduce ongoing MEO requirements, increased risk of damage to elevators and to simplify way-finding.

20.2 The design of the elevator and elevator cab must be able to withstand heavy use and bumping without damage to doors and panels rendering the elevator inoperable.

21 CAB OPERATING PANELS

21.1 Every elevator and associated operating panel(s) shall be wired to provide fire service, security, priority service and Medical Emergency Operation (MEO) features, regardless of the whether the feature is deemed a requirement of the facility at the time of design.

21.2 Medical Emergency Operation shall be wired in all elevators as the building and elevator requirements may change over time, exceptions may be made for Freight Elevators.

21.3 Floor/level labels shall match the floor/level labels of the facility.

21.4 For certain situations, touch screens may be considered for ease of cleaning and maintenance. Buttons are preferred. Areas that may be considered for touch screens are:

.1 Towers such as JPS at VGH or Columbia Tower at RCH
.2 MDRD elevators (for infection control purposes)
.3 Heliport Elevators for providing information in the Elevator cab (ie: MEO operation)

21.5 At a minimum, the following components shall be provided to each operating panel:

.1 A single button per floor (except for front and rear doors where necessary)
.2 An emphasis mark for the lobby/main floor such as a star or asterisk
.3 Door open and door close buttons
.4 A door hold button shall be provided for each front and rear doors (where applicable).
.5 A surface mounted independent service keyed switch with the appropriate designated coloured ring
.6 A fire service operation keyed switch with the appropriate designated coloured ring
.7 An emergency call button An alarm button
.8 A card reader (for MEO, Priority Service etc.) preferably integrated flush with the operating panel

21.6 Door open, door close, and door hold buttons shall be engraved in English with the description of their function in addition to the code requisite international symbol.

21.7 Car call and door operation buttons shall be equipped with LED illuminating rings or elements.

21.8 All components of the operating panel shall be selected to minimize joints, recesses and dirt traps to aid in the management of infection control. Approved manufacturers of car and hall operating panels include Dupar, MAD and Schaefer with these specifications incorporated.

21.9 All operating panel materials shall be selected to tolerate the regular use of hospital grade cleaning agents without degradation.

21.10 All operating panel materials shall be selected to tolerate occasional sterilizing cleaning agents (such as bleach) without degradation.

21.11 Where front and rear doors are required, front door call buttons shall be located on the left side of the operating panel; rear door call buttons shall be located on the right side of the operating panel, front and rear line up on the same level. Door operation buttons shall be clearly labelled as the front and rear doors e.g. [F3, R3] or [F1, R3].

21.12 Where front and rear doors are required, two operating panels shall be provided, one at each end of the elevator cab adjacent to the doors.

21.13 Cab operating panels shall include a hands free phone and activation button which shall have a priority call service connection to 24/7 personnel (not voicemail) monitoring, per the facility emergency response protocols, procedures and contracts.

21.14 A cab position indicator shall be mounted at the top of the panel, or programmed into the display screen of the operating panel, to indicate the current location and direction of travel of the elevator.

21.15 At least two (2) spare slots shall be provided in the service panel for future services.

21.16 An electrical outlet shall be provided with ground fault circuit protection in the service panel and in the side of the cab. For clarity, the cab electrical outlet is provided for convenience.

21.17 An emergency cab light shall be provided.

21.18 Subject to HCF request and approval, options for in-cab display screens (in addition to touch screens for elevator operations) that meet the TSBC requirements shall be provided if requested by the HCF.

21.19 For elevators that are equipped with a display screen, floor/level labels shall be programmed specific to the HCF requirements. Text and information presented shall be agreed to in writing with the Facility Manager and/or designate(s), prior to preparation of shop drawings by the contractor.

21.20 Stainless steel buttons and components of the operating panel are often preferred in Healthcare settings. Stainless steel, or, copper alloy plating of all elements on the operating panel – with the intent of improving infection control - shall be included as an alternate option for pricing in construction documents.

21.21 Layout examples of operating panels are included in the Appendices to this document and shall be used as the basis of design for all operating panels.

21.22 Integrated flush mount card readers (for MEO, Priority Services, etc.) shall only be considered when specifically requested by the HCF. In most cases, they should be avoided.

21.23 Options for in-cab display cases for advertising and media that meet infection control and TSBC requirements shall be provided when requested by HCF's.

22 DOOR HOLD

22.1 A door hold function shall be installed on every elevator installed in a HCF with the exception of Freight Elevators which are application specific.

22.2 The door hold function is initiated by a push button in the cab to extend the door dwell time and allow the movement of slower passenger, beds or other equipment that requires extra time to load or unload.

22.3 The door hold button shall be centrally located on the operating panel, adjacent to the door open and close buttons, clearly labelled "DOOR HOLD".

22.4 The door hold button shall illuminate while in door hold mode.

22.5 Door hold mode shall be canceled by pressing the door close button.

22.6 The door hold function shall be adjustable for each elevator to extend the door dwell time between 20 - 120 seconds. By default, the door hold dwell time shall be set to 45 seconds

23 HALL CALL BUTTONS

23.1 Hall call buttons shall be located in the most convenient location (e.g. closest to the main circulation route) for single elevators or groups of multiple elevators.

23.2 Hall call buttons intended for staff use only shall be located adjacent the elevator or bank of elevators in consultation with the HCF's, fully separated from call buttons used by the public. Signage shall indicate staff use only.

23.3 Where practical, preference shall be given to Vandal Resistant Jumbo Hall Call Buttons.

23.4 If the cab operating panels utilize touch screens, obtain alternative pricing for touch screen hall call buttons.

23.5 Supplementary information is included in the Appendices to this document.

24 HALL LANTERNS AND POSITION INDICATORS

24.1 Hall lanterns and position indicators shall be provided above each elevator door, at each landing location.

24.2 Where only one (1) elevator is provided, a hall lantern and position indicator shall be provided at each elevator lobby above the doors.

24.3 The specification of the position indicators shall also be selected to allow the display of exception indicators to indicate, as a minimum, the following signals:

.1 Elevator Travel Direction
.2 Fire Fighter Operation
.3 Medical Emergency Operation
.4 Out-of-Group Operation (including independent service, priority service, inspection etc.)
.5 Out of Service

25 IN-CAB LANTERNS

25.1 Where only one (1) elevator is provided, in-cab lanterns are acceptable in lieu of hall lanterns.

26 VOICE ANNOUNCER

26.1 In-cab voice announcers shall be provided capable of broadcasting audible messages that shall, as a minimum:

.1 Be mounted in the cab operating panel
.2 Shall have a field programmable selection for type of voice and basic messages which include but not limited to:

i. Landing where cab is stopping
ii. Direction of travel
iii. Nudging Operating
iv. Fire Fighter Operation
v. Emergency Power Operation

27 PHONES

27.1 Separate elevator phone lines are required for each elevator run to the elevator machine room or agreed termination point for the building from the elevator cab.

27.2 Approved phone products for installations and upgrades are Emercom, , Rath MicroTech and Webb. Phone products for the elevator must be non-proprietary and able to be re-programmed at any time by any qualified elevator technician.

28 IN CAB POSITION INDICATORS

28.1 Cab position indicators shall be provided in each cab operating panel.

28.2 Cab position indicators shall have digital displays with a minimum display height of 50 mm.

28.3 Cab position indicators shall show at least:

.1 Landing where elevator has stopped
.2 Arrows showing direction of travel when the elevator is moving

28.4 Where a display panel is provided in the operating panel, the position indictor shall be integrated into the programming of the display panel.

29 CAB INTERIOR FINISHES

The objective for all cab interiors is to provide aesthetically pleasing results that effectively complement infection control requirements, patient, staff and public transport and comfort. Cab interior finishes shall vary based on the type and usage of each elevator and HCF. The following are considered general best practices.

29.1 All cab interior finishes shall be selected to tolerate the regular use of hospital grade cleaning agents without degradation.

29.2 All cab interior finishes shall be selected to tolerate occasional sterilizing cleaning agents (such as bleach) without degradation.

29.3 Cab Interior Finishes – Flooring

.1 All Elevators shall be equipped with a durable flooring surface suitable for healthcare such as Tarkett Healthcare Flooring, Marmoleum by Forbo, or approved equivalent. Products shall be slip resistant, resilient flooring with anti-microbial properties and installed between cab walls and/or bumpers rails such that the flooring can be removed independently of other elevator components. In new elevator installations the elevator sub floor shall be steel to increase the longevity of the elevator.
.2 No jointing shall be permitted in floor covering.
.3 Checker plate floor covering shall not be utilized unless in a specialized application such as a garbage freight elevator.

29.4 Cab Door Finishes (Interior)

.1 Cab door panels shall be finished with an ASTM type 304 brushed stainless steel #4 finishes with a vertical grain.

29.5 Cab Wall Finishes

.1 Laminate finishes shall be provided from the floor to the intersection with the ceiling.

.2 For larger cabs where seams are necessary, they shall be vertical and placed symmetrically in the cab. Seams shall be minimized and as flush as possible to avoid dirt traps and facilitate ease of cleaning.
.3 An electrical outlet shall be provided in the sidewall of the Cab in addition to any that may be in the COP/Service Panel.
.4 Trespa, stainless steel or other approved product equivalents are to be used for Cab interirors.

29.6 Elevator Handrails

.1 Handrail terminations shall be turned into the cab wall to prevent snagging. Handrail ends shall terminate tightly flush to the cab wall.
.2 Handrails shall be continuous around cab walls to minimize terminations and fixtures.
.3 Handrail profiles – circular or flat – and offsets from the cab wall shall be selected to suit the predominant requirements of patients at the HCF.
.1 If the elevator is a Service or Freight Elevator used for patient transfer, food transfer, housekeeping, or facility operations flat hand rails should be considered
.2 If the elevator is a passenger elevator used in acute hospitals, residential care facilities, or specialized HCF's (i.e. BC Cancer) then round hand rails should be considered.
.4 An option for copper alloy film coating – to aid in managing infection control - shall be requested as an alternate option in the tender/RFP documents.
.5 All handrails shall be easily demountable for replacement if/when damaged.

29.7 Bumper rails

.1 Service cabs, freight elevators or other elevators where the HCF requires additional cab protection due to predominant usage, shall be equipped with durable timber bumper rails to protect the lower walls from damage from carts and other vehicular traffic on all cab walls without doors.
.2 In passenger elevators, lower bumper rails are optional based on feedback from the HCF, but if installed shall be stainless steel located on all cab walls without doors.
.3 All bumper rails shall be easily demountable for replacement if/when damaged.
.4 Finished height off finished flooring should be equal or close to 3.5" to the bottom of the bumper rails or as otherwise specified by the HCF.

30 CAB LIGHTING

30.1 All elevators that are primarily used for Patient Transport shall be equipped with indirect lighting. The HCF shall be consulted on the use of direct/indirect lighting. LED strip lighting is preferred. Lighting provided shall meet the minimum requirements per the Safety Code for Elevators (100 lx).

30.2 Elevators that are not primarily used for patient transfer may utilize LED pot lights. LED strip lighting is preferred in most cases unless pot lights already exist. The HCF shall be consulted on

the use and type of direct/indirect lighting. Lighting provided shall meet the minimum requirements per the Safety Code for Elevators (100 lx).

30.3 Designs shall avoid the collection of dust, minimize cleaning requirements, and meet minimum infection control requirements.

30.4 Lighting fixtures shall be located in the ceiling recesses. Bulbs where used shall be replaceable without the requirement to gain access above the ceiling space. See Appendices for indicative sketch.

31 ELEVATOR ENTRANCES, DOOR FRAMES AND DOOR FINISHES

31.1 The finish of lobby/hall doorframes and doors shall be specified as appropriate to the HCF.

.1 In hospital and acute care facilities, door frames and hall door panels shall be stainless steel.
.2 In care homes or administration buildings, alternative finishes such as painted or baked enamel, or wood shall be considered, as appropriate for the HCF.
.3 Laminate or stainless steel corner returns, as appropriate to the facility, shall be provided as protection to all hall wall returns.

31.2 Infrared detectors shall be provided to all elevator entrance doors to signal the door to stop and re-open when the curtain of light beams is disrupted.

31.3 Detectors shall be provided for all elevators, excluding freight, to signal the operation of the door (i.e. green if open, flashing red if closing). Acceptable products include Panachrome by Avire, or approved equivalent.

32 REQUIREMENTS FOR HYDRAULIC ELEVATORS

32.1 The use of hydraulic elevators shall be limited to appropriate building applications in lieu of traction elevators.

32.2 Where an elevator machine room wall is also an external building wall, a tank heater shall be provided.

32.3 An oil level indicator, with a visual display of the oil level, shall be provided on each hydraulic elevator tank.

32.4 Gate valves shall be provided, both in the machine room and in the pit of each elevator.

32.5 A motor soft starter shall be provided on all hydraulic elevators.

33 REQUIREMENTS FOR TRACTION ELEVATORS

33.1 Cab frames and platforms shall be balanced to ensure the cab frame rests, without putting unnecessary pressure on the cab guides.

33.2 Traction machines shall be mounted such that they are adequately isolated from the building structure to prevent the transmission of noise and vibration through the building structure.

33.3 Cab platforms shall be suitably isolated from the cab frame to allow for smooth ride quality.

33.4 Traction motors shall be placed in a machine room.

33.5 All parts of the traction motor and machine shall be non-proprietary as outlined in these Technical Guidelines.

34 MACHINE GUARDING

34.1 Guards shall be provided to machines with traction sheaves to:

.1 Provide a safe machine room environment;
.2 Protect the ropes from any machinery or equipment that may fall.

35 CONTROLLERS

35.1 Controllers shall be non-proprietary as defined by these guidelines.

35.2 Controllers shall have built-in, on-board diagnostics. Access to diagnostics and fault codes shall be readily available with the control equipment, and shall be displayed and logged on a non-proprietary network.

35.3 Controllers shall be approved in accordance with the A17.1/B44-07 Safety Code for Elevators.

35.4 Controllers shall be provided with suitable electrical protection in the event of power fluctuations and other low, high or zero voltage conditions.

35.5 Controllers shall have all of the operational capabilities to meet the requirements in these specifications.

35.6 Controllers shall be equipped with an RFI Filter to reduce EMI and RFI noise.

35.7 Controllers shall comply with IEEE 519.

35.8 Acceptable manufacturers for non-proprietary controllers include MCE I-Control for high demand elevators or groups, MCE 4000 for low demand traction elevators or groups, MCE 2000 for low demand hydraulic elevators or groups, and approved equivalent(s). Preference shall be given to I-Control systems, or approved equivalents, for car groups with high demand or additional features such as MEO, Priority Service, Fire Service, Security, etc.

35.9 All controller(s) mounts shall be seismically restrained.

35.10 All controllers shall be installed on a raised platform provide by the OEM in the machine room.

35.11 Controller shall be located in the machine room of the elevator.

36 ELEVATOR IDENTIFICATION

36.1 Elevator identification is noted as a critical design element, in particular at HCFs with multiple buildings and multiple elevators.

36.2 All elevator identifications shall be coordinated with the existing HCF where there are existing buildings and elevators.

36.3 Elevator identification shall be logical numbers/codes that relate to the HCF and existing elevators.

36.4 Repetition of numbers/codes and/or identifiers that are similar shall be avoided, including between buildings at the same HCF.

36.5 All proposals shall be approved by the Manager, Contracts and Optimization, Facility Manager, prior to design completion.

36.6 All motors and controllers shall be clearly labelled with the elevator name and TSBC identification number clearly visible for any inspection or maintenance.

37 ELEVATOR DISPATCHING

37.1 Collective Operation for Single Elevators:

.1 Cabs shall operate from call buttons located within the cab and hall call buttons located at each floor landing. When a cab is available, it shall automatically start and dispatch to the registered hall call location. Once the cab starts, it shall respond to registered calls in the direction of travel and in the order the floors are reached.
.2 The cab direction shall not reverse until all calls have been answered, or until all hall calls ahead of the cab and corresponding to the direction of cab travel have been answered.
.3 Calls shall be answered corresponding to the direction in which the cab is traveling, unless the call in the opposite direction is the highest (or lowest) call registered.
.4 Call buttons shall illuminate to indicate call registration. Extinguish call buttons once calls have been answered. In cab calls shall be cancelled in the same manner.
.5 The elevator shall remain at the last call answered for an adjustable time period, by default set at five (5) minutes. Once this time period has expired, the elevator shall return to the main lobby.

37.2 Group Control and Dispatching

.1 The cabs shall operate as a group, capable of balancing service and providing continuity of group operation with one or more cabs removed from the system.
.2 A hall call(s) shall be rendered ineffective until cab doors begin to close after passenger transfer. In cab calls shall be cancelled in the same manner. Priority shall be given to coincidental cab and hall calls in the cab assignment.

.3 The controls shall be programmed to meet changing traffic conditions on a service demand basis. Provisions shall be included for to control heavier traffic in either direction, intermittent or low demand. As traffic demands change, group and individual cab assignments shall automatically and continually change to provide the most effective and efficient means to handle current traffic flow. Means to detect long-wait hall calls shall be provided with preferentially service response capabilities.

.4 Priority shall be provided to coincidental cab and hall calls in hall call assignment.

.5 Cab direction reversal shall be achieved without closing and reopening cab doors.

.6 System software shall be easily reprogrammable. A basic algorithm shall be designed to optimize service, based on equalizing system response of registered hall calls and equalizing passenger trip time to the shortest possible time.

.7 Floors below main floor shall be programmed to logically minimize delays in passing or stopping at the main floor in both directions of travel. Manual means shall be provided to force a stop at the main floor when passing to or from lower levels.

.8 Backup dispatching shall function in the same manner as the primary dispatching.

.9 Delayed cabs shall automatically be removed from group operation until the delay has been resolved.

.10 The cab position shall update on position indictors (hall and cab) when passing or stopping at each landing.

.11 Multiple power sources and separate fusing shall be provided for call button risers to avoid hall call button failure.

.12 Serial or duplicate communication links for all group and individual cab computers shall be provided.

38 REMOTE ELEVATOR DISPLAY, MONITORING, AND CONTROL

38.1 Unless otherwise provided in writing by the Manager of Contracts & Optimization, Facility Manager or Clinical Operations, independent monitoring screens shall be provided at designated locations in the facility or other designated locations within the HCF site.

38.2 All remote monitoring systems shall be non-proprietary.

39 ELEVATOR MANAGEMENT SYSTEM

39.1 Non-proprietary Elevator Management Systems (EMS) shall be provided as appropriate to the size and complexity of the HCF.

39.2 All elevators shall be equipped with programmable inputs to accept signals from the facility Building Automation System to provide multiple functions including but not limited to restrict the ability to put additional cabs on independent service, if one (1) cab in a group is already out of service.

39.3 The elevator shall be equipped with programmable outputs to allow discrete signals to be sent to the facility building automation system, including but not limited to when the:

.1 Cab is out of service;

.2 Cab is on medical emergency;
.3 Cab is on inspection operation;
.4 Cab is on independent service;
.5 Cab is in fire service.

39.4 The EMS shall maintain a record of every status point change occurring on the monitored equipment and provide the ability to replay these events in simulation at a later date in real time, slow speed, single-step, reverse or fast forward. This information shall be retained for a period of at least twenty-six weeks and archived and automatically sent monthly to the Facility Manager or their delegate (delegates) thereafter.

39.5 The EMS shall store traffic fault and statistical data for a period of at least three (3) years. The system shall log error type, cab number, floor position, and major system status points whenever a fault or logged event occurs.

39.6 The EMS shall provide interactive control of required features provided in the elevator control system. These features shall be revised as the requirements of the building change. Interactive controls may include but are not limited to security floor lockouts, entering cab and hall calls, firefighters' service, lobby recall, priority service and up/down peak service.

39.7 In the case of a power failure, the EMS shall be capable of connecting to an emergency power back-up unit. The loss of power shall not affect any stored data. The system shall have the capability to detect the loss (disconnect) of any individual unit from the monitoring system, by periodically polling all units to ensure that normal communications between the unit(s) and the terminals/server are maintained.

39.8 The EMS shall automatically and immediately re-boot the program and continue to operate after a power loss or other system malfunction.

40 INDEPENDENT SERVICE

40.1 A keyed switch shall be provided with the appropriate designated coloured ring, surface mounted to each cab operating panel marked "Service".

40.2 When the key is turned to the "ON" position, the cab shall be removed from group operation and not accept any hall calls.

40.3 The elevator shall park with the doors open at the required floor.

40.4 An in-cab call can be registered, and operation of the elevator shall be initiated, when the cab call or door close button is continually pressed, until the cab doors are completely closed.

41 INSPECTION OPERATION

41.1 Inspection operation shall be provided in all elevators in accordance with Safety Code regulations.

42 HOISTWAY ACCESS OPERATION

42.1 Hoistway access operation shall be provided in all elevators in accordance with Safety Code regulations.

43 MEDICAL EMERGENCY OPERATION (MEO)

43.1 Note: Medical Emergency Operation (MEO) was formerly referred to as “Code Blue”.

43.2 Definitions

.1 MEO Stage 1 is the operation where an elevator is recalled directly to a specific level as requested by HCF Staff

.2 MEO Stage 2 is the operation of the elevator after MEO has been initiated from within the cab.

43.3 MEO shall be installed to provide rapid response in a Medical Emergency.

.1 MEO should be installed on the majority of elevators in a HCF as the purpose of the areas the elevators serve tend to change over time. Exceptions are freight elevators, bed lifts, scissor lifts, and barrier free lifts.

.2 MEO is installed to provide medical staff priority use of the elevator to provide rapid response in a medical emergency.

43.4 MEO Stage 1 shall be initiated by standard keys in all cases and a corresponding key switch ring with the appropriate designated matching colour. They shall be equipped with:

.1 Three (3) positions: CANCEL / OFF / CALL. The “Off” position shall be the neutral position where the key can be inserted and removed. The “CANCEL” and “CALL” positions shall be a momentary position to toggle the request between call and cancel requests.

.2 An illuminating indicator adjacent to the switch shall indicate that a cab is being called for a MEO.

.3 Remote call locations may be required to initiate MEO operation from other locations for the convenience of the medical emergency staff. The locations include but are not limited to Nursing Stations, Emergency Rooms, Heli-Pad landings or other location where expediting the MEO operation will ensure better and faster cab response times for the patient. Design considerations shall be included to prevent false calls from remote call locations.

44 PRIORITY SERVICE OPERATION (PSO)

44.1 Priority Service Operation shall be provided where elevators are required to move patients on beds or other large equipment that requires an empty elevator.

44.2 PSO initiating buttons are to be mounted in a discrete location, to be agreed with the Facility Manager, away from the main hall push button risers.

44.3 Priority Service initiated by a proximity reader shall be arranged as follows.

.1 A key switch with the appropriate designated colour ring shall be provided at every elevator landing location designated by the Facility Manager and/or delegate(s) and labelled “STAFF ONLY”.
.2 The key switch shall have three (3) positions: CANCEL / OFF / CALL. The “Off” position shall be the neutral position where the key can be inserted and removed. The “CANCEL” and “CALL” positions shall be a momentary position to toggle the request between call and cancel requests.
.3 An illuminating indicator adjacent to the switch shall indicate that a cab is being called for a PSO.
.4 The actuation of a priority service switch shall remove the elevator from group operation, complete any cab calls previously made by current passengers, and then respond directly to the priority service level called with the intent that the elevator should then be empty.
.5 The elevator shall make one (1) express run once it has responded to an express priority call and then return to normal group operation.

44.4 Priority Service initiated by a keyless system shall operate as follows:

.1 A switch shall be provided and labelled “STAFF ONLY”
.2 The actuation of a priority service switch shall remove the elevator from group operation, complete any cab calls previously made by current passengers, and then respond directly to the priority service level called with the intent that the elevator should then be empty.
.3 The elevator shall make one (1) express run once it has responded to an express priority call and then return to normal group operation.

45 WANDERING PATIENT / INFANT THEFT SYSTEM REQUIREMENTS

45.1 Elevators shall be equipped with software that shall interface with a third party wandering patient / infant theft system. Requirements shall be determined at each HCF during the design specification phase.

45.2 If the wandering patient / infant theft system detects that a patient is in an elevator, the elevator shall not accept any cab calls.

45.3 The elevator system shall have the means to accept an additional input for an override of the wandering patient / infant theft system, to permit the activation of cab and hall calls by a third party external to the elevator.

45.4 The wandering patient / infant theft system shall be connected to the elevator control system in the machine room and provide dry contacts to activate the lock out of floor calls. These connections shall only be permitted in the elevator controller junction box described in Section 5 of the General Requirements for Elevators.

46 RESTRICTED ACCESS

46.1 Note: Restricted access to elevators is intended to fulfil two functions:

a) Restrict access to various floors from within the cab (restricting cab calls)

b) Limiting access to elevators (restricting hall calls)

46.2 The default standards for floor security access are as follows:

.1 The security systems shall be isolated from the elevator control system with an interface box and terminal strips (see also Section 5 of this document).
.2 Elevators shall have resident software capable of interface with security systems.

46.3 Restricted Cab Call Operation

.1 Restricted access to car calls is to prevent unauthorized access to various floors and provides secure access for designated users.
.2 The security system shall provide one (1) dry contact in the machine/control space per floor designated as under restriction.
.3 Fire Fighter Operation Phase II must override any restrictions on cab call buttons.

47 SECURITY

47.1 Where security cameras are provided within the cab interior (for safety, wandering patient, infant theft or other) the following criteria shall be met:

.1 Adequate conductors shall be provided to the travelling cable
.2 Mounting of camera shall be by an elevator contractor
.3 Site specific requirements and restrictions shall be coordinated with the facility

48 EMERGENCY BACKUP POWER

48.1 The number of elevators required to be equipped with emergency backup power shall be designated separately for each HCF.

48.2 When elevators are operating on emergency backup power, elevators shall automatically recall and park elevators at designated floors. This is typically the lobby but will vary at certain HCF for critical patient requirements.

48.3 The elevator software shall accept an input from the building to advise that the elevators are operating on emergency backup power

48.4 The elevators software shall accept a pre-transfer signal from the building, to advise that the source of power is about to change (either from Normal to Standby, or returning to Normal Power). If this signal is “ON” , elevators shall remain parked, or any elevators in motion shall stop at the next landing and open the doors to decant the passengers. Required response times shall be provided in each project specification suitable for the HCF.

48.5 The number of elevators required to run on emergency backup power shall be determined as appropriate to each HCF in conjunction with the Facility Manager, their designate(s) and/or the HA. Typically a minimum of 1 elevator per group shall be equipment with emergency backup power.

48.6 During specification preparations, any current generator capacities and connections required for designated elevator emergency backup power shall be confirmed. If the information is not available from the facility, it shall be included for review and confirmation by the contractor.

48.7 When power at a facility is lost but immediately reinstated, all elevator systems shall have the capacity to automatically return to service, within 5 minutes, without the requirement for servicing or the maintenance vendor to reset the system.

48.8 All emergency back-up systems must be tested prior to commissioning including under load to ensure generators, switchgear, controllers and transfer systems are fully operational and function as intended for the elevator to function. The tests must be documented, witnessed and signed off by the elevator consultant of record, elevator installation company, Facility Manager or Contract Manager, Facilities or their designates.

49 EMERGENCY RECALL OPERATION

49.1 Emergency Recall operation is required on all new elevators.

49.2 The selection of the designated recall level and any alternate recall levels shall be determined based on the minimum requirements of the safety code, and for the safety of the patients and non-ambulatory passengers. For example, a parkade level may be a better alternative for wheelchair bound passengers to safely exit the building.

49.3 The requirements of the fire department shall be considered where conflicts in requirements are identified.

50 SIGNAGE

50.1 Elevators shall be provided with signage and markings per all relevant codes.

50.2 Elevators shall be identified at the main recall level and all levels of buildings more than 3 stories.

50.3 Elevators shall be provided with hall tactile identification markings on both sides of the jambs at each landing for the visually impaired.

50.4 The Designated Fire Fighter Elevator shall be identified as the recall level.

50.5 The alternate recall level of the elevators shall be marked on the fire service keyed switch and at remote fire service switch locations.

51 TRAUMA PATIENT ELEVATOR CABS

51.1 Non-public use elevators used to transport patients shall have the capacity to accommodate a bariatric bed, up to four staff, four IV pumps, extra corporeal life support equipment, portable ventilator, oxygen tanks and monitors; and have enough space to allow for staff to complete emergency procedures within the elevator.

51.2 Custom sizing of these elevators shall be provided by the trauma team at each HCF. Where achievable, the elevators shall be designed through the assessment of actual simulations prior to specifications.

52 SERVICE ELEVATORS

52.1 Any elevator that is used primarily to move heavy services, including but not limited to linen, food, supplies or portable MRI machines, shall be rated as Class C loading (in accordance with the most recent edition of the B44 Safety code for Elevators).

52.2 Service elevators for movement of food services supplies and/or other heavy loads (e.g., portable X-ray) shall be provided. Where service elevators are provided, at least one shall have a minimum loading capacity to accommodate a single piece load of at least 2270 kg and single axle loading of 1135 kg.

53 MEDICAL DEVICE REPROCESSING VERTICAL TRANSPORTATION

53.1 Where vertical transportation is required for medical device reprocessing, preference shall be given to elevators rather than dumbwaiters and separate elevating devices provided for each of the sterile and soiled processes. Any installation of dumbwaiters in Acute Care facilities requires the approval of the Manager of Contracts & Optimization and Vancouver Coastal Health.

53.2 Where Medical Device Reprocessing is the elevators main function the level of infection control shall increase and the final design shall be signed off by the clinical staff on site, infection control, and the manager/director for the medical device reprocessing department for that HCF.

53.3 All devices for Medical Device Reprocessing using dumbwaiters shall be of robust design with special consideration given to doors, locks, motors and equipment to ensure reliable and continuous operation without failure or breakdowns and continuity of supply and technical support.

54 ALLOWANCE FOR ADDITIONAL WEIGHT

54.1 Elevators shall be provided with the capacity to accommodate 10% extra weight for cab finishes above the rated capacity.

55 EQUIPMENT ACCESSIBILITY

55.1 Provisions shall be made to elevator components and/or designated spaces to enable the removal and/or replacement of the largest elevator component from the space for servicing and/or replacement at a later date. This includes but is not limited to machine room doors and, where required, access hatches in the machine room floors and/or walls and/or external cladding to transfer and land equipment. Special consideration shall be shown provided if a crane is required designating where they will set and the limits available to operate within up in any future modernization or repair required. Where required, particularly at sites with restricted access to

the machine room and/or HCF surroundings, elevator components shall be designed to be removed in smaller components to facilitate reasonable removal and/or replacement.

55.2 Hoist beams shall be provided in hoist ways, machine rooms and control spaces to facilitate servicing of elevator components and removing sections of the elevators and equipment as required.

56 ELEVATOR MACHINE ROOMS

56.1 All elevators shall be equipped with a machine room.

56.2 Where requested, an IT drop shall be provided in machine rooms for the purposing of transmitting information from the local controller to a remote monitoring station.

PART 3 – ELEVATORS IN NEW HEALTHCARE FACILITIES

57 INTRODUCTION

Part 3 of these guidelines is intended for use in specifying new elevators in new HCFs.

57.1 Elevators shall be located and designed to accommodate the diverse activities of each HCF, and their crucial role in HCF operations, care, staff and patient circulation, Elevators must contribute to the overall efficiency and effectiveness of facility operations for staff and patients,. Elevator systems shall be designed to accommodate the wide range of user and functional requirements to satisfy requirements for safety, reliability, longevity, responsiveness, accessibility, and operational efficiency. In most acute hospital settings, the impact of patient flow will be a major consideration when designing the elevator. In conjunction with associated architectural, structural, and related design provisions, elevators shall be designed to accommodate potential vertical expansion, increased capacity and/or change-in-use of the HCF, with a minimum of alterations. This may be accomplished through the inclusion of additional elevator shafts for future development.

58 ELEVATOR DESIGN BY FUNCTIONAL REQUIREMENT

58.1 Elevator design shall take into consideration the end use of the equipment. The purpose of the elevator shall be defined at the commencement of every project and the necessary technical guidelines incorporated into project specifications for approval by HA and Manager, Contracts and Optimization.

58.2 Various Elevator Purposes include but are not limited to:

.1 Heavy Passenger Use (Acute Hospital with Heavy Use).
.2 Patient Transfer – Traditional
.3 Patient Transfer – Trauma
.4 Patient Transfer – Bariatric
.5 Administration
.6 Research (requiring to carry sensitive, often heavy freight)
.7 Residential Care Home
.8 MDRD (Clean and Soiled for Materials Reprocessing)
.9 Parkades
.10 Elevator dedicated to carrying freight, garbage, linen, food
.11 Clinical
.12 Helicopter Landing Pads
.13 Wheelchair Lift

59 ELEVATOR QUANTITY, SPEED, SIZE AND CAPACITY

59.1 Elevator service in a HCF shall be evaluated based on demands placed on the system during a typical, fifteen-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 cabs at various floors throughout the elevator round trip.

59.2 An elevator analysis, to provide service excellence at all HCFs, shall be provided and be predicated on the projected number of patient, staff counts in the facility and the projected vehicle traffic. The number and grouping of elevators required for a specific project shall be determined following traffic studies by an experienced vertical transportation professional.

59.3 For each HCF, calculations shall be based on actual facility operations, anticipated traffic movements and populations. Additional guidelines and examples are included in the Appendices to this document and shall be integrated into all designs.

59.4 The design shall assume that staff shall travel on both general public and patient transfer systems.

59.5 Passenger elevators shall have a handling capacity of at least 12% of the total population for a peak 5 minute period.

59.6 For adequate elevator service, the following average wait time (AWT) interval is required, unless stated otherwise:

.1 Public (ambulatory passenger) elevators 40 seconds
.2 Patient elevators, 30 seconds
.3 Service elevators, 35 seconds
.4 Clean and soiled, 45 seconds
.5 Load Factor: Passenger elevators shall provide adequate service with a load factor below 40%. 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 the Safety Code for Elevators and Escalators.

59.7 Distinct separation of traffic types shall be provided, with passenger elevators for public, patient; and trauma elevators for inpatient traffic; and service elevators for materials and logistical traffic.

59.8 Grouping of elevators, rather than providing single units or small groupings at various locations, shall be provided.

59.9 Elevators shall be located to provide separation of traffic types in addition to minimization of walking distances. Horizontal walking distances of up to 45-60m (150-300 feet) are generally acceptable for staff and visitors. Distances of 86-93m horizontal meters (250-300 horizontal feet) are generally acceptable for materials handling elevators.

59.10 When more than one elevator group is available, a person or vehicle origin does not necessarily dictate which vertical transport element that will be used. A certain percentage of the population will migrate to other areas of a facility and may not use the same elevator throughout the day. Elevator design shall accommodate a minimum migratory imbalance of 10%.

59.11 Elevator system capacity shall be based on the peak traffic conditions. The design shall address the following service criteria:

.1 Traffic Patterns
.2 Handling capacity

.3 Average interval
.4 Average cab loading

60 TYPE OF ELEVATOR

60.1 Hospital facilities with three or more levels shall employ traction type elevators with a machine room for public and other high traffic elevators.

60.2 Machine room less elevators shall not be permitted or installed.

60.3 Roped hydraulic type elevators shall not be permitted or installed.

60.4 Basement traction elevators shall not be permitted.

60.5 If hydraulic elevators are utilized, consideration and preference shall be given to holeless type (i.e. not requiring excavation to install) employing single stage, direct acting piston/cylinder configurations). Hydraulic elevators shall be limited to facilities with no more than three levels and a maximum vertical rise of 8.25 meters and shall only be used where adequate justification is presented for acceptance by the Manager, Contracts and Optimization and/or the HA

61 ELEVATOR CONFIGURATION

61.1 Elevators for public use shall be configured with platforms that are wider than they are deep, with centre opening doors, to facilitate efficient loading and unloading.

61.2 Size of Elevators

.1 Elevators shall be sized in accordance with actual needs for the HCF based on the intended purpose. This shall include consideration for special clinical requirements including but not limited to bariatric, trauma, helipad or other special requirements.
.2 Whenever possible, elevators shall be selected from industry standard dimensions. Custom sizing shall only be accepted by the HA in exceptional circumstances.
.3 Cab heights shall be 3048mm (10’-0”) clear to underside of ceiling.
.4 Door type and size shall be matched with the platform size and orientation.
.5 Where a facility has both Service and Public elevators, and the Service elevators are designated for the transportation of patients in beds, the team shall also consider sizing the Public elevators to accommodate the flow of patients in beds for redundancy and to ensure clinical and facility options in the case of failures, repairs or breakdowns.
.6 In most applications, whenever possible the elevator cab should be sized to accommodate HFC beds.

62 COMMISSIONING AGENT

62.1 HA may directly procure a Commissioning Agent for all projects. All consultant and construction teams shall provide the requirements set out by the Agent and this document.

63 AUDITS

63.1 Near or at the end of the warranty period for each elevator in a project, a full audit shall be completed to establish the current condition of the elevator. Every component of the elevator shall be comprehensively assessed and reported to the Manager, Contracts and Optimization. Where there are deviations in overall performance of the equipment or maintenance of the elevators or machine room, the Elevator Contractor shall remedy the issues and the elevators shall be re-audited to establish an approved baseline condition. The audit will follow a procedure established by the HA and a pre-audit conference shall be attended by all parties.

PART 4 – MODERNIZATION OF EXISTING ELEVATORS

64 INTRODUCTION

64.1 The purpose of this section is to provide guidelines for the modernization of existing elevators in existing HCFs.

64.2 The objective of an elevator modernization is to provide safe, reliable, sustainable and consistent elevator performance for a minimum of 25 years from the time of completion of the elevator project.

64.3 The scope for modernization of existing elevators shall be determined on a case-by-case basis. Scope shall be defined clearly by the elevator consultant, approved by the Manager, Contracts and Optimization or his designate Contract Manager, Facilities and a specification prepared for tender or competitive bid by the elevator consultant.

64.4 Complete replacement of elevator equipment may be required in certain locations in the HA facility portfolio.

64.5 Where any new components are required, the design specification shall be prepared per “Part 2 – Technical Requirements” of this document.

65 PERMISSION TO WORK AT EXISTING FACILITIES

65.1 Five(5) days’ notice of any work that is to be undertaken at a facility, including investigations and inspections, shall be notified to the Project Manager for their approval and the approval of key stakeholders which include the HFC FMO Site Manager and Contract Manager, Facilities.

65.2 No work shall commence on site without the prior approval of the Project Manager.

65.3 Where input is required from facility stakeholders (e.g. security, fire alarm etc.) the vendor shall provide a detailed account of their expectations of the work required, the start time and duration of the work and any affect the work may have on the facility. If necessary, alternate circulation routes shall also be proposed with the request for permission to perform the work.

66 RENEWAL PROCESS – WORKING IN EXISTING FACILITIES

66.1 Where elevator renewal projects are required in existing buildings, the project must adhere to all requirements of infection control requirements as listed in CSA Z317, in addition to any site specific requirements mandated by the facility.

66.2 It is the responsibility of the Contractor to ensure all standards in this document required by each facility are strictly adhered to, particularly in areas that impact at-risk patients.

66.3 Construction methods, work zones required and scheduling of disruptive work shall be reviewed and agreed with all key Project stakeholders, prior to the implementation of any work on site.

66.4 All Project team members shall note the sensitive nature of working in a live HCF where most occupants are either vulnerable or in a life threatening circumstance due to illness or injury, or there is treatment in those who are vulnerable due to illness or injury and/or their close friends and family attending at HFCs.

66.5 Safety, infection control and deference to site users shall be the top priorities at all times when working in a live HCF environment and shall be strictly enforced by the Project Manager.

67 INFECTION CONTROL PLANNING DURING CONSTRUCTION

67.1 Ante-rooms shall be provided to all construction zones. Pre-fabricated ante rooms shall be utilized to minimise site construction in vulnerable areas.

67.2 Specific infection control requirements for each HCF shall be included in the project specification, with critical areas emphasised to ensure clear understanding and implementation by the contractor. Requirements shall be determined as follows:

.1 The elevator consultant shall prepare a project scope outline for presentation to the Infection Control team at the project HCF, clearly marking affected areas on drawings.
.2 Estimates of construction duration in affected areas shall be provided.
.3 The Infection Control team shall have a period of two weeks to review the scope and affected areas, and to provide their specific site requirements for infection control for the project.
.4 The site specific requirements for infection control shall be included in the tender for construction services.

67.3 Contractors providing infection control measures during construction shall meet the following requirements:

.1 The site superintendent shall have a minimum of three (3) projects experience in the delivery of construction projects in a healthcare environment requiring infection control measures.
.2 The site superintendent shall provide a minimum of three references from previous projects successfully delivered, with a minimum of two references from the infection control officers for the project facility.
.3 The site superintendent shall be the same individual throughout the duration of the project. Where a change is unavoidable, the contractor shall provide continuity of service, additional training and additional reporting until the HA is satisfied that the new site superintendent is fully informed and in control of the project requirements. No additional costs shall be charged by the contractor for changes in their personnel.
.4 Weekly reporting, including photographs of all infection control measures, shall be provided by the contractor to the Project Manager for HA for the duration of the project.

68 MODERNIZATION SCOPE

68.1 The decision to modernize elevator equipment shall be based on the following criteria, which shall be weighted differently and appropriately to each HCF:

.1 Critical ranking of the elevator for facility usage (critical, high, normal, low)
.2 Age of equipment and components
.3 Quality of the original elevator equipment
.4 Condition of existing equipment and components
.5 Availability of spare parts to replace existing equipment or components if they are retained
.6 Ride quality objectives
.7 Reliability of the equipment
.8 Ease of long term maintenance and availability of parts

69 ELEVATOR MACHINES

69.1 Where geared machines are being considered for replacement, an alternate gearless machine equipment option shall be considered.

69.2 A report on the average power consumption of the geared versus gearless options shall be provided for review by Manager, Contracts and Optimization.

69.3 If existing machines are retained they shall be refurbished as follows:

.1 At a minimum, the machine shall be serviced in accordance with sentence 8 of TSBC Directive D-L4 100311 2 as follows:

h) Cleaned to ensure safe and proper operation, including but not limited to residual pads, linings, pins, springs, sleeves, discs.
i) A brake marking plate must be provided.
j) The brake setting and method of measurement must be permanently and legibly marked on the driving-machine brake.

.1 Any worn parts must be replaced and tested.
.2 The machines shall be:

- Thoroughly cleaned and painted.
- Flushed and replaced with new gear oil
- Have the seals replaced where leaking
- Any adjustments made to have a proper gear mesh between the crown and worm gear.
- The machine shall be painted, use a contrasting colour for components that rotate such as the main drive sheave as outlined in 15.6
- Stencilled with the elevator name and TSBC number

.1 Driving machine sheave rope retainers shall be provided for seismic requirements in accordance with 8.4.3.1 of the B44-07 Safety Code.
.2 New machine isolation pads of equivalent properties of the original equipment manufacturer shall be provided.

70 ASCENDING CAR OVERSPEED AND UNINTENDED MOTION PROTECTION

70.1 A system and associated devices necessary to provide ascending car overspeed and unintended motion protection for the elevator shall be provided.

70.2 Pre-approved products include a Hollister-Whitney Rope Gripper or equivalent.

70.3 The device shall be mounted directly to the elevator machine beams and an engineered drawing must be provided, and the installation must be in accordance with the submitted plans.

71 HOIST ROPES

71.1 Hoist ropes shall be replaced when elevator machines are replaced.

71.2 The hoist ropes shall match the original manufacturer specifications for type, diameter and rope lay, and new rope shackles shall be provided.

72 GOVERNORS

72.1 Governors that are not equipped with overspeed switches shall be replaced.

72.2 Governors that meet all current code requirements and remain in good operating condition shall be retained upon review on a case-by-case basis.

72.3 Where governors are located in the overhead and are not self-resetting, these shall be replaced with self-resetting governors.

72.4 When existing governor tension sheaves are retained, the bushings shall be cleaned and lubricated as part of the project to restrict acoustical issues and limit maintenance requirements.

72.5 All governors shall be calibrated to trip the overspeed switch and drop the mechanism that actuates the car safeties, in accordance with the contract speed and code requirements.

73 ELEVATOR DRIVES

73.1 Variable Voltage Drives with generators shall be replaced with AC Variable Frequency Drives.

73.2 Regenerative drives shall be considered on gearless applications and on geared applications that are 350 feet per minute and 8 stops or more.

74 HOIST MOTORS

74.1 Hoist motors shall be replaced unless justifiable evidence and reasoning to retain is presented which shall be considered.

74.2 New AC motors shall be provided to match the characteristics of the new AC Variable Frequency Drive being provided.

74.3 Motors shall have invertor spike resistant (ISR) windings.

74.4 The motor shall be sized accordingly to match the speed and capacity required to meet elevator performance requirements.

74.5 The motor shall be aligned with the existing machine with care and attention to accurate tolerances. The connection between the motor and machine shall be installed and commissioned to eliminate acoustical and vibration issues, and to extend the life of the equipment.

75 CONTROLLERS

75.1 The existing controllers shall be replaced with new, non-proprietary microprocessor control systems.

75.2 The controller shall have all of the operational capabilities to meet the requirements in these specifications as outlined in “Part 2 – Technical Requirements” of this document. Thermal potential and machine room environment shall be controlled appropriately to the equipment supplied.

75.3 All existing controller(s) mounts shall be seismically restrained.

75.4 Thermal monitoring of elevator systems shall be provided, with automated alarm to the facility 24/7 monitoring station or as otherwise designated by the HFC, FMO and HA.

75.5 Minimum operating range of all elevator equipment shall be 90 degrees Fahrenheit for 5 hours.

76 CLOSED LOOP CONTROL

76.1 Motion control systems shall be equipped with closed loop control.

76.2 Closed loop feedback power controls shall be arranged to continuously monitor the actual elevator speed signal from the velocity transducer and compare it with the intended speed signal to verify proper and safe operation of the elevator. The power factor shall remain continuously at 95%.

77 MACHINE ROOM FLOOR PATCH AND PAINT

77.1 All holes shall be repaired. In addition to structural and other design requirements, special attention shall be given to providing a smooth, seamless floor and wall finish.

77.2 The machine room floor shall be cleaned, prepared and painted with a durable white or grey semi-gloss paint.

78 SEISMIC MOTION SENSOR

78.1 Where required by code, provide and mount on a solid appropriate wall surface in the elevator machine room, a device to detect seismic activity and send a signal to the elevator controller.

79 HALL DOOR EQUIPMENT

79.1 Door Interlocks

.1 Replace existing door interlocks with new interlocks and new wiring in accordance with the most recent requirements of the B44 Safety Code for Elevators.
.2 Where door locks are of good original quality, effort shall be made to retain instead of replacing. Examples are Otis 6940 Door Interlocks.

79.2 Hall Door Tracks and Redundant Retainers

.1 The existing door tracks and door retainers shall be retained if possible.
.2 If there is notable damage to the door tracks they shall be replaced
.3 All hall sills shall be cleaned for the full width of the sill and in like new condition or replaced.
.4 Otis J tracks shall be replaced with new conventional tracks and all hall door rollers shall be replaced.

79.3 Door Closers

.1 Weighted and spring type closers shall be replaced with new Spirator Door Closers from Smartork or similar approved.
.2 Sill type closers shall be retained unless they are worn or proven problematic through the maintenance contract.

79.4 Drop Key Access

.1 Provide drop key access at each hall door.
.2 Each door interlock shall be equipped with means to allow the door lock to be lifted with a drop key device.
.3 All holes in each hall door shall be filled with a sleeve that is positively tightened such that it cannot be removed.

79.5 Door Hardware, Rollers, and Linkages Renewal

.1 The intent of a modernization is to renew the door equipment and hardware to new/near new operational condition.
.2 Replace all damaged or worn astragals on each hall door panel.
.3 All cab sills shall be replaced.
.4 Replace all hall door rollers

79.6 Door Restrictors

.1 Unitec Folding Door Restrictors shall be installed.

80 TOP OF CAR INSPECTION AND STOP SWITCH

80.1 Where existing top- of-car inspection stations are not code compliant, a new top-of-car inspection station shall be provided, conveniently located for safe operations and access while performing maintenance from the car top.

80.2 The inspection station shall be designed with redundant and protected buttons in accordance with elevator safety code requirements.

80.3 If the inspection station cannot be mounted within easy reach from the lobby, an auxiliary stop switch shall be provided that is within easy reach from the elevator lobby. The stop switch shall be wired in series with the stop switch on the top of car inspection station.

81 CAB AND COUNTERWEIGHT GUIDES

81.1 The replacement of guide rollers on cars and counterweights are to be determined on a case by case basis. Typically, older roller guides that do not have provisions for the adjustment or spring tension in the rollers shall be replaced.

81.2 New Roller Guides to the car and counterweight shall be provided in most cases. Elsco Model B (or similar approved) is the minimum quality permitted for the car and Elsco Model D (or similar approved) is the minimum quality permitted for the counterweight.

81.3 Where additional seismic supports are required, cab upper and lower guiding member position restraints shall be provided in accordance with 8.4.5.1 and 8.4.7.2.1 of the B44 Safety Code.

82 CAB COUNTERWEIGHTS

82.1 Typically, counterweight frames shall be retained when modernizing elevators. Any new weight added to the counterweight shall be suitably fastened to prevent weights from slipping free of the counterweight and to eliminate any acoustical issues due to rattling weights or fasteners.

82.2 Upper and lower guiding member position seismic restraints shall be provided in accordance with 8.4.5.1 and 8.4.7.2.1 of the B44-07 Safety Code.

83 HOISTWAY FLOOR MARKINGS

83.1 If not already provided, each landing shall be identified from the inside of the hoistway by marking the floor level on the inside of each hall door panel at the top and bottom with a stencil a minimum of 4” tall.

84 SAFETY PLANK

84.1 Typically, unless the speed or capacity of the elevator is changing or there is a mechanical reason that prevents the re-use of the safety plank, it shall be retained, cleaned and refurbished in addition to the actuating rod and safeties.

85 BUFFERS

85.1 Typically, existing buffers shall be retained. For oil buffers, buffer fluid shall be flushed and replaced.

85.2 Where oil buffers are provided, a buffer return switch shall be installed if not already in place.

86 PIT STOP SWITCH

86.1 All pit stop switches that are not protected from accidental actuation shall be replaced.

86.2 Additional pit stop switches shall be provided when the main switch cannot be actuated from the pit. For example, elevators with exceptionally deep pits that are only equipped with one pit stop switch.

87 PIT LADDER

If not already provided, the elevator contractor shall provide a pit access ladder.

88 APRON (TOE) GUARD

88.1 Where achievable, new sheet metal apron guards shall be provided to replace the existing apron (toe) guards providing as much protection as possible below the car sill.

88.2 New apron guards shall extend 48” below the car sill, unless limited by the existing pit depth and car over-travel.

88.3 The apron guard shall be fastened on both sides to prevent deflection when loaded horizontally from the lobby.

89 SEISMIC REQUIREMENTS

89.1 Where deflector sheaves are located in the overhead, provide deflector sheave rope seismic retainers in accordance with 8.4.3.1 of the B44-07 Safety Code for any overhead deflector sheaves.

89.2 A counterweight displacement detector device shall be provided if the counterweight has been displaced from within the guiderails.

.1 The counterweight displacement detector device shall be connected to the elevator controller and cause the elevator to slow down, stop and level to the floor where the car travels away from the displace counterweight.

90 CAB INTERIOR VENTILATION

90.1 Where ventilation is not already provided, a new ventilation fan shall be installed with the capacity and design to provide adequate quiet air flow through a HEPA filter (MERV14 or as approved by HCF) into the cab occupancy space so the cab is pressurized and air is vented out through the required elevator code floor and ceiling openings into the elevator shaft.

90.2 Existing ventilation shall be redesigned to function as outlined above in like-new operating condition or replaced where required.

90.3 A fan grill cover shall be provided and painted to match the ceiling of the cab.

91 HOISTWAY ACCESS KEYED OPERATED SWITCHES

91.1 Hoistway access shall be provided at the top and bottom landings regardless of the speed of the elevator.

.1 The keyed switch shall be mounted in the sight guard or entrance jamb of the door at each respective landing. They shall not be installed in the hall station.

91.2 The contractor shall be responsible for any cutting and patching required for new fixtures and to make-good the existing elevator entrance finishes.

92 PANEL FOR EMERGENCY PERSONNEL

92.1 Where required by Code, or when considered necessary by the HCF, a fixture shall be provided within close proximity of the main floor elevator lobby that shall contain the following:

.1 A remote telephone and handset that can call directly into every elevator hands free phone;
.2 A two position keyed switch for fire fighter operation;
.3 An illuminating indicator to advise emergency personnel that elevators are set on recall-operation.

93 HALL DOOR FRAMES AND ENTRANCES

93.1 Existing entrances and frames that are not finished in stainless steel shall be fully wrapped up to at least 40 inches off the floor to protect existing finishes and include all floor and code required markings and barrier free access information.

94 HOUSEKEEPING

94.1 All elements of the cab, machine room and any areas impacted by construction activities shall be thoroughly cleaned and all debris removed prior to final inspections of any elevator modernizations.

94.2 Where alterations to existing areas are required, all impacted areas shall be made good and returned to previous or better condition.

PART 5 – OPERATIONS AND MAINTENANCE

95 INTRODUCTION

95.1 Part 5 of these guidelines is intended for use in determining operations and maintenance requirements for elevators, new and modernized.

96 PERFORMANCE REPORTING

96.1 Performance reporting information shall be available and provided upon request for all elevators after elevator commissioning by Manager, Contracts and Optimization, Facilities Manager or their designates.

96.2 Where an entrapment or elevator shut-down occurs, provision shall be made to notify the Facility Manager, the Manager, Contracts and Optimization and/or appointed delegate(s) with a priority communication.

97 AUDIT REPORTING

97.1 Following the completion of project scope for each elevator modernization in a project, a full audit shall be completed to establish the new baseline condition of the elevator. Every component of the elevator shall be comprehensively assessed and reported to Manager, Contracts and Optimization.

98 WIRING SCHEMATICS

98.1 Wiring Schematics shall be provided for each elevator control system provided.

98.2 The Schematics shall be:

.1 “As built” and shall match the actual wiring of the controllers.
.2 Complete and cover all components of the elevator without any exceptions.
.3 Specific for the actual elevator
.4 Submitted in both hard copy (2 copies, full size) and electronic (.pdf) format

99 MANUALS

99.1 The OEM Manual and Owner’s Manual shall be provided for each elevator and/or specific component included in the scope of each project.

99.2 The Owner’s Manual shall include all procedures and protocols required to operate all installed equipment, including but not limited to the following:

.1 Simple description of the reset procedure for automatic emergency recall operation
.2 A description of the operation of all special features including but not limited to Medical Emergency Operation, Priority Service, Standby Power testing and independent service etc.
.3 What HCF staff can check and do before they place a call to the elevator contractor for service.

.4 Routine housekeeping procedures that are recommended by the elevator contractor to sustain the equipment shall be included such as cleaning procedures for hall sills, cab sills, door detector edges, stainless steel finishes and cab/hall call buttons.
.5 All lighting manuals shall be provided in the Owner's Manual.
.6 Submitted in both hard copy (2 copies in separate hard cover binders with labelled section dividers) and electronic (.pdf) format

99.3 The OEM Manual shall include all information required to install, service, maintain, repair and replace all components of the elevator and its operations.

99.4 The OEM Manual shall include:

.1 A detailed spare parts list for all elevator components including but not limited to control boards, hall door rollers, top of cab inspection, door operator, roller guides, lighting specifications, hall and cab call buttons;
.2 Details of all fault codes and diagnostic/troubleshooting instructions;
.3 Instructions for mandatory testing including but not limited to brake tests, governor tests and other tests that are required, in accordance with elevator safety code regulations;
.4 Emergency backup power procedures;
.5 Fire alarm testing procedures;
.6 Submitted in both hard copy (1 copy in a hard cover binder with labelled section dividers) and electronic (pdf) format.

100 WARRANTY REQUIREMENTS

100.1 Contractor obligations during the warranty period shall be under the current and required VCH Scope of Work contract documents referenced in the Appendix at the end of this document.

101 MAINTENANCE TRAINING

101.1 During construction, training shall be provided to all affected vendors to address temporary conditions e.g. alternate fire procedures, alternate security/infant theft procedures etc.

101.2 When turning over an elevator or group of elevators to the HCF, the local building operators and appropriate staff shall be provided an orientation of the various elevator operations and any keyed switches. These features include and are not limited to automatic emergency recall and reset procedures, medical emergency operation, and priority recall operation.

.1 Training sessions shall be video recorded for use by personnel not available at the training sessions.

102 CHECKLISTS

All construction team members, including all consultants and contractors, will be required to complete project checklists as part of project deliverables to the Project Manager for quality and assurance monitoring.

APPENDICES

These appendices are provided as supplemental information to the guidelines. Numbered references correspond to their host sections in the main body of this document.

A1 – Introduction

1.2 – Technical Guidelines Deviation Submission

Documentation shall be provided with clause references to these Technical Guidelines for all deviations for approval to the Manager of Contracts, Facilities

A7 - Barrier Free Access

A7.1 Best practices for additional barrier free access shall include vertical switches mounted on the side and rear walls of the cabs that extend from the handrail to the floor to allow users to:

- Place cab calls without having to use their hands.
- Activate the hands free phone

The Blusson Building at Vancouver General Hospital is equipped with a good example of this type of barrier free access.

A13 – Vibration and Acoustical Isolation

The technical requirements require all elevator equipment in particular the elevator driving machines to be mechanically isolated from the rest of the building to prevent the transmission of noise through the building structure.

Suggestions to assist in the isolation of the machinery equipment can be found at http://www.vibra-sonic.com, where details describing the isolation of overhead traction machines are documented as guidance.

A21 Cab Operating Panels

Figure 1 shows key operating panel components and layout. Designs shall include clear instructions, latest technologies, and complement infection control measures effectively. This figure is **INDICATIVE ONLY** – final approved HFC design by the Elevator Consultant or Installer for the Project.

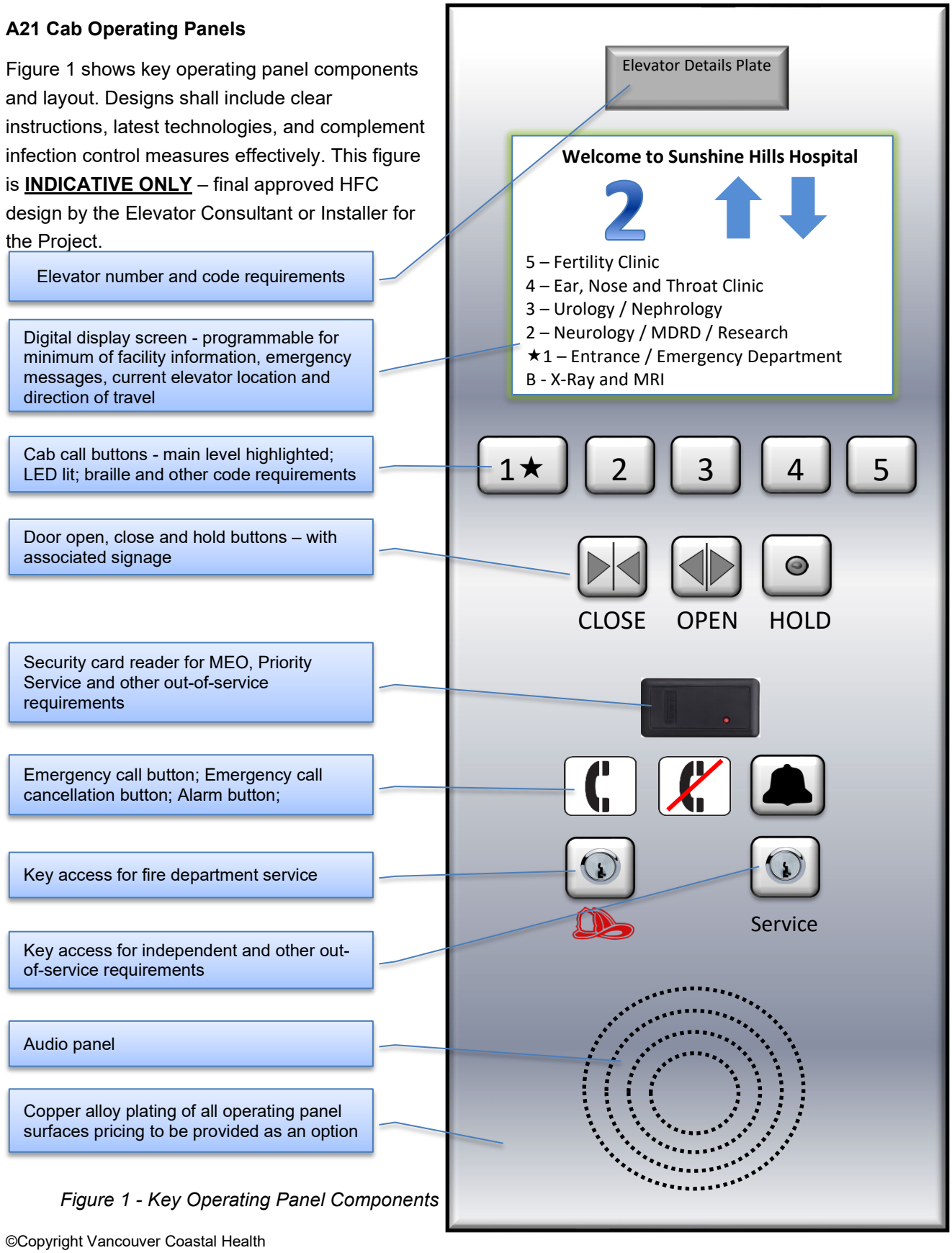

Figure 1 - Key Operating Panel Components

A28 – Cab Interior Finishes

The intent of the cab finishes design and specifications, as shown **INDICATIVELY** in Figure 2, is to:

a) Maximize patient comfort by avoiding direct lighting for patients lying on beds. All lighting fixture components requiring regular maintenance (e.g. bulbs) shall be replaceable from the inside of the cab, without the requirement to access the cab roof. LED lighting is preferred including strip lighting as outlined in Figure 2 or other configurations in line with approved elevator cab design.
b) Minimise the spread of infection that can occur when ceiling panels are disturbed for maintenance or repairs, by avoiding the requirement to access the cab roof from within the cab.
c) Minimise the spread of infection by limiting all joints, recesses, seams etc. of cab finishes, including floors, walls, ceilings, handrails, bumper rails, operating panels, lanterns etc.
d) Air intake rather than exhaust into elevator cab through a HEPA filter with a MERV 14 rating or HFC approved alternative.

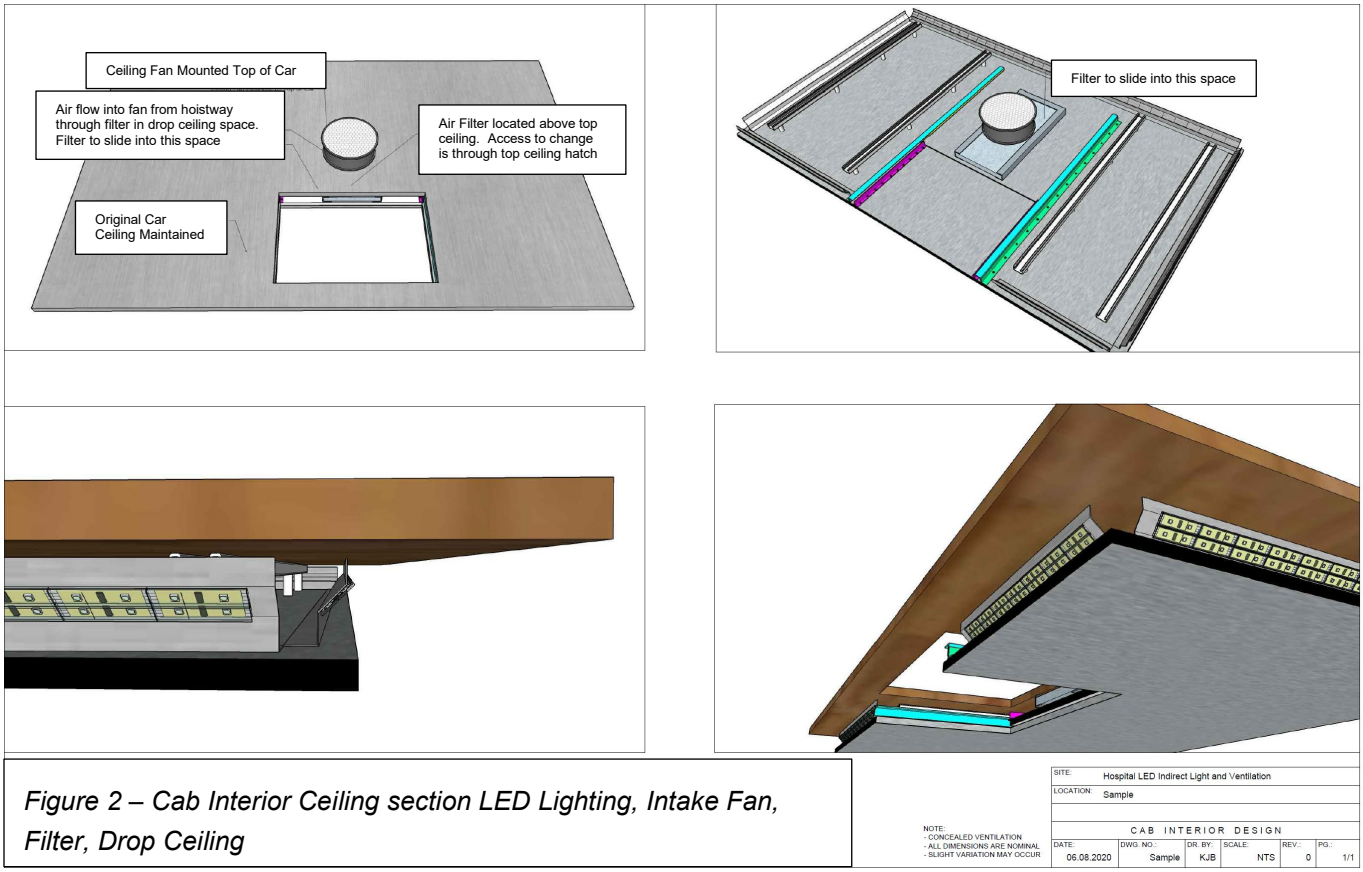

Figure 2 – Cab Interior Ceiling section LED Lighting, Intake Fan, Filter, Drop Ceiling

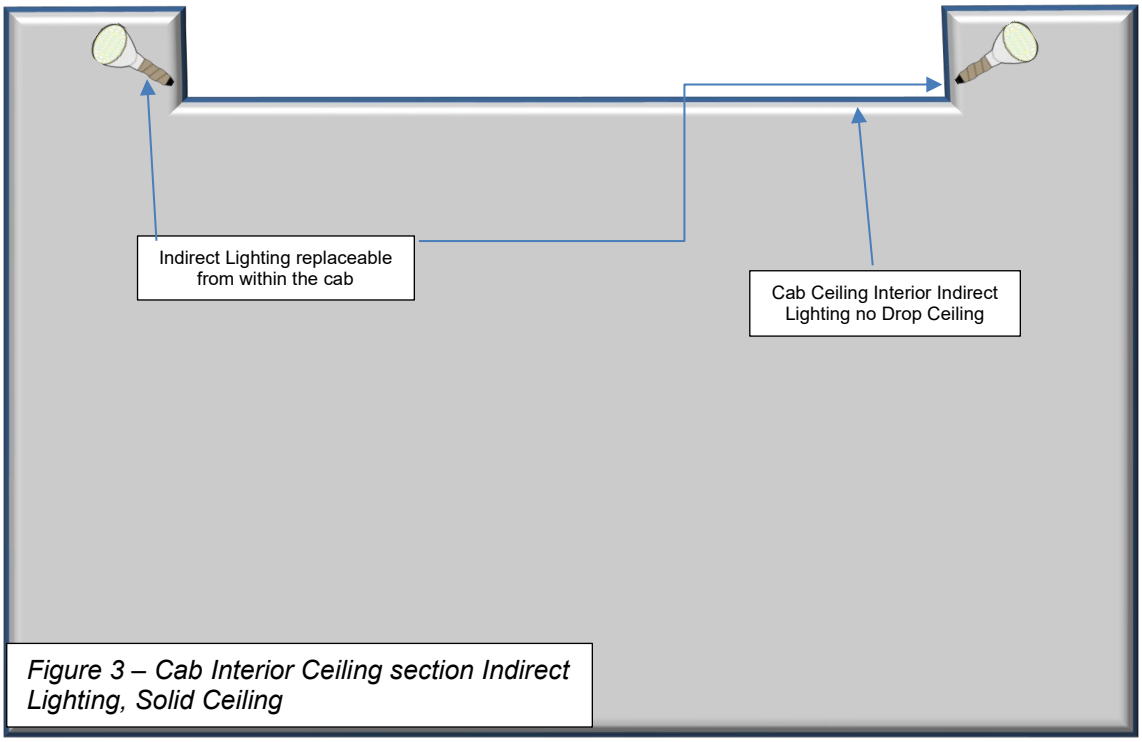

Figure 3 – Cab Interior Ceiling section Indirect Lighting, Solid Ceiling

A36 – Elevator Dispatching

A36.1 Calculations based on anticipated traffic movement shall be taken into consideration, rather than assumptions for overall building population.

For example, a floor with ambulatory patient day procedures may need to move more people that the actual static population counted at any given time.

As another example, 10 treatment rooms - where the average treatment time is 15 minutes - might have a population of 24 people at peak periods. Traditional calculations would take 12% of 24 people and move 2.88 people every 5 minutes. In reality, every 15 minutes you will have 10 patients coming in with one person accompanying them and the same amount leaving. This amounts to 40 people in 15 minutes, which is 13 people in a 5 minute interval, which is larger than the 2.88 people calculated with traditional methods.

A36.2 Dwell Times

For public elevators, the door dwell times shall be as follows: (latest version of CSA Z8000)

- Nominal cab call dwell time shall be 3.5 s.
- Nominal hall call dwell time shall be 5.0 s.
- Nominal nudging initiation time shall be 20.0 s.

Dwell times shall be adjusted to suit particular HCF requirements as required for specific purpose.

A42 – Medical Emergency Operation

A42.1 When Medical Emergency Operation Stage 1 has been initiated, the elevator shall respond as follows:

a) Upon receiving a Medical Emergency signal, the elevator group control system shall select the elevator available in the shortest time, cancel all existing hall and cab call demand and send the cab directly to the MEO level.
b) An audible signal shall be provided in the cab selected. This signal shall sound to alert any passengers to immediately exit the elevator at the next landing.
c) An illuminating Medical Emergency notice shall be provided in the cab(s) selected that reads “Medical Emergency, Please Exit” or similar. The sign shall illuminate for the duration of the MEO.
d) A hidden indicator shall be provided in hall lantern stations to illuminate “Medical Emergency” when that cab has been selected and entered into MEO operation.
e) Hall lanterns with indicators shall be provided at all landings to advise passenger and emergency personnel that the elevator is on MEO operation.

A42.2 When Medical Emergency Operation Stage 2 has been initiated, the elevator shall respond as follows:

a) Elevators designated as MEO shall be equipped with a two (2) position momentary keyed switch to initiate MEO operation inside the cab labelled “OFF” and “ON”. The OFF position is the neutral position where the key can be inserted and removed. Turning the key momentarily to “ON” shall initiate MEO within the cab.
b) When the elevator has arrived at the required MEO landing, they shall have five (5) seconds to initiate MEO operation within the cab before it is automatically restored to group operation.
c) The Code Team shall initiate the MEO operation in the Cab by rotating the switch to the MEO “ON” position.
d) Upon actuation of a cab call, the elevator shall proceed directly to the target floor.
e) The elevator shall be automatically restored to normal operation once the elevator has reached the destination called by Code Team. All audible and visual indicators shall be extinguished.
f) If extra time is required by the Code Team, or if the elevator needs to remain at the designated floor, then independent service shall be initiated.
g) Cab doors shall operate in normal mode during an MEO, thus the door hold button can be used to extend the time if required.

A41.3 Cancelling MEO Operation - MEO Operation can be cancelled in the following ways:

a) MEO Operation shall be cancelled at the hall station where MEO was initiated by rotating the key to the cancel position. This shall cancel the MEO operation if the elevator has not yet arrived at the landing.
b) If a proximity card reader system is used, the MEO operation shall be cancelled by swiping the hall call proximity reader a second time.
c) The cab shall automatically time out and return to normal group operation and all audible and visual indicators for MEO operation will stop and extinguish respectively.

A42.4 MEO Operation Identification and Marking

a) Key orientation shall have the neutral “OFF” position at the 12 o’clock position. The key shall rotate 90 degrees clockwise to the “ON” position to initiate Stage 2 MEO operation.
b) The MEO Operation initiation devices shall be provided with a blue ring or collar.
c) The MEO Operation initiation devices shall be labelled with “Medical Emergency” blue, or white on blue.
d) The MEO Operation initiation devices shall be engraved with blue infill or white on blue, and shall state “MEDICAL EMERGENCY OPERATION”.
e) All keyed switches used to initiate Stage 1 or Stage 2 Medical Emergency Operation shall have their positions labelled in BLUE.

A42.5 MEO Operation and Automatic Emergency Recall

a) If Automatic Emergency Recall Phase 1 is initiated when an elevator is in MEO Stage 2 operation, that elevator shall recall in accordance with Automatic Emergency Recall operation, once the Medical Emergency Operation has been completed or cancelled.

A42.6 MEO Operation in banks of Multiple Elevators

a) For a bank of elevators, all elevators shall be capable of operating in MEO at one time. If an MEO is initiated while an elevator is currently in Medical Emergency operation, the HCF staff shall be able to call another elevator in the same bank for MEO operation.

QUALIFIED ELEVATOR CONTRACTORS ONLY

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TK ELEVATOR CONTRACT C03593

RICHMOND ELEVATOR CONTRACT C03594

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ABOVE ELEVATOR CONTRACTS REQUIRED FOR INSTALLATION, WARRANTY AND SERVICE

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TO PRE-QUALIFY CONTRACTORS FOR ELEVATOR INSTALLATION OR MODERNIZATION UNDER REQUIRED CONTRACTS AND THESE GUIDELINES CONTACT:

VANCOUVER COASTAL HEALTH

MANAGER OF CONTRACTS & OPTIMIZATION, FACILITIES, REAL ESTATE AND STRATEGIC DEVELOPMENT INITIATIVES